MARCH 2021

VIEWPOINT

OFFICIAL QUARTERLY MAGAZINE OF CEAI

www.ceai.org.in

Export of Consultancy Services

CONSULTING ENGINEERS ASSOCIATION OF INDIA

Creating Value Ethically for Engineers

60 Years

Service to Consulting Engineers

ISO 9001:2015

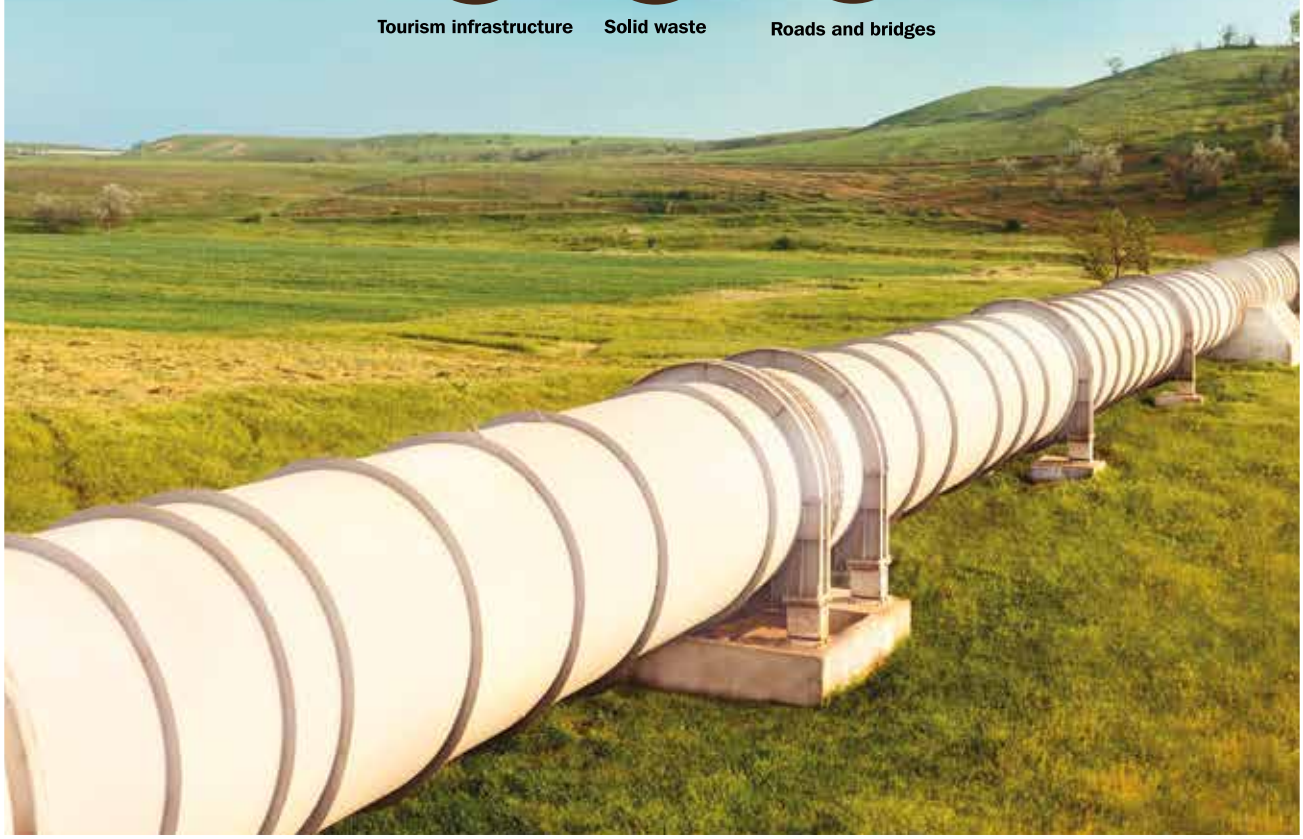
www.stc.co.in

BUILDING URBAN LIFELINES WITH MASTERY

Established in the year 1976, Shah Technical Consultants works towards the objective of providing professional services in the field of urban infrastructure specialising in the water and waste water sectors. With projects both in India and overseas, STC is today a widely recognised and trusted name in infrastructure consulting.

OUR SECTORS

- Sewerage
- Water supply
- Storm water
- Tourism infrastructure
- Solid waste
- Roads and bridges



SHAH TECHNICAL CONSULTANTS PVT. LTD.

Mumbai
#407, Raheja Centre,
Nariman Point, Mumbai – 400 021.
+91 22 22871061 | stc@stc.co.in

Chennai
Old No. 43/2, New No. 24/8,
Vijayaraghava Road (Adjacent to Andhra Club),
T. Nagar, Chennai – 600 017.
+91 44 28150573 | stc.chennai@stc.co.in

Jaipur
#32, Lions Colony, Opp. Morani Motors,
Sitabari Tonk Road, Jaipur – 302 018.
+91 141 2552981 | stcjaipur@stc.co.in

MARCH 2021

VIEWPOINT

OFFICIAL QUARTERLY MAGAZINE OF CEAI

www.ceai.org.in

CONTENTS

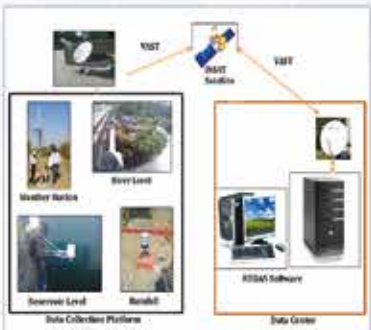
Editorial Board Members

Mr. A P Mull, *Chief Editor*
Mr. Girish Mishra
Mr. Pradeep Chaturvedi
Dr. Rajashekhar R Malur
Dr. Saranjit Singh
Mr. Somenath Ghosh
Mr. Sunil Srivastava
Mr. V N Heggade
Mr. Vijay Nadkar
Mr. C J Ragunathan
Mr. Gautam Bysack
Ms. Neha Jain

MECHATRONICS SYSTEMS PRIVATE LIMITED

An ISO 9001:2015, ISO 14001:2015, ISO 27001:2013
& CMMi Level-3 Certified Company

Smart Digital Integrated Water Resource Management & Control System

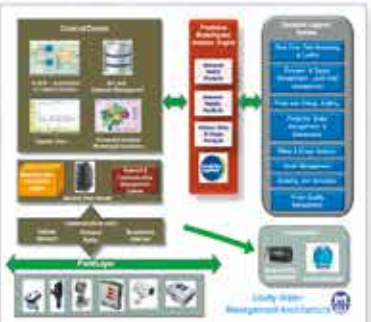


Real Time Hydro Metrological Information System(RTDAS)

Flood Forecasting & Flood Management System with Dam Automation

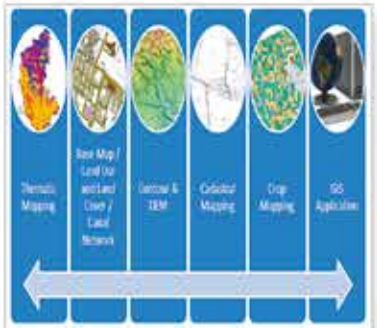
Canal Automation & Smart Irrigation Management System

Water is Life... Conserve it !!!



Smart City water Supply Management

Enterprise Management Information System



Geographical Information System (GIS)

"Mechatronics House"
Survey No. 107, Mumbai-Banglore Bypass Highway, Warje, Pune 411058
Phone : 020 6704 4300

Email : info@msplpune.com **Url :** www.msplpune.com

Message from Chief Editor

Dear Fellow Consulting Engineers & Readers,

India took a giant step when it transformed from a developing nation to one which can stand on its own and also come to the aid of others in their time of need. The pandemic had triggered extensive research to develop a vaccine and India was one of the nations that produced a vaccine which was approved and used to vaccinate not only its own population but also help other nations who were in dire need of it. Indian bio-technology capabilities got a big boost and recognition worldwide.

India and its people have the capability to excel in all spheres once they put their heart and soul into it and get the right encouragement and recognition. India has a good number of consulting engineers who are qualified, capable and experienced with a demonstrable track record. While they are using their knowledge and expertise for the growth of the nation they can and should also use them for the benefit of other developing nations. Fulfilling the requirements of developed nations which are facing a demographic issue, is another large opportunity. The field is wide open and there is growing space for a very large number for the daring, the innovative and the industrious. In all that they do, Engineers must keep Safety, Health, Environment and Security in mind, all in keeping with Green Engineering to achieve the Sustainable Development Goals.

Longer the life the more sustainable would be a project and even a product. Consumerism is antithetical to sustainability, hence reuse of a product must be a part and parcel of its design. The design life should also be a part of the product labelling; be it a small product or a large machine.

In these columns it has been stressed time and again that Engineers are the sine qua non for a project. Along with Engineers are scientists and technicians - each one has a role to play. They contribute to improving the quality of life of a society, engineering its safety, health and environment. The very aspect of Safety is apparently being short shrifted as per the failures, accidents and disasters that are reported in the media. That's something which has to be tackled immediately. Each and every person right from the top most person to lowest grade of worker even a cleaner must be aware of all safety requirements, whether it is a construction site or a plant. The person may not be directly concerned but if the person is aware then that person could always raise the red flag and warn others. Engineers cannot take chances – their work and the resulting product must be 100 percent safe and fit for purpose for the intended design life.

The past year was recorded the Chamoli disaster, the freeze in southern USA and other happenings which have once again raised an alarm and a reminder that the forces of Nature are paramount and humans are mere pawns. Just because a natural event has not occurred for decades, it does not mean that it will not happen again or that it cannot ever repeat. Nature is kaleidoscopic, infinitely supreme and many of its dynamics are still an enigma.

However, with all the resources that are available and being developed, prediction systems must be put in place to monitor and forewarn so that losses especially of lives is avoided. Development is necessary, neigh essential for growth of a nation. However, that needs to be done judiciously.

Other disasters that the country witnessed were the result of human errors – misjudgments or not going by the book or not being aware of the sequences to be adopted and the consequences of not following them or shear disdain for the consequences. All these factors have been analysed time and again but their recurrences are staggering. The adage 'haste makes waste' holds good in all spheres of human activities. It would therefore be prudent that any project – big or small, be first thought through fully and planned in details by a dedicated team who 'enjoy doing their work' and not consider it as a burden and a means to merely earn their livelihood. Decisions need to be based on engineering parameters and judgement, with climate change and sustainable development being prime considerations and not subservient to other factors. The decisions should all be for the good of the project so that the facilities being built would function for their design life, albeit with regular maintenance.

This issue of Viewpoint on "Export of Consultancy Services" presents some important aspects essential for ensuring that the Indian Consulting Engineers consider and provided for them correctly and perform their obligations as intended. As the authors of the article in this issue have shared, working in other countries is an enriching experience. The more the Indian Consulting Engineers take up projects abroad, the more they will reap the benefits of helping that country as well as their own.

Happy Exploration of Opportunities in New Markets

A P Mull

Engineering and Technical Consultancy Services from India

Dr Abhay Sinha
Director General
Services Export Promotion Council (SEPC)

The Services sector has been a mainstay of the Indian economy due to which India has emerged as a global hub for supply of various services. Today India's exports of services are over $200 billion annually, which contribute to 7% of India's GDP. India's services exports base has been growing at over 8% per annum in the last few years. Services account for 54% of India's Gross Value Added (GVA) and contribute more than 40 percent to India's total global exports.

According to World Trade Report 2019, India is the fifth largest services trader in the world and a large number of jobs are supported by services exports in India. ICT sector alone employs 3.5 million workers in India. Services exports lead directly to employment of approximately 2.6 crores people in India (accounting for around 30% share), while leading to indirect employment as well.

Engineering and technical consultancy services are among the major services exported from India and it comes under the head of 'Technical, Trade-related and other business services' of BPM6 classification. Engineering and technical consultancy services include a wide range of services broadly involving activities such as:

- Project Identification/ Evaluation
- Environmental Impact Assessment
- Identification and development/ sourcing of technologies
- Preparation of Feasibility Reports, Market Studies
- Designing of Projects
- Engineering Design Services
- Equipment Procurement and Erection
- Project Management Services
- Architectural/ Construction Engineering Services
- Project Commissioning, Operations and Maintenance

The Indian engineering industry is growing rapidly as the country is gradually becoming an important part of the global supply chain in Engineering services sector, which is moving from volume-based to value-based models and as a result clients' confidence in the Indian Engineering services is growing. India is placed at a position of high comparative advantage with one of the largest pool of talented engineers with low cost, knowledge of English and specialised engineering expertise and experience. Indian Engineering services has a strong focus on export-oriented production and business activities supplying services to global firms around the world.

According to Grandview research, the global Engineering Services Outsourcing (ESO) market size

was valued at USD 1.06 trillion in 2020 which is expected to expand at a compound annual growth rate (CAGR) of 22.9% from 2021 to 2028. The increasing collaboration between Engineering Service Providers and the equipment manufacturers is emerging as one of the primary reasons of growth of ESO covering areas such as IoT, AI, Additive Manufacturing, Block Chains, Robotic Process Automation and Hardware Robotics. These are some of the key areas that are experiencing high growth of business over the years.

India's exports of Technical, trade-related, and other business services, which includes 'Architectural, engineering, scientific, and other technical services' was 14.8 billion US Dollar in 2019 growing at the compound annual growth rate of 4.8% since 2015.

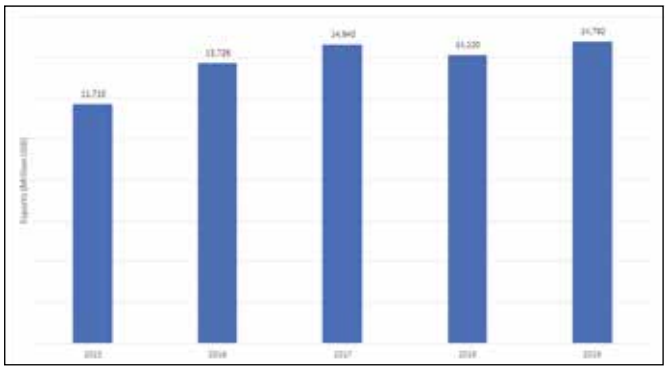


Figure 1: 'Technical, trade-related, and other business services' Exports from India to world

Source: TradeMap

The sector seems to have strong future prospects. For instance, in the construction sector, PwC Report on Global Construction 2030 forecasts that the volume of construction output will grow by 85% to $15.5 trillion worldwide by 2030 with three countries, China, US and India, accounting for 57% of global growth.

Services Export Promotion Council (SEPC), which is set up by the Ministry of Commerce and Industry, Government of India, with a view to give proper direction, guidance and encouragement to the Services Sector, has been instrumental in facilitating exports of services through the following services:

1. **Trade Intelligence**: Trade Information, Market Analysis, Business Contacts, Business Opportunities and Market Access Conditions
2. **Export Development**: Export Readiness, Training and Counselling, Strategy Formulation and Development, Value Chain Optimization
3. **Export Promotion**: Exhibitions, Buyer Seller Meet, Business Delegations to overseas markets, Brand Campaign for India's Services Sector
4. **Enabling Business Environment**: Policy inputs to Ministries, Facilitating Cross Border Trade, Policy Advocacy, Facilitating implementation of various export promotional schemes.

As part of export promotion, SEPC provides policy inputs to the Government on various issues related to services exports from India. SEPC also promotes Indian services exports through different events; Buyer Seller Meets, exhibitions, knowledge sessions, etc. Currently SEPC is organising the events virtually due to the ongoing pandemic.

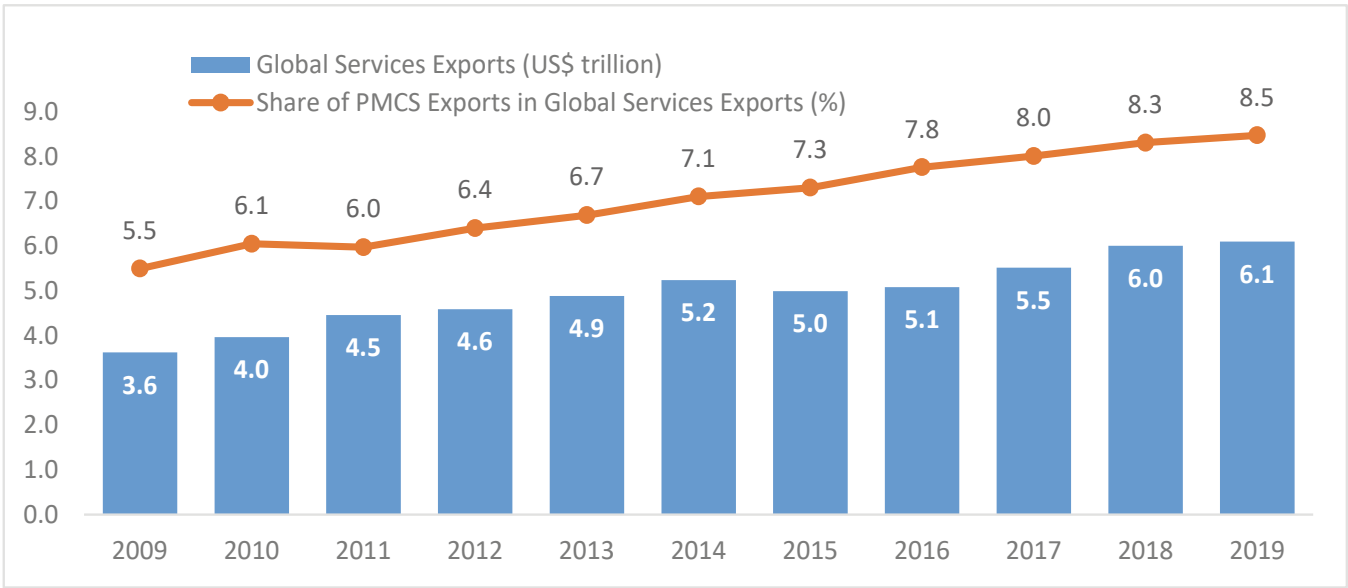
India's Exports of Consulting Services: Challenges and Opportunities

Vanlalruata Fanai[1]
Deputy General Manager
Research & Analysis Group
Export-Import Bank of India

Introduction

The Services sector has played an increasing role as a driver of global economic growth. According to the UNCTAD, the services sector accounts for two-thirds of global economic output, more than half of global employment and about a quarter of direct exports[2]. Indeed, during 2009-2019, global services exports have increased by a compound annual growth (CAGR) of 5.3 per cent topping US$ 6 trillion, outperforming global merchandise exports, which grew by 4.2 per cent during the same period (Chart 1).

Chart 1: Share of Professional and Management Consulting Services in Global Services Exports



Source: ITC, UNCTAD, WTO.

1. Vanlalruata Fanai is a Senior Economist in Export-Import Bank of India. His views are personal.
2. Antunes, Bruno, "Services sector vital to COVID-19 economic recovery", November 6, 2020, https://unctad.org/news/services-sector-vital-covid-19-economic-recovery

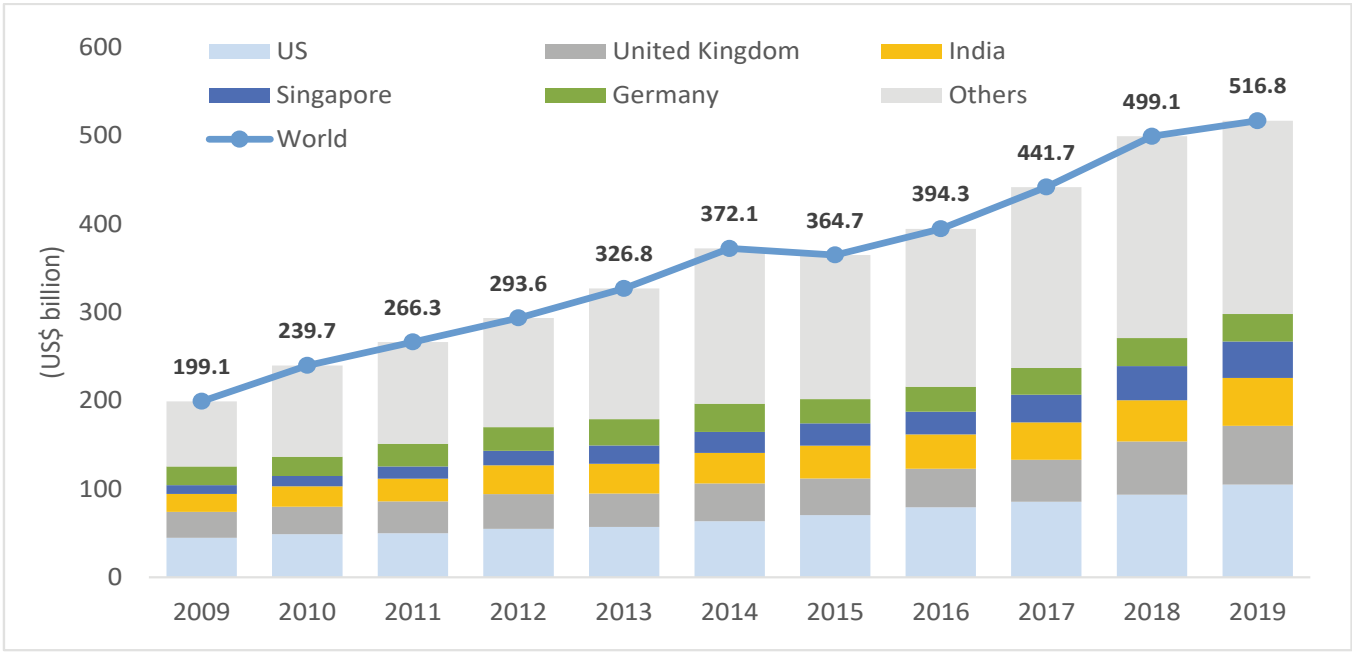
The period also witnessed the growing importance of professional and management consulting services (PMCS or consulting services)[3], whose share in global services exports has risen from 5.5 per cent in 2009 to 8.5 per cent in 2019. In terms of value, global exports of PMCS have more than doubled from US$ 199.1 billion in 2009 to US$ 516.8 billion in 2019.

India's Emergence as the Global Exporter of Consulting Services

The post-independence India witnessed substantial growth in investment in core industrial and infrastructure sectors which created opportunities for various consulting companies, including those in construction and engineering, to contribute their expertise in these projects. From dependence on foreign companies for meeting the technological and consultancy needs for setting up major industrial projects, the capabilities of Indian companies in the fields of design, engineering and technical consultancy have developed to a level comparable with that of consultancy companies from developed countries. This has been reflected in the nature of projects undertaken by Indian consultants in the recent past. Indian consultancy capabilities are strong in diverse areas, and the expertise sought for their services covers sectors such as civil engineering and construction, telecommunication, power, metallurgy, chemical, petrochemicals, computer software, educational and healthcare administration, among others.

India also has enjoyed a significant wage based cost advantage in engineering and technical personnel, compared to that in developed countries and several other developing countries. Furthermore, Indian engineers have the reputation of being among the best in Asia, with productivity levels comparable with the best in the world and the ability to work long hours. Further, India has large skilled and trained manpower including scientists, designers and engineers, and also vast industrial capabilities. There is, thus, immense potential for further enhancing the growth of the consultancy sector, including exports of consulting services.

Chart 2: Major Global Exporters of Professional and Management Consulting Services



Source: ITC, UNCTAD, WTO.

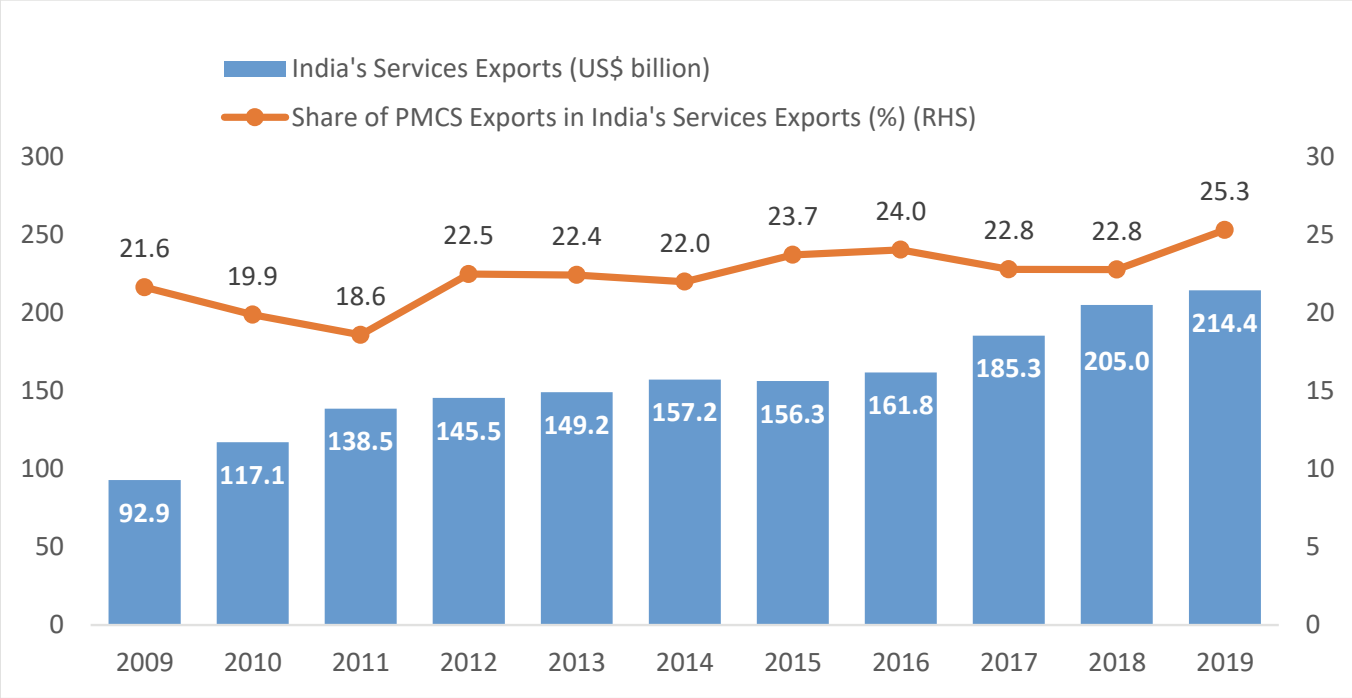
3. Analysis in this paper primarily focuses on professional and management consulting services as defined by the sixth edition of the International Monetary Fund (IMF)'s Balance of Payments and International Investment Position Manual (BPM6).

In fact, according to the data provided by the International Trade Centre (ITC), India is now the third-largest exporter of consulting services globally, after the United States (US) and the United Kingdom (UK)[4]. According to ITC, the top five exporters of consulting services viz. the US, the UK, India, Singapore and Germany, together accounted for as much as 57.7 per cent of global exports of consulting services in 2019 (Chart 2).

India's progress in penetrating the global consulting market is evident from a significant rise in its exports of consulting services which grew at a CAGR of 10.4 per cent during the decade, surpassing the growth of other top exporting countries, except for Singapore.

Even domestically, exports of consulting services play an increasing role in driving the growth of India's overall services exports. The decadal growth of India's exports of PMCS at 10.4 per cent stood much higher compared to that of India's global services exports, which stood at 8.7 per cent during the same period. By 2019, exports of PMCS accounted for over a quarter of India's global services exports (Chart 3).

Chart 3: Share of Professional and Management Consulting Services in India's Services Exports



Source: ITC, UNCTAD, WTO.

The period also witnessed a rise in India's position as a global exporter of services from being the 10th largest exporter of services globally in 2009 to the 8th position in 2019, with a concomitant increase in India's export of services, which has more than doubled during the same period. With the sector contributing to over 63 per cent of India's economic growth in the last five years viz. 2015-16 to 2019-20, boosting services exports is critical in sustaining India's growth story.

4. China is not included in this analysis since separate data for 'professional and management consulting services' exports for the country are not available in the ITC's trade database. The closest available data for China pertain to 'other business services'. It may also be noted that 'professional and management consulting services' accounted for 38 per cent of global exports of 'other business services'. Under this category, China was the 7th largest exporter, after the US, the UK, Germany, France, the Netherlands and India.

Major Importers of Consulting Services

Major markets for consulting services largely concentrated among developed countries in Europe and America. By 2019, only one country from the Asian region viz. Singapore featured among the top ten global importers of consulting services. Those top importers have managed to expand their market size over the years as is evident from the increase in their combined share in global import of consulting services from 65.8 per cent in 2009 to 68.1 per cent in 2019.

It may also be noted that countries such as the Netherlands, the UK, Singapore and Luxembourg not only managed to increase their shares in the global import market but also witnessed a growth of over 5 per cent in the past five years (Table 1).

Table 1: Top Global Importers of Professional and Management Consulting Services, 2019

Country	Import, 2015		Import, 2019		Change in Share	CAGR (2015-2019)	Nominal GDP, 2019
Top Importers	**US$ bn**	**Share %**	**US$ bn**	**Share %**	**%**	**%**	**US$ bn**
1. United States	42.7	13.7	55.7	13.6	-0.1	6.9	21,433.2
2. Netherlands	**20.2**	**6.5**	**39.9**	**9.8**	**3.3**	**18.5**	**907.2**
3. Germany	31.8	10.2	34.8	8.5	-1.7	2.3	3,861.6
4. UK	**16.9**	**5.4**	**28.4**	**7.0**	**1.5**	**13.9**	**2,830.8**
5. Singapore	**16.9**	**5.4**	**27.6**	**6.8**	**1.3**	**13.0**	**372.1**
6. Belgium	24.5	7.9	27.0	6.6	-1.3	2.5	529.7
7. France	19.0	6.1	23.8	5.8	-0.3	5.8	2,715.8
8. Switzerland	15.1	4.9	14.8	3.6	-1.2	-0.5	704.8
9. Luxembourg	**7.7**	**2.5**	**13.3**	**3.3**	**0.8**	**14.7**	**71.1**
10. Canada	9.9	3.2	12.8	3.1	0.0	6.7	1,736.4

Source: ITC, UNCTAD, WTO, IMF.

Strategies for Enhancing India's Presence in Global Consulting Market

While consulting services exports from India have witnessed a decent growth of over 10 per cent in the last decade, featuring among the top global exporters of consulting services, stagnancy in its global export market share at the range of 9 to 11 per cent during the decade is a matter of concern. India's share in global exports of consultancy stood at 10.5 per cent in 2019, marginally higher than 10.1 per cent witnessed in 2009.

This reflects the need for adopting an appropriate strategy to address various challenges faced by the Indian consulting industry to effectively compete in the highly competitive global arena.

There have been challenges associated with a time lag, cost overrun and information flow, which could be addressed if Indian consultants actively participate in projects supported by multilateral agencies. Projects funded by multilateral agencies are characterized by professional appraisal for technical feasibility and economic viability. As the funds for such projects are generally tied up fully, the consultants are ensured timely payment during contract execution. Further, host country payment risks do not exist and the bid evaluation and selection processes are transparent and fair.

Another issue that poses challenges to this sector is rapid changes in technology. While consultancy firms from various parts of the world are adopting advanced technology, there are areas where expertise has to be shared or grouped to get into a strong position in this competitive field. Further, consultancy firms are increasingly required to provide a comprehensive range of services spanning various sectors of the economy. This calls for pooling of resources, complementary skills and the ability to draw upon resources adopting a consortium approach, to handle multi-sectoral assignments. To address these problems, Indian consultants need to forge strategic global alliances, to enhance their scale of operation and access to important projects.

Again, in a highly competitive era, there is a need to develop the brand image of India. Some of the strategies include projecting India as a source of technological skills, creating a brand image through Indian Missions abroad, nurturing contacts and developing strategic tie-ups to gain early access to information about tenders for international projects at an early stage, and registering with multilateral institutions worldwide and with other international vendors, are some of the strategies to project the brand image. A higher success rate in securing consultancy contracts is expected to positively impact securing of turnkey and construction contracts as well as supply contracts.

A conscious effort must also be made by Indian companies to make structured marketing efforts through presentations on their strengths including skills, expertise and cost competitiveness to the overseas partners. Companies need to adopt strategic export development approach in tracking export opportunities and target countries systematically.

There is also a need to leverage upon research and development (R&D) capabilities of the nation, as the key to success and leadership in engineering consulting in process industries is through investment in R&D. Many global engineering consultancy companies have achieved success through investing heavily in R&D, which enable them to enhance their competitive strength.

Indian consulting industry can also take advantage of services offered by key Institutions such as India Exim Bank that have a close working relationship with multilateral institutions like World Bank, Asian Development Bank, African Development Bank, and European Bank for Reconstruction and Development, and provide support services to Indian project exporters, including consultants. India Exim Bank has been playing a key role in providing an impetus to the growing internationalisation of Indian companies, by extending both funded and non-funded supports. The Bank, through its linkages with multilateral agencies, offers a range of information and advisory services to help improve their prospects for securing business in projects funded by multilateral institutions. The Bank, in the past, had led business delegations to such multilateral institutions and organized seminars and workshops to enable Indian consultants to bid in projects supported by these multilateral institutions. The Bank has also participated in several initiatives with International Finance Corporation (IFC) Washington, a member of the World Bank Group, to promote Indian consultants under various IFC supported facilities and programmes. India Exim Bank has also floated a joint venture company, GPCL Consulting Services Ltd. (GPCL), to deal primarily with procurement-related advisory services. GPCL has undertaken a number of assignments in over 30 countries abroad for multilateral funding agencies such as the World Bank, the Asian Development Bank, the African Development Bank, among others. The company also undertakes training and capacity building in the area of procurement-related guidelines, practices and procedures of multilateral agencies.

Last, but not least, the year 2020 witnessed economic and social disruptions brought about by the pandemic that greatly affected global trade during the year. The UNCTAD (2021) has noted that the services sector will be one of the hardest-hit sectors, declining by about an estimated 16.5 per cent in 2020. While this projected plunge has

been driven by a considerable decline in sectors such as travel, transport and tourism activity, the majority of activities under other services category, including consulting services, were largely insulated as they could be traded remotely, and have better opportunity to provide services or execute export orders even during the time of the pandemic. Thus, while consulting services generally depend heavily on travel and in-person meetings with clients, with stringent timelines for their engagements, they now need to adapt to the post-pandemic reality. They need to be agile in adapting their business strategies to the changing market and customer needs and step up their adoption of digitalization to boost engagement and establish a digital-first culture with the clients. Such kind of innovative approach and forward-looking thinking would be critical for consulting firms to enable them to thrive in the post-COVID environment.

References

1. Antunes, Bruno, "Services sector vital to COVID-19 economic recovery", UNCTAD, November 6, 2020, Geneva.
2. International Trade Centre, Trade Map (accessed on March 23, 2021), Geneva.
3. Ministry of Commerce and Industry, Government of India, "Export Promotion of Consultancy and Management Services from India", March 2006, New Delhi.
4. Ministry of Finance, Government of India, "Report on Task Force on Project Exports", Published by Export-Import Bank of India, January 2003, New Delhi.
5. Mukherjee, Arpita, "Trade in Construction and Consultancy Services: India and the GATS", ICRIER Working Paper No. 75, November 2001, New Delhi.
6. UNCTAD, Global Trade Update, February 2021, Geneva.
7. UNCTAD, Handbook of Statistics 2020, Geneva.
8. UNCTAD, International Trade in Services – Quarter 3 2020, UNCTAD/ GDS/ DSI/ MISC/ 2021/1, 22 January, 2021, Geneva.

Importance of Engineering Consultancy Services

M. R. Moorthy
Advisor-Business Development Strategy
PEMS Engineering Consultants Pvt Ltd

The importance of Engineering Consultancy Services (ECS) in recent days has increasingly been gaining significance both in India and abroad as it drives growth in crucial sectors of the economy. The past years have been witnessing a steady growth in the ECS sector especially the Indian expertise and capabilities. The reason for the change is due to the worldwide acceptance of the Indian Engineering professionals in challenging assignments which they delivered. The pandemic did have some impact, but it is only temporary.

India is doing extremely well in the Space sector, Aero Space, Défense, Tunnels, Petroleum and Petrochemicals, Nuclear Power, Metro Railways, etc. India being a developing country with limited resources, there is always a need for all domains of engineering to provide a cost-effective solution without compromising on quality, Thus the engineering fraternity have to face India specific challenges to meet such needs with limited R&D resources and facilities.

In recent years, due to new technological developments and fast-growing demands in a globalized setting, a lot of talented and experienced engineering professionals have got exposure to the international scenario. Meanwhile due to the growing market in India, many overseas engineering consultants of repute opened up their offices in India to tap one of the fastest emerging markets. Besides, during the last few years, India received substantial financial assistance from The World Bank, Asian Development Bank, Japan International Cooperation Agency, et al due to political stability in the country.

It may be of interest to note that many overseas ECS consider India as one of the favoured destinations for outsourcing to cut down on operational cost in addition to other factors like availability of acceptable and knowledgeable quality engineers, the Indian Law, domestic market, language advantage, learning capacity of professionals, adaptability, etc. India has another recognizable advantage of a young population in large numbers. A lot of Young Engineers get qualified from premier institutions like the Indian Institutes of Technologies every year in various disciplines thereby providing a base for meeting long term needs.

Today, India can proudly claim that its ECs can reach any global market to compete and provide services as per the needs of those countries and clients. The emergence of Indian software consulting firms managed mainly by engineers who are spearheading the emerging fast changing technology world is now very well recognized worldwide. This distinct Indian image established worldwide by our software experts, enables ECS who are well placed in India in other engineering domains also to broaden their base and explore the global market.

When one is exploring export opportunities for the first time especially when it relates to Engineering Services, it is critical and essential to study and understand

the country specific needs in targeted countries. ECS should also absorb what is essentially required to meet the demands of the clients in overseas countries and stay in the business of Engineering to achieve success from start to finish.

Thus, if one is considering entering a new international market, then the choice of Market Entry Approach (MEA) is of crucial strategic importance as that would impact the entire marketing and business plan process. It is advisable not go wide and try to reach too many countries at a time, instead the initial strategy should be **"Go Narrow and Go Deep".**

What is Engineering Consultancy Business?

The dictionary definition of a consultant is "an expert in a particular field who works as an advisor to a company or to another individual". In other words, the ECS business is the ability to take one's own or the organization's specialized knowledge through experience gained over a period of time to someone who would be willing to pay money for such knowledge services.

Generally Engineering Consultants work with businesses and infrastructure developers to assist them in their dreams and visualization. Companies operating in the engineering services sector develop structures, machines (plant and equipment), materials, instruments and other processes and systems. ECS include providing advice, feasibility studies, designs, technical services during construction and development, guiding in commissioning and afterwards for operation and maintenance. ECS are individuals or an organization considered as experts in a specific field with in-depth knowledge of the subject matter with vast experience to provide professional advice, guidance, counsel to the needy by sharing expertise and wisdom.

After hearing the potential clients with full concentration, these Engineering Consultants (ECS) polish or refine the clients "ideas" using their professional knowledge and skills. Further ECS explore possibilities of practically implementing the ideas into reality by adhering to the design, construction needs. along with complying the set standards and statutory regulations. Thus, Engineering is a very broad field and consultants need to know everything that a potential client may demand from planning/ execution to commissioning, operation and maintenance including briefing on many risks, financial planning, regulations, standards, possible and prudent protection against unforeseen eventualities, etc. One important area where the client heavily depends on ECs is to provide cost effective solutions.

Going Global

Coming to the subject, as and when ECS decides to go global, then proper planning needs attention and also a clear mind set with well-structured action plans coupled with constant review and monitoring.

A few important stages needing attention are listed below to understand about the business and how to move forward.

Once an ECS business entity is well established and thriving in its domestic market, it is desirable to branch out into a new market. Taking ECS business global is a complex, dynamic and challenging process. An organization has to be wise in selecting the overseas market where its foray would have synergy and be fruitful and successful.

The reasons for a firm planning or desiring to expand internationally may be due to profitable opportunities existing in a country. Another reason to go global may be a strategic move and willingness to spread and diversify and to balance the risks of the organization instead of **"Putting all of their eggs in one basket".**

Before jumping to go global, an ECS should conduct an audit of its resources and capabilities. The ECS should understand that in a fast-changing technology driven world, it should possess clear market knowledge, sufficient portfolio of services, latest technologies and tools, reliable partners and all other relevant parameters.

More important than all the strategic planning, cash

flow statements, designing marketing road maps, etc. is getting the Owner's Chief Ready and Focussed in the Business. It is also very important that **"For the Owner's, ECS should be a Passion"** otherwise somewhere it could lose support and slip or it can risk falling by the way side.

Starting a new venture is adventurous and exciting by maintaining enthusiasm provided one can allocate the required budget at least for a minimum period of two years and at times even longer. Like any other activity, running and operating a business activity in a new country is a constant responsibility involving Foreign Exchange Laws, Laws of that country, Compliance both in India and abroad, etc.

The important points which need attention are listed below:

1) Organize an excellent brochure/ web site briefing on the specialties and skills with success stories giving client details along with a presentation.
2) Update competencies through advanced training, learning, upgrading technology, new tools and software for faster and reliable analysis.
3) Focus on communication skills.
4) Properly respond to the needs of the client regularly and on time.
5) Expanding business through networking and relationships.
6) Promoting by advertisements in various consultancy association journals and popular government newsletters.
7) Register with various recognized authorities in that country for establishing the reputation and dependability of the organization.
8) Keep close contact with the Embassy of the proposed country in India and also Indian Embassy abroad for collecting information on the various business opportunities and other related matters.
9) Accompany Indian delegations visiting the overseas country and also coordinate and engage with their visiting team.
10) Study the country's consultancy business opportunities along with a SWOT analysis.

The steps to be taken for going global are:

a) Selection of the Country

The first step for expanding internationally is to identify the country or region to attempt and expand first. One needs to consider many factors like cultural, economic, political, financial, past experiences of others, if any, market risk etc.

b) Conducting Market Study and Research

Today any business for that matter is no more local. They have become global. Since competition is also equally severe it is essential to carry out a business study and research to pinpoint the markets to be targeted for the services. The study should enable identification how the market prefers to receive the services to be offered.

A few things worth considering while conducting the business study are:

i). Your Goals
ii). About Competition
iii). Method of market study to be adopted
iv). Investment Risk
v). Potential Threats and Opportunities
vi). Focus on probable client needs and demands
vii). Revenue Generation
viii). Later to evaluate the success of the business against benchmarks.

c) Allocating Budget for staying in the country for a reasonable period

Unless ECS business is a passion for the owner, attempting to go global as a total commercial venture may not work out. Sustainability should be the Mantra. In ECS business, one should adopt the strategy of a long-distance runner rather than that of a sprinter. Short term gains are practically ruled out due to severe competition and also demands from clients. Initially focusing only on typical Return on Investment for the first few years, 2 to 3 years, should not be the strategy; rather it should be

to win more clients and establish reputation. One must plan to stay for long period and be prepared to face the difficulties for a reasonable period of time. It is also advisable to devise and create a clear-cut Exit Policy in the eventuality of drastic negative deviation from the market study and revenue generation by engaging the country specialist financial experts.

d) Organizing country specific team

All ECS business organizations rely on Humans as the fundamental base to deliver. The concept like pre-feasibility, then feasibility study, detailed project reports, detailed designs, many models, tools, cost effective solutions, project management, financial management and other aspects of execution depend very heavily on Humans. It is therefore recommended that knowledgeable professional engineers with country specific experience are identified before entering the market. Organizing country specific teams plays a considerable role in belong able to answer many questions of the clients. They enable gaining the confidence of the clients. Here ECS have to channelize their energy by involving fully to appoint the right - well qualified, knowledgeable and experienced professionals to manage the technical part of the activity as well as other aspects of the business. Knowing the local language and customs are an advantage.

e) Other Basics Factors needing attention

Have a decent office which need not be costly, which looks inviting is an advantage. As mentioned earlier, create a knowledgeable and acceptable human base with good country knowledge. Keep a healthy cash reserve to hold on even during difficult times. Undertake to do only what can be done with the resources available and the Magic of believing in oneself.

Sourcing information, adapting to the changing environment with latest technology, supporting legitimacy along with empirical or verifiable knowledge and advice are few key factors which can influence overseas clients to make a favourable decision for engagement. Nowadays clients also seek greater speed, responsiveness and control. Besides there is the need to understand that overseas clients look forward to a sensible or realistic or in other words pragmatic approach along with candour (open, frank, honest) engagement. In short one should be prepared to change ones Attitude from traditional approach.

An ECS can penetrate into overseas markets by adopting any one of the strategies given below.

1) Strategic Alliance i.e., an Association through a Memorandum of Understanding without any equity partnership, etc, Here ECS are solely responsible to the client for all matters relating to performance and financial risks,
2) Through Joint Venture route by sharing the roles and responsibilities with clear understanding on financial and other matters which can be on project-to-project basis or any other manner,
3) 100% subsidiary, as per the law of the country,
4) Providing services through Internet facilities i.e. outsourcing services through established consultants,
5) Exporting to overseas firms as per their needs and specifications,
6) As a turnkey solution provider i.e., concept to commissioning. Operation and Maintenance can be options, or
7) Any other established or acceptable method.

The matters that ECS need to be aware of while trying to establish in a country and competing against internationally established engineering consultants having proven capabilities in that country are:

1) The political scenario, stability and financial resources of the country along with the domestic attitude and approach to accept Indian companies over or in par with those from USA, Japan or Europe.
2) Many countries perceive that the quality of services

and also honouring commitments of ECS from India may not match with that of those from developed countries.

3) Confidence of overseas clients regarding Indian ECS for adherence to targeted time schedules. It is still a question mark.

4) Presumption that Indians have the habit of delaying things on some pretext and if financial commitments of the clients are not being favourable, priorities are not given.

5) Lacking the will and the confidence to commit resources to acquire the latest technological capabilities due to many factors including investment cost.

6) Taxation laws of the country and impact of the same in the Indian context.

CONCLUSIONS

Running an ECS business or any business for that matter, involves long term commitment and a lot of work. Each one of the clients should be treated like the Boss, hence dealing with them could at times be stressful. The ECS must only be with clients who understand the ECS and to whom they can provide end results as envisaged. Focus on what is best for the clients but do not accept any untoward behaviour of the clients. Make Sure, that they see and realise that the Services are worth every paisa.

Indian ECS with their knowledge and hard work has the potential to achieve results, but it is not a risk free attempt. What may be appealing on paper need not be a reality and so ensure that proper due diligence is carried out. Devising short term and long-term goals by analysing the Return on Investment (ROI) is a must for any business entering overseas along with an Exit Strategy.

Ensure that Ethics and Character count in the consultancy business through one's actions, attitudes and behaviour beyond money. Over a period, this approach will provide more satisfaction, greater peace and self-confidence to take up any challenging assignments. It is known that Reputation is the fulcrum of the consultancy business. Without a strong foundation of Ethics and Character the reputation can be lost in the wink of an eye.

All individuals or organizations engaged in ECS should know that consultancy business is in the "Cusp" (point of transition) of description or definition. It is time to understand the fact that the concept of consultancy is being reinvented and reshaped, The Concept of Crowd Consulting which is not one person based but crowd based or few people based is also catching up. Brain time and advice from a diverse group of specialized individuals covering a wide range of fields is considered as one of the prudent ways of engaging consultants.

The 'Connected' World is full of opportunities – What is Needed is Sustained Energetic Motivation and Efforts to showcase, tap and expand India's capabilities in the changing scenario with a Mission to take India forward for the benefit of the Future Generations to also be able to Enjoy the Bounties of the Earth.

ACKNOWLEDGEMENTS

Sincere gratitude to Hon Ex Ambassador to Iraq, Mr. Dayakara Ratakonda and Dr. Rajashekhar R. Malur of Tata Consulting Engineers Limited.

Interpreting Engineering Consultancy Services Export Through Transaction Cost Economics Theory

Shantanu S Apte
Vice President
Head of Delivery – Hydrocarbons & Chemicals Business Unit
TATA Consulting Engineers Limited

Abstract

Despite proven capabilities in the engineering consulting services business, the Indian organizations have been unable to aggressively pursue export-oriented business opportunities to access the market. The export growth of BPO and IT services, both of which are human capital intensive is impressive in comparison with Consulting Engineering Services (CES). Some established management theories like Industry factor, Resource based view and Institutional theory are discussed to understand internationalization of CES. The paper provides a brief background about the concept of Transaction Cost Economics (TCE). The paper discusses five critical factors like Technical Capabilities, Knowledge Management Systems, IT infrastructure, Project and Program management capabilities and Organizational culture from the perspective of TCE.

Keywords: Consulting Outsourcing, Consulting Engineer, Engineering Consulting, Engineering Consulting Services, Indian Engineering Consulting, Transaction Cost Economics

Introduction

Consulting engineering terminology could convey different meanings based upon the context in which it is used. The terminology used in this paper is as per ACEI, Ireland (Association of Consulting Engineers of Ireland). It defines consulting engineer as "an expert in the planning, design and construction of both public and private infrastructure. With varied backgrounds, consulting engineers may have civil, structural, or mechanical and electrical expertise". It also defines the consulting engineering as "a profession that is aimed to benefit the whole of society, through the application of safer, cleaner, and more efficient foundation".

It further states that "consulting engineers are licensed professionals with diverse qualifications, including civil, structural, mechanical, electrical, environmental, geotechnical, chemical, industrial, and agricultural disciplines. At consulting engineering firms, teams of knowledgeable experts can fill many distinctive educational, technical, and mechanical roles that can help to solve or prevent many problems. Consulting engineers may design an entire project, or they might be responsible for only one component of the design, depending on the need. Their support can be provided throughout the process, from inception to completion, in order to facilitate the best solutions".

The second section of this paper describes phenomenon

of exporting of consulting engineering services. The third section discusses the concept from the Transaction Cost Economics perspective. The fourth and last section provides conclusion.

Exporting of Consulting Engineering Services (CES)

Why do CES firms look for exporting their services? How the exploration of export market by CES firms is different than other product or service-oriented firms? Is addressing export market easy or difficult for CES organizations? Various such questions are already studied and analysed by various researchers.

To serve current discussion, the categorization of the CES organizations is proposed as below.

1. Pure play engineering services organizations
    a. MNC firms having Indian Captives
    b. Indian firms
2. Organizations that are IT service providers but are also engaged in engineering services
    a. MNC IT firms having Indian Captives
    b. Indian IT firms
3. Indian product firms that mainly cater to their own firms or group companies in the field of engineering consulting
4. Large Manufacturing MNCs having India captives that provide engineering services to parent organization both domestically and internationally.

The motives of each of these categories of firms for exploring international market can be very different from another. Hence it is not possible to overly generalize the motives behind exploring export market.

It is important to understand three distinct characteristics of CES. Unlike many other services, CES professionals need necessary accreditation and official certifications applicable in the country where services are to be rendered. Unlike many other services businesses, CES depends more upon intellectual and human capital and less upon financial capital. The third important characteristic is the nature of work that necessitates CES professionals being mobile and able to visit/ work at sites spread across geographies. This aspect necessitates availability of necessary short, medium-term or long-term work permits or visas.

Researchers Krull, E., Smith, P., & Ge, G. L. (2012) studied CES internationalization phenomenon through the Strategy Tripod. They considered Industry Factors, Resource Factors and Institutional Factors as the three legs of the Tripods. The Industry Factors are nothing but a perspective of Porter's competitive model. As CES services are associated with projects that are usually capital intensive and dependent upon macro-economic environment, the CES providers try to navigate highs and lows by exploring international markets. Unlike emergencies like the COVID-19 pandemic that has affected the entire globe, normal macroeconomic scenarios across different regions/ nations/ geographies allow CES organizations to ride through uncertainties.

Another approach to study internationalization of CES phenomenon is through Resource Based View (RBV) proposed by Barney (1991). CES organizations leverage their resources capabilities and skills in terms of networking and relationships. The unique resources provide the openings to international markets. Professional knowledge and international experience and track record of the firms also play important role. The third approach studied by Krull, E., Smith, P., & Ge, G. L. (2012) is that of institutional factors. This approach stems from Institutional theory and neo-Institutional theory. According to this theory, one industry operating in a specific market segment influences and gets influenced by other industries operating in the same market segment. Thus, the internationalization of services through "follow the customer" phenomenon happen. The internationalization can thus be forced by an existing customer or it can also happen due to peer competition pressure.

These are but illustrative theories proposed by researchers to contextualize CES internationalization phenomenon. There is a scope to evaluate other established theories to extend the understanding further.

Consulting Engineering Services through Transaction Cost Economics (TCE) perspective

In 1937, Ronald H Coase highlighted the importance of understanding transaction costs. It was the seminal work of Williamson, O. E. (1979) that brought the TCE theory to the forefront of industry research and practice.

In the economies where demand and supply sides of the equation are not governed by government regulations but by free markets, the firms have three choices. These are illustrated through a fertilizer producer. Should the producer, design and engineer the plant with his own employees, or should he invite bids and offer it as EPC or EPCM? Should he try a combination of approaches? Fundamentally it boils down to three simple questions though the answers are not simple.

a. Do engineering activities inhouse with internal teams having necessary experience and skills.

b. Do engineering activities with partners who have complimentary experience and skills.

c. Outsource engineering activities completely to service providers who have experience and skills.

Assuming all three options provide similar quality of deliverables within defined timelines, the question that needs critical probing is "at what cost"?

Each of the options mentioned above incur costs associated with each individual activity that needs to be performed. The decisions get complicated as complexities of the tasks increase. However, at the core of it all lies understanding and appreciation of cost incurred at each transaction level. Even if task is completely outsourced still there are elements of costs associated with each transaction like identification of service provider, coordination, review and monitoring progress and contract adherence etc.

The concept can be explained with an example of a certain Fertilizer manufacturer (buyer) deciding to go ahead with the Consulting Engineering service provider (seller). Both buyer and seller want their individual interests to be served. Both are interested to reduce waste, enhance quality and eliminate delays. All transactions have varied degrees of risks associated with them and although some part of the risk cannot be avoided, they attempt to reduce unnecessary risk (from their own perspectives). Both want to have decent contract in place without the complexities. How could they proceed? In an ideal scenario, both have all information necessary to make decisions but, it is not so in a real world. Every "Make or Buy" decision is unique to an organization and is unique in different context.

Such questions arise not only in domestic market but in the international market too and with complexities of international markets, it gets increasingly difficult to answer the question.

The role of consulting engineer is very crucial as his work influences the cost of entire project throughout life cycle. The kind of foresight and capabilities the consultant can bring to table influences a lot of downstream activities. The processes that he finalizes, the equipment choices he makes, the material movement path that he decides, the construction material that he recommends, each of this activity strongly influence clients' meeting ever stringent environmental and safety norms. The type of consultant can take the concept to practical reality in many ways – sub optimal, optimal and far superior. The international market demands the very best of consulting talent.

CES organizations having ambition to go international are recommended to study five facets of organizational functioning very critically. These factors are depicted in figure 1 below.

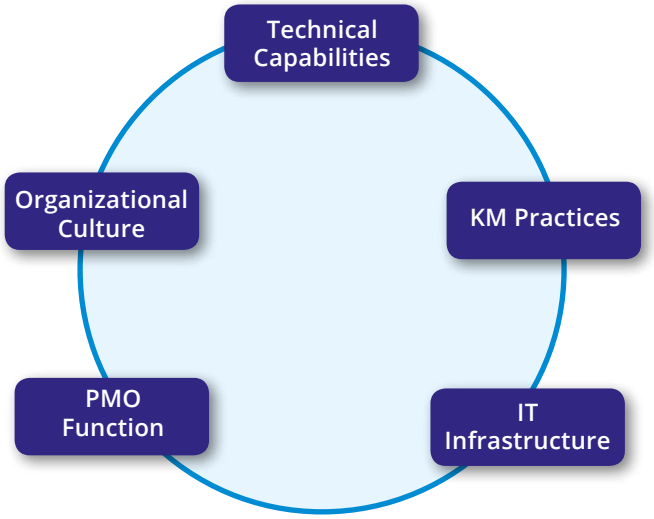


Figure 1

1. Technical Capabilities

a. Do the organization's resources possess necessary certification and credentials to provide services in the target market?

b. Do the organization's resources have technical skills and capabilities to develop and deliver desired solutions within timelines and as per quality norms?

c. Are some of the organization's resources known for their technical expertise, brilliance and track record?

d. Are such resources active and visible at suitable industry forums?

e. Do resources keep themselves upgraded about evolving environmental and safety norms?

2. Established Knowledge Management Systems and Practices

a. Consulting Engineering services demand excellence across multiple disciplines of Engineering viz. Civil, Mechanical, Chemical, Electrical, Instrumentation and Control (which includes IT), etc. In order to provide most cost-effective solution to the customer, the organization needs to develop and deploy organization wide Knowledge Management (KM) tools to avoid "reinvention of wheel" and provide best in class solution. Hence the question arises - Does the organization possess well defined KM processes and practices? Does it have necessary KM Tools deployed?

b. It is essential to have the ability to deploy the "crowd sourcing" tools to seek solutions at a faster pace to tap diverse experience and expertise of employees. Does it enable cross pollination of ideas that result in better solutions?

3. Efficient IT infrastructure

a. Last decades have witnessed accelerated enhancements in Information Technology systems that provide ease of connectivity across geographies. With the ever-increasing communication capabilities with constant reduction in associated costs, IT systems have become a must for business. Is organization leveraging efficient IT infrastructure and processes?

b. Do policies around data protection and security exist?

c. Does the organization promote concurrent developments by teams spread across geographies?

4. Program/ Project Management (PMO) function

a. Export business necessitates interactions with multiple stake holders across geographies and with various stake holders. A strong PMO functions with necessary skills and tools to manage a project is a key differentiator. Does the organization develop and deploys strong PMO functions?

b. Each interaction amongst the stake holders results into actions and each action incurs the cost. The PMO team can play a key role in reducing/ eliminating duplication of tasks while driving efficiency. Does the organization have a systematic PM skill development plan?

c. Do systematic project reviews take place keeping in mind multi-disciplinary approach and overall cost perspective?

d. Does organization promote strong contract governance mechanism?

5. Organizational Culture

a. Studies after studies have established that organization culture has a huge role in eliminating waste as well as promoting teamwork. Does the organization pay attention to and has systematic plan to ensure teamwork culture in place?

b. Apart from technical skills, the skills needed to ensure effective communication amongst stake holders can greatly influence the delivery outcome. Does the organization have systematic training plan for soft skills development?

c. If culture encourages collaboration and provides decision making power at the distributed levels, the transactions become less bureaucratic and less time consuming. Does the organization identify and incentivise collaborative and innovative behaviour?

d. Does the organization champion cross cultural sensitivity and gender diversity?

e. Does culture incentives and rewards pursuit of nothing but excellence.

Each of the categories mentioned above influences the cost effectiveness of the organization. Although it may look basic and simple, critical relook at each of these points can provide answers to level of preparedness of organization on a twin front of excellence and cost competitiveness. The clarity in understanding each activity can certainly help a CES organization accelerate its export-oriented journey.

Conclusions

Despite high amount of standardization and wide availability of information exchange, export from CES organizations from India is still a trickle. A detailed research in 2012, conducted by Gross, A. C. (2012), pegged the global addressable market for CES at 550 Billion USD. This is a staggering number. India has successfully established itself in the areas of BPO and IT services space. It has also attracted marquee MNCs to India tapping Indian talent pool. The question of why Indian CES are still finding themselves in the infancy stage could lie in understanding simple questions posed by Transaction Cost Economics Theory. Once an organization understands the cost drivers and value enablers, the resulting actions can certainly provide greater push to address the global market.

Looking at the export figures, the business models that worked for manufactured products and services like BPO and IT are not necessarily working for CES. The higher need for collaboration, the necessity to understand codes and standards, the requirement to acquire necessary credentials and certifications might be some of the impediments in solving the puzzle of high-end collaborative engineering consulting across geographies.

Indian CES organization have been able to traditionally access markets in Middle East and Africa but not in the developed economies including Europe and North America. The reasons behind this might be found in the approach to five critical business categories mentioned in the paper.

Various management theories attempt to explain the motives and rational behind CES organization's export-oriented journey. No single theory can explain it completely. This paper has proposed the Transaction Cost Economics theory to critically examine and understand the requirements plus the costs associated with various categories and the efforts needed to drive down the costs. The Transaction Cost Economics as a concept is very simple to understand and easy to practice. The problem of not being internationally competitive cannot be solved only at the apex level

but it can certainly be solved at each transaction level. The excellence coupled with cost competitiveness is the key to tap international market for CES firms.

References

- Barney, J. (1991). Firm resources and sustained competitive advantage. Journal of Management, 17(1), 99-120. https://doi.org/10.1177/014920639101700108
- Gross, A. C. (2012). The global engineering consultancy market. Business Economics, 47(4), 285-296.
- Krull, E., Smith, P., & Ge, G. L. (2012). The internationalization of engineering consulting from a strategy tripod perspective. The Service Industries Journal, 32(7), 1097-1119.
- Williamson, O. E. (1979). Transaction-cost economics: the governance of contractual relations. The journal of Law and Economics, 22(2), 233-261.
- https://www.acei.ie/resources/what-is-consulting-engineering

A Strategy for Export of Consultancy Services

K K Kapila
CMD
Intercontinental Consultants and Technocrats Pvt Ltd. (ICT)

India has a very large technical and management manpower. The overall numbers would perhaps be larger than those in any other country. In spite of this, India has not been able to capture more than 2-3% of the world's consulting engineering market.

An analysis of the scenario reveals that Indian firms have a low financial base and are generally hand to mouth entities because Consulting in India generally has been on Least Cost or QCBS of 70:30 with Quality being assigned 70% weightage and Cost 30%. The tendency is therefore to generally quote low rates. In the current scenario of QCBS method, those with highest quality marks are seldom able to secure works. There is, therefore, an urgent inescapable need to have a change in engagement of consultancy works by bringing in a suitable amendment in the GFR as under:

1. **Consultancy Works should never be awarded on Least Cost Basis. The basis should be as given below.**
   - Complex Projects requiring import of state-of-the-art technology must be awarded on Quality Based Selection (QBS);
   - Consultancy Assignments for Typical Projects like Expressways, Tunnels, Power Plants, etc. must be procured at QCBS 90:10 basis (Technical Weightage 90% and Financial Weightage 10%); and
   - Procurement for all other consultancy assignments must always be on QCBS basis, i.e., on 80:20 basis (Technical Weightage 80% and Financial Weightage 20%).
2. **No Least Cost Procurement for Works, Goods or Consultancy;**
   - No Works, Goods or Consultancy Services should be procured on Least Cost Basis. In fact, it should be at Lowest Workable Rates:
   - For all Cases, the Standard Deviation method should be applied to remove abnormally low rates – which is the bane of all problems;
3. **Atmanirbhar Bharat Vision**
   - No work, however complex should be awarded to an International Company;
   - The work should be awarded to a Joint Venture of an Indian Company and an International Company, with the Indian Firm bringing the local knowledge and financial strength to the Consortium, and the international firm, the technical knowhow;
   - In all Consultancy assignments requiring an International company, minimum 40 % key staff must be provided by the Indian Company besides all logistics like office facilities, operations, vehicles, local administration, etc.;

- The essential Condition for the International Company should be that they post their experienced and capable engineers/ technical personnel, who have been with them for over 5 years, on the project in India and to transfer specialized knowledge/ technology to the Indian Partner through detailed specialized input; and,
- The payment to the foreign partner to be linked with posting of its engineers/ technical personnel and documented Transfer of Technology.

4. Definition of an Indian Company

- Should be explicitly defined. An Indian Company must necessarily be a Company registered in India with at least 60% ownership by Indian Nationals residing in India;
- It should not merely be a Foreign Company Registered in India and largely owned by the Foreign Company and/ or remotely managed;

5. Present Definition of Micro Small Medium Enterprise (MSME)

- Currently a Company is registered as a MSME, if it has a turnover of up to INR 250 Crores (excluding foreign exchange earnings);
- The threshold amount should be increased to INR 400/ 500 Crores (excluding foreign exchange earnings);

The Government of India needs to support the Consulting Engineering Organizations by recommencement of assistance schemes for Consultants to procure international projects. Under this scheme for the projects secured by the Consulting Firm, the expenses incurred by them towards site visit for recce including travel and stay, purchase of documents, preparation of bids including expenses incurred on travel and stay besides the negotiations should be reimbursed to the extent of 50%, as was being done in the past.

Besides the financial support, there is also a need to encourage utilization of Government of India's assistance funds to developing and neighbouring Nations, by providing consulting services through Indian Consultants. That way, the Indian Consulting Engineering organisations would be able to help those Nations with Feasibility and Detailed Engineering Report which they could then project to various financial institutions to get the financing for implementation of the projects. That would enable India to be able to build goodwill with various Nations with minimal investment. Once the Feasibility and Detailed Project Reports are done by Indian Consulting Engineering organisations, the Contracting Companies could also gain as the consulting organisation would have full knowledge of the project available for the Bidders to make a more competitive Bid vis-à-vis those from other countries. Thus, the export of consulting engineering services would also help in boosting export of construction activities as well.

New Strategy for Export of Engineering Consultancy Services

Sudhir Dhawan
Past President
CEAI

Introduction

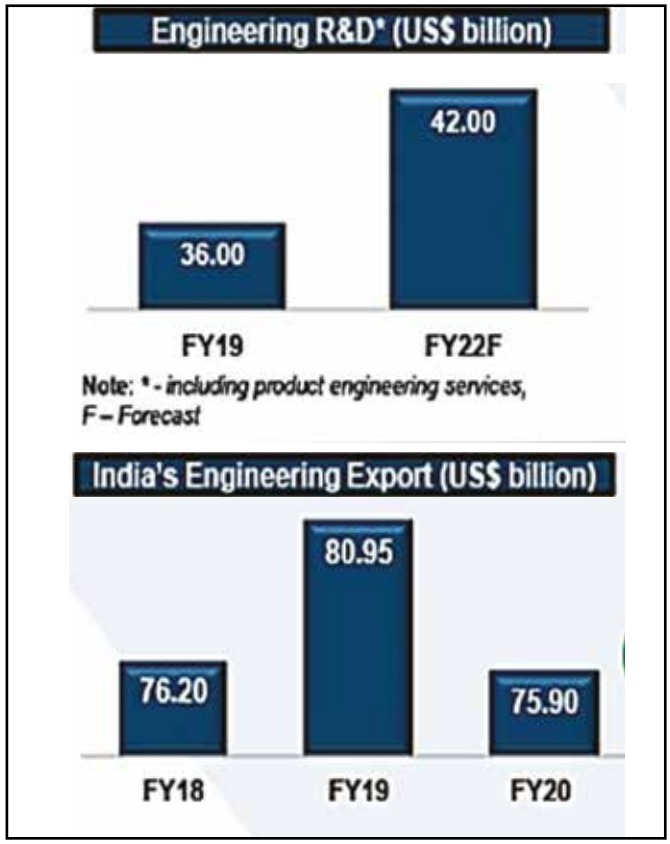
Indian engineering firms have been exporting consultancy services to a number of countries for the past many years. The export of Indian engineering services had been marginally increasing on year to year basis but for some years it has even decreased. Therefore, the time has come to try some alternative aggressive solution to increase export of engineering consultancy services from India.

Size of the Consultancy sector in India

The development of consultancy capabilities and business is directly proportional to growth in economic and industrial development. Due to the nature of the industry, getting accurate estimates of its size is difficult. Unfortunately, no proper data base is available for engineering consultancy companies and individual consultants. A very rough estimate made by the Consultancy Development Centre (CDC), a few years back indicated that about 200,000 persons are engaged in consulting business in about 10,000 consulting firms. According to these estimates, the current size of the consulting industry in India is about Rs. 20,000 crores including exports and is expected to grow at a CAGR of approximate 25% in the next few years.

Report of IMF

The International Monetary Fund (IMF) predicts that the global real GDP growth will be 3.7% over 2019 and 2020, and 3.6% from 2021 to 2023. That trend would be mainly driven by regions of Asia and Africa. According to the report, Asia would represent 66% of the global middle-class population by 2030. For instance, the



(Courtesy IMF)

Indian IT-BPM industry grew by 7.7% in FY 2019, with software products and engineering services reaching US$ 25 billion.

Going forward, the Asia Pacific and Middle Eastern region are expected to be the fastest growing markets in the engineering services, design, animation and graphic designing industries. Developing countries such as India and China have started attracting foreign investments to improve their infrastructure. This was mainly due to increase in internet penetration, growth in population and increasing economic activity.

Export Highlights

- In FY2019, India's engineering export stood at US$ 81.02 billion and for FY2020, it stood at US$ 75.97 billion.
- Engineering contributes 25% of India's total exports in goods and is its largest foreign exchange earner.
- The engineering sector has a 30% weightage in India's Index of Industrial Production.
- Out of 209 export destinations of Indian engineering goods, the top 25 nations accounted for 75.49% of India's total engineering export in 2018-19.

(Source: WTO)

Road Ahead

- Turnover of capital goods industry is expected to increase to US$ 115.17 billion by 2025F. India's engineering R&D market will increase from US$ 36 billion in FY2019 to US$ 42 billion by FY2022.
- India needs Rs. 235 trillion (US$ 3.36 trillion) of investment in infrastructure in the next decade (2020-2029).
- The export of engineering goods is expected to reach US$ 200 billion by 2030.

(Source: WTO)

Traditional Avenues

The export of consultancy services from India can be divided into two groups:

Group 1: Direct export by Indian companies to foreign clients.

Group 2: Foreign companies based in India using Indian manpower for third country projects.

There are very few Indian companies who are exporting engineering consultancy services or have the potential to do so. The export market is quite competitive both in terms of technical and commercial points of view. Indian consultants sometimes fail to meet the qualification criteria.

Multilateral Bank funded projects

Indian companies have performed well to obtain projects in the infrastructure sector for multilateral Bank funded projects in South East Asia, South Asia and Africa. Indian consultants are able to secure good score technically also. Some of the Indian consultants are able to dominate small countries by securing projects on continuing basis for a number of years.

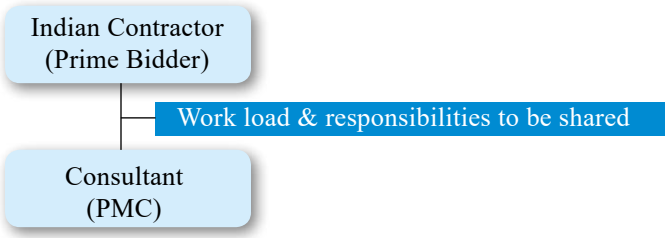
Dynamic Shift

Indian companies should consider providing total solution to the client. This means that Indian companies should offer Design and Build (D & B) solutions as many clients even in India are opting for this mode. It is not easy for Indian consultants to directly offer D&B solutions because of lower financial base.

Would like to suggest alternative models for offering total solutions.

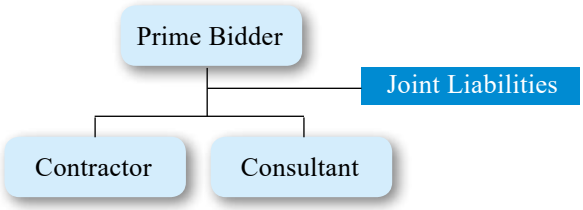
Model 1:

Indian consultants tie up with Indian contractors in which role of consultants is limited to design and project management. The consortium should be responsible for the total solutions with division of responsibility and liability.



Model 2:

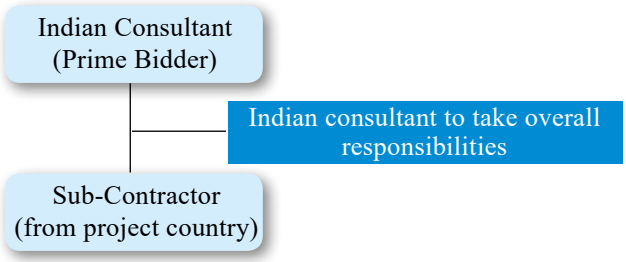
Some of the large Indian consultancy companies should tie up with Indian contractors for providing D&B services. In this case Indian consultants would need to share financial liability and responsibility. The model can be further evaluated with Exim Bank



Consortium Bidding

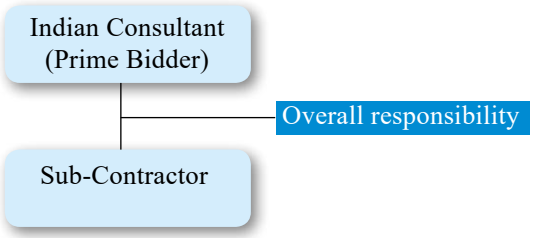
Model 3:

Indian consultants tie up with local contracting firms operating in the country of the project location to offer D&B solutions. In such a case, proper scope division, liabilities and responsibilities are to be finalized with proper legal safe guards between foreign contracting firms and Indian consultants.



Model 4 (for India):

In order to enter any of the above three models, Indian consultants should start offering such services for projects in India. This experience would be extremely useful to handle such projects abroad.



Preparatory work:

In order to enter D&B field, Indian consultants need lot of preparations and planning. Some of the required actions are:

- Form D&B Group inside the company
- Upgrade contract management department
- Form associations with vendors and suppliers
- Identify contractors for potential tie up
- Undertake small projects on D&B basis. For example: Sub-station or water system for a power plant

Government Support

Government support would be important in pushing the new agenda. Some of the steps that may be considered are:

- Create white paper on the new approach
- Meet SEPC and discuss areas of Government support
- Discuss with MEA to offer such solutions for some bilateral aided projects
- Establish procedures with Exim Bank and ECGC

New Countries with export potential

The CIS countries of Azerbaijan, Armenia, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Uzbekistan and Ukraine may be explored for export of consultancy services. Some of these countries are receiving funding from European Investment Bank (EIB).

What CEAI Can Do

CEAI can form a small group which would do the base work. The group would comprise of representatives from companies which are in the export business. The group would identify companies which are interested in exploring new avenues for export services. Based on the group's report, CEAI could initiate the discussion with SEPC and other Government Departments.

Engineering Fulfillment of CCPP Project in Indonesia- Enhancing Customer Experience

Rajarajan Rathina
Deputy General Manager
Power Business Unit
TATA Consulting Engineers Limited

Introduction

This paper broadly presents the major challenges encountered by the project team in an international project, while progressing through the various phases of the project from concept to commissioning, the actions taken to overcome the challenges and commissioning the project successfully. TCE was supporting a foreign EPC Contractor in engineering a combined cycle power plant, coming up in Indonesia. The services included basic and detail engineering of the power project. The customer being an upcoming EPC player in the power industry, strategically, the success of the project was very critical for them as it was their maiden project in Indonesia. The end owner for the upcoming plant was an Indonesian government owned corporation. Unlike the other seasoned EPC contractors, the customer was dependent on TCE for the success of the project. The project team took the lead and offered seamless support to the customer, there-by achieving successful COD of the plant which was commissioned in December 2018 and is currently in commercial operation.

Project Details

The project comprised a Combined Cycle power block (2-2-1 configuration) with a gross rated output of 500MW. The block was an expansion project to the existing plants. It consisted of two (2) gas turbines & generators (GTGs), two (2) heat recovery steam generators (HRSGs) and one (1) steam turbine & generator (STG) in multi-shaft configuration with bypass stack (which allows simple cycle operation) and Balance of Plant (BOP) equipment. The gas turbine (GT) was designed for single firing using natural gas.

Figure-1: Bird's Eye-view of Completed Plant

Each GTG was coupled to a dedicated HRSG unit that produces high, intermediate and low-pressure steam from the exhaust of GT thermal energy. The steam generated by each HRSG in a block was combined in the common steam header and delivered to a common steam turbine (ST), thereby allowing the ST to generate power in bottoming cycle. The ST was a reheat condensing turbine.

The exhaust steam was condensed in a water-cooled condenser and the cooling system for the steam turbine condenser was a once through cooling system using sea water drawn from an intake canal.

The GT was an advanced E-class heavy-duty gas turbine designed for 50 Hz operation with single shaft, cold end drive and silo type combustors. The HRSG was horizontal type, natural circulation, unfired, reheat, triple pressure design. The low-pressure drum of the HRSG was provided with feedwater storage function and the integral deaerator was mounted on the top of LP drum. The condensing steam turbine consists of HP and IP-LP cylinders for steam expansion.

A. Setting the Stage with the customer

The customer was an upcoming EPC player in the power industry and was executing the project in Indonesia for the first time. Thus, executing the project successfully in Indonesia was very critical for them to gain a strong foot-hold in the region. Based on TCE's prior successful record in executing the power projects with other major foreign EPC's, the customer had signed the contract with TCE for the first time to execute the basic and detail engineering of the plant.

It was understood that the customer did not have prior experience in engineering a power plant and hence was an "inexperienced customer". That situation further increased the accountability of the project team. The project team took the lead and guided the customer in finalizing the systems design, layouts, participated in design review meetings and taking approvals from the owner. Apart from the engineering execution, the team were also involved in decision making in certain areas on behalf of the customer. Key value additions in mechanical design resulted in $350,000 cost savings to customer. The Vendor recommendations provided by TCE enabled the customer to procure certain critical packages from India which resulted in further cost savings to the customer.

Handholding the customer over the complete cycle of the project "from concept to commissioning support" resulted in the successful completion of the project and achieving COD on time.

B. Changing the Project Owner's perception

The Project Owner had not been associated with TCE in the past and hence their initial impression about TCE needed to be set on the right track. Besides, TCE was a relatively new face in Indonesia and had to establish its presence in a new market area. The project owner was keen to understand more about TCE's credentials as an engineering consultant.

Impacting the Owner's perception at the initial stage was necessary for the smooth execution of the project. During the first meeting with the Owner (Kick-off Meeting), the project team presented TCE's credentials and provided an overview about its vast experience in engineering thermal power plants of different capacities. That helped the owner to understand TCE's capabilities.

As a part of review process, periodic design review meetings were planned with the owner. The purpose of those meetings was to present system-wise design concept, sizing criteria and operation philosophy and seek their approval. Clarifications sought on the design aspects were provided during the meeting and certain revisions mutually agreed upon recorded as action items, to be updated by the project team and reviewed during the next meeting. The series of design meetings resulted in building the owner's confidence vis-à-vis TCE.

Secondly, integrated 3D engineering was another key factor that helped the owner in understanding TCE's engineering capabilities. The complete plant was designed and virtually constructed in a 3D environment.

3D engineering eliminated the occurrence of issues that are common at site during construction and erection phase, when only 2D drawings were used for engineering. The layout and piping engineering were carried out through 3D modeling and hence clashes or fouling in layout, equipment, systems and piping were avoided and planning was much better. A

Figure-2: 3D Engineered Plant and the Actual plant at site

clash-free model ensured smooth execution during the construction and erection phases.

Successful 3D engineering execution needed complete coordination among the different departments/ disciplines of the project team. Several stage-gate reviews of integrated 3D model were organized with the Owner at periodic intervals to update the project progress. The 3D model review typically covered the following sequence:

1. Review of action items from the previous 3D model review (if any) by owner & owner's engineer to ensure that all the previous action items were closed, and model was updated accordingly.
2. Complete walk-through of the latest integrated plant model.
3. Detailed review of the updated plant model covering area by area and apprising the progress achieved when compared to the previous 3D model review. All the disciplines/department areas were covered - Civil, Architectural & Structural, Mechanical, Piping, Electrical, Instrumentation & Control, HVAC and Firefighting
4. Any comments or observations from the owner/ owner's engineer during the meeting were recorded as an action item for EPC contractor/ engineering consultant.

Apart from the above formal review process, several informal discussions were held with the Owner during the course of the project execution to clarify their queries. The updated 3D plant models were also shared on a regular basis with the owner, the owner's engineer and site team for better understanding and effortless execution. These step-by-step periodic review processes- both internal and external; resulted in gaining the owner's confidence.

C. Field Engineering Support

Providing engineering support to the site team during construction and commissioning was one of the key activities that needed attention. That phase generally overlaps the last phase of detail engineering services. The site team's queries or concerns were clarified with regards to the design requirements. On certain occasions, the site team would suggest modifications in design based on constructability issues. During such revisions, the site team would coordinate with the design team to ensure that there were no other issues arising due to the modifications. Most of the times, the clarifications were addressed by the design team from the home office. Based on the requirement, certain key members of the design team were posted at site to support the site team.

Some of issues encountered by the site team during the erection and commissioning phase, are highlighted below along with the action taken by the design team to resolve them.

1. Erection and commissioning support were part of the customer's scope. For the main plant equipment such as GT, ST and HRSG, the customer had only requested for Technical Assistance (TA) support

from the OEMs, while erection and commissioning were to be carried out by the customer's site team.

Action: Complete engineering support was provided to help the customer in resolving certain erection and commissioning issues.

2. Commissioning related issues of certain critical equipment and systems such as Cooling Water System, Feed Water System, Condensate System and Oil-Water Separator (OWS). These was mainly due to lack of experience of the customer's site team

   Action: Relevant experts from the design team were posted to the site. Design notes were prepared to address the start-up and commissioning issues. These notes included a step-by-step procedure and detailed explanation that specifically addressed the issues.

3. Steam bypass valve operation- Differences in opinion between the customer's site team and design team in the bypass-valve operational concept.

   Action: Relevant experts from the design team were posted to the site. The logics and operational concept were reviewed, updated and implemented successfully in the DCS.

4. Load rejection scenario- Certain contractual requirements to be met during the load rejection scenario were not complied at site.

   Action: Design team proposed the desired modifications that helped the customer in complying with the owner's requirements.

   Additional efforts undertaken by the design team.

   a) Detailed presentations were prepared for better understanding of certain design concepts, thus helping the customer's site team to successfully commission certain equipment and systems.
   b) Seamless coordination with the vendors and TA's at site resulted in closing certain critical engineering related issues.
   c) Certain clarifications raised by the Owner/ Owner's engineers at site were also addressed in detail though planned meetings.

The above consolidated efforts by the design team helped the customer in resolving all the major issues and subsequently commissioning of the plant.

D. Steam Blowing Procedure

Steam Blowing Operation (SBO) is one of the critical pre-commissioning activities carried out in a new power plant during the commissioning phase. The activity is performed on the critical steam piping of steam cycle circuit to ensure that the scales, oxides of metal, any slag left behind in the piping internals during welding process were removed prior to initiating the operation of steam turbine. This is an important activity to be completed by the EPC contractor as a part of the steam turbine OEM (original equipment manufacturer) start-up requirement. If it is not done, then any left-over metal particles or scales formed within the pipes can travel along with the steam into the steam turbine and can cause pitting/damage of the turbine blades. Based on the recommendations of the ST manufacturer, continuous blowing method was adopted for the project. During SBO, adequate Cleaning Force Ratio (CFR) across the steam blowing circuit must be ensured.

During the design stage, the outlet steam parameters for different operating conditions at the HP steam turbine exhaust were evaluated and carbon steel piping was selected for the CRH line (header and individual lines to each HRSG). The decision to select carbon steel material for the CRH lines further led to encountering the challenge during SBO. While blowing the headers, both the gas turbines and their respective HRSGs were operated to achieve the desired CFR. However, CFR in the individual CRH and HRH lead lines could not be achieved in that mode.

Therefore, to achieve the required CFR in the individual CRH and HRH lead lines, only one train was operated (1GT+1HRSG). While increasing the GT load to meet the CFR requirement, it was observed that the main steam temperature was rising close to 500°C, which was not acceptable for the carbon steel piping (CRH lines) for which the acceptable temperature limit was 427°C.

Solution

The root cause of the problem was "high temperature GT exhaust gases that in-turn produces high temperature steam" while trying to achieve the required CFR values. That had to be brought to permissible levels, acceptable for the carbon steel permanent piping. The other critical lines identified for steam blowing were alloy steel piping and hence a higher temperature was acceptable. If the exhaust gas temperature was controlled from the GT side, then consequently the temperature of the steam would be brought down to acceptable levels. Based on the discussions with the GT manufacturer, it was understood that the turbine exhaust temperature (TET) could be brought down by pre-setting the value in the GT control system to the desired temperature at the rated GT exhaust flow condition. This was temporarily modified to meet the steam blowing requirements and then reset to the normal operating conditions thereafter. Achieving the desired lower temperature without software modification was not possible.

Prior to implementing the above modifications in the GT control systems, the proposed revisions in the software underwent various simulations (using the simulator) to understand any other issues that could come up while operating the GT under that mode. It was observed that were no errors or alarms generated during the simulation. The next step was to implement the modification in the GT control systems.

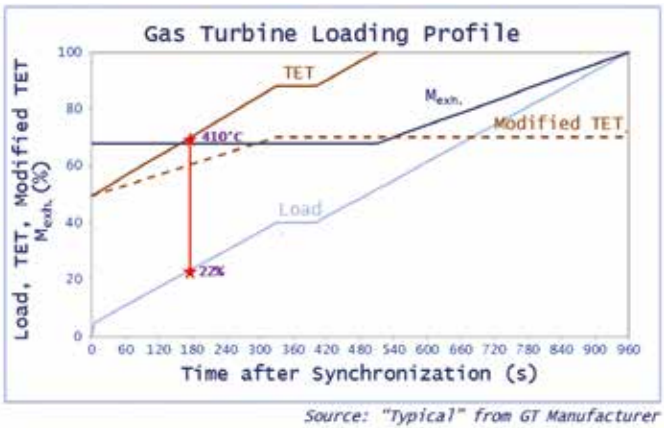


Figure-3: GT Exhaust Temperature Profile

Steam blowing was successfully completed using the modified approach, with the gas turbine operating under "Steam Blowing Mode". The steam blowing mode in the GT control system was made inactive post completion of the operation.

E. Provide Training to Plant O&M Team

Based on the good services offered to the customer during basic and detail engineering phase, following additional sub-assignments related to the same project were offered to TCE.

1. Preparation of Commissioning Procedures
2. Preparation of Training Manual and conducting Class Room Training sessions
3. Preparation of Plant Operating Procedures

Through a series of interactions with the owner during the detail engineering phase, the owner's expectations on the training requirements were well understood. Accordingly, a training plan and schedule were prepared and discussed with the owner to seek their approval. Post receiving the approval for the training plan and schedule, training materials were prepared and submitted to the owner in advance. The training modules were segregated day-wise and discipline-wise and accordingly the trainers were assigned. On a broader level, training modules included design concepts and operational philosophy at a system level and overall plant level. Apart from the general operational concepts, certain project specific requirements were also covered that would help the O&M team to get acquainted with the requirements and operate the plant without any hurdles.

Training to the plant's O&M team was conducted through class-room sessions. Training material was provided to all the trainees ahead of the training sessions. Post completion of the training session, a test was conducted for all the trainees to evaluate their understanding. Training completion certificates were issued to all the trainees.

Figure-4: Class Room Training Session

The class room sessions were a new experience and were successfully completed. The owner appreciated TCE's efforts in conducting the training sessions.

Conclusions

Every project comes with a set of challenges and opportunities. This project was no different. While there were several challenges during the project execution stage, there was also an opportunity to gain a first-time customer's confidence and establish TCE's execution capabilities in a new market.

From a Customer's perspective, apart from delivering high quality deliverables, taking the lead and being flexible to meet the customer's requirements was the key to customer satisfaction. The above contributions in the project resulted in a repeat order from the same customer. The project was TCE's first major contribution in the Indonesian market. Subsequently, there were other projects some of which are ongoing with different customers in that region.

From the end-owner's perspective, the project was successfully delivered beyond their expectations. During the project completion stage, the Owner had expressed interest in TCE's support for training the Owner's engineering team for execution of a new power project. It was a total turnaround of customer experience, moving up from a stage where owner had concerns about TCE's capability to a stage where Owner was delighted with the overall performance and experience of interaction with TCE. It was a win-win for all – the Owner, The EPC Contractor and TCE.

Status & Way forward for Export of Consulting Services

K K Kapila
CMD
Intercontinental Consultants and
Technocrats Pvt Ltd. (ICT)

The COVID-19 pandemic, besides the global health crisis, prompted the largest economic shock to the world economy. As per World Bank's Economic Survey 2020-21, Volume 1 "the world economy is estimated to contract in 2020 by 4.3 per cent, while IMF pegs it at 3.5 per cent". The crises created a trade-off between lives and livelihoods leading to limited human interactions and halting of trade of goods and services at all levels, including imports and exports.

The demand for consulting services tends to increase with the economic development of the country. However, due to COVID-19, during the year 2020-21, the export of consulting services were as much impacted as any other sector of the economy. The requirement for consultancy services stem from a diverse range of clients, largely governed by the large corporate sector and government institutions, funding agencies (Bilateral Agencies and Multilateral Agencies).

Consulting is the business of providing specialized solutions to solve specific problems. The pillars of the consulting industry are problem-solving and decision-making, coupled with communication, negotiation, and analytical skills. The demand for specialized consulting services has never been higher – in India and globally – than now. In the Union Budget 2020-21, the Government of India has given a massive push to the infrastructure sector by allocating INR.1,69,637 Crores (US$24.27 billion) for the Infrastructure Sector. Consultancy and Infrastructure have a symptomatic relation and hence as a corollary, the consultancy sector in India is definitely poised for a high trajectory growth. The pandemic experienced in 2020, definitely played spoil sport but since the virus load is on a wane and the vaccination drive is gaining momentum, economists do predict a rapid recovery in near future. The IMF and other world bodies have echoed similar sentiment for the immediate and midterm future. The world, as in India, is thus set to witness realistic growth in the Consultancy sector in the back drop of predicted growth figures.

While there is no one figure available of the number of Consulting Engineering firms in the country, according to a recent report by the Associated Chambers of Commerce and Industry of India (ASSOCHAM), the consulting industry in India comprise of 6000 consultancy firms in metropolitan areas with 200 R&D institutions and laboratories supporting these firms. The sector is expected to grow at a compounded annual growth rate of 30 %.

The ASSOCHAM Report mentions that countries worldwide such as USA, UK, China, Japan, Saudi Arabia, CIS countries, Far East countries such as Vietnam, Indonesia, Malaysia and Gulf nations

acknowledge the competency of Indian consultancy firms, with their ever growing demand in the EU as well. Some of the strengths that set Indian consultancy firms apart from the others are their Low cost structure, Professional competence and Expansive human capital, Focused approach, Expertise in diverse areas and usage of knowledge management tools, intent to follow best practices, Strong communication and interpersonal skills, high learning agility, flexible and out-the-box thinking and adaptability to dynamic situations.

India is presently recognized as one of the most important players in the global economic landscape. Its trade policies, Government reforms and inherent economic strengths have attributed to its standing as one of the most sought-after destinations for foreign investments in the world.

Total exports from India (Merchandise and Services) stood at US$ 304.25 billion between April and November 2020, while imports totalled US$ 290.66 billion according to data from the Ministry of Commerce and Industry. The estimated value of services export and import for 2020-21 stood at US$ 130.60 billion and US$ 74.98 billion respectively. India registered trade surplus of US$ 13.59 billion between April and November 2020.

Engineering by far is the largest segment in the Indian industry witnessing tremendous growth. Engineering contributes 25% to India's total exports of goods and services which is the largest foreign exchange earner.

The Exim Bank of India, a specialized export credit agency for India has been executing the role of furthering international trade for India's economic development. More transparency from the Exim Bank for advance information for their strategies, loan or grant disbursements will act as a catalyst.

CII, FICCI and other Industry Associations work towards providing clearer strategies based on deeper insights and analytical perceptions. At the forefront for facilitating Indian business connections and interactions with global business, these organizations have activated a multi-pronged strategy for global networking by meeting heads of states and governments, decision makers, networking with counterpart organisations, multilateral and academic institutions and other policy making bodies which adds on to the export of consulting services to a large extent.

Export of Consulting Services has also been one of the important factors behind transfer of knowledge to the local governing departments and local agencies. It has enabled the clients and local consultancy firms in enhancing their expertise and skill sets. Companies from the developed countries have since long been involved in the infrastructure development of the under developed and developing countries. With the continued practice of transfer of knowledge and national experts gaining the expertise from the global firms, the local firms of developing and underdeveloped countries are playing a vital role in infrastructure development of their own countries. One of the recent examples to support the fact is the Zojila tunnel project in India. Even though being a very complex tunnel project in the difficult mountainous region of Jammu & Kashmir, Government of India entrusted the project to an Indian consultancy firm for its implementation.

The Consultancy firms emerging from the developing countries are now involved in providing their services to other developing and under developed countries. This has not only resulted in the lower fees of consulting assignments but also improvement in the speed of implementation of multiple mega projects at the same point in time.

The right composition of funds to be invested for the right infrastructure need of the nation is advised by the expert firms which not only has proven to be the most advantageous factor but also a guiding light for the clients.

The biggest challenge for the Indian consulting firms is to compete with the global players in the market.

There is need for Indian consultancy sectors to define their specializations and differentiate themselves from their competitors. With increasing globalization of consulting firms, Indian consultancy sector needs to adopt new organizational strategies that best suit their contexts and identities. Outsourcing from India acts both as a challenge as well as a driver. Though outsourcing assists in development and globalization, many Indian consulting firms find that it restrains their growth in the outsourced regions. The Consultancy firms have a challenge to leverage the organizational knowledge efficiently so that there would be a proper balance between utilization of existing knowledge and creating new knowledge.

Proactive initiatives from all Indian Diplomatic Missions by identifying export opportunities in respective Countries in advance and promoting Indian Engineering Industry is the key to success. An innovative approach of the Missions where dedicated cell of personnel consisting of bureaucrats, technical persons and financial experts may be engaged with export promotions to facilitate achievement of increasing targets year on year.

Another potential area of export of consultancy is the backend services for engineering design; this is also typical offshoring of engineering design services. India's knowledge capabilities are exported across the world in the domain of Infrastructure Design, Urban Planning, Development and Operations. India is fast becoming the knowledge processing outsourcing hub for global infrastructure design and implementation. The Engineering Design offshore Services transfer ideas and designs into functional components which can be prepared in a short time period. The engineering design offshore requires the understanding of international projects and availability of IT infrastructure and engineering manpower. The common composition of team for Engineering Design offshore Services include Design Leaders, Design Engineers, Program Managers, Detailers, Technicians, Specialists in using specialized software for specific requirements of clients. With this trend, Indian engineering design consulting firms are increasingly looking to potential locations like Africa, Far East countries such as Vietnam, Papua New Guinea, Indonesia, Japan and even EU, USA and UK. Almost all design services such as preparation of Feasibility Studies, Techno-economic feasibility reports, Detailed Project Reports, etc. including operations process parameters, detailed engineering designs & drawings can be outsourced to India. In a way, this is also akin to export of consultancy services from India. However, issues of Goods and Services Tax implications need to be revisited for realizing the full potential of this sector. The industry drivers as mentioned above, are the traits to be strongly leveraged to unleash the potential of this growing sector.

The Urban planning related management consulting business is also growing rapidly, considering the increasing urban population. The process of urbanisation is amongst the most significant global trends of the 21st century. Today, 55 per cent of the world's population live in cities. By 2030, projections show that 60 per cent of people will be urban dwellers. That proportion is set to increase to 68 per cent by 2050. With the rise in urbanisation, cities are driving sustainable development while supporting a new era of health, liveability and economic growth. Cities are hubs of innovation often deployed to address a wide range of challenges, for example ensuring that all residents have access to adequate and affordable urban basic services – including water, mobility, security, solid waste management and renewable energy – and to maximize city growth and opportunities . This increasing level of urbanisation needs to be addressed with special focus on urban planning and urban infrastructure designing. To bring uniformity with international standards and guidelines- in terms of processes, methodology, tools and technology in assignments related to urban planning and urban infrastructure development, the organisations like FICCI should collaborate more actively with ITPI (Institute of Town Planners, India)

1. 10th Session of World Urban Forum, 2020

and other planning institutes. The ITPI and FICCI may be encouraged to create a list of reference documents for specific region for urban planning assignment.

The Government of India has taken up initiatives for encouraging Indian consultancy firms to export services offered. Role and function of Exim Bank, Services Export Promotion Council, Consulting Engineers Association of India, etc. are notable. The Export Advisory Services Group [EAS] of Exim Bank offers a diverse range of information, advisory and support services, which enable exporters to evaluate international risks, exploit export opportunities and improve competitiveness. Value added information and support services are provided to Indian projects exporters on the projects funded by multilateral agencies. Further hand holding and awareness of the potential of markets need to be explained and promoted by the agencies for meritorious consultancy firms to take advantage and participate in the opportunity presented in the new world.

The Consulting Industry in India is growing at a fast pace and soaring to new heights all across the world. While the sector is generally well established within the country, it is time to take a collective action to have a 'call to action' to exploit the tremendous potential available for exporting the services and thus providing the impetus to the omnipresent consulting market. The Consulting engineers and firms need to further leverage technology, available skill sets, and deeper understanding of international standards required by clients in targeted markets. This can be done well by embracing innovation, fostering talent, refining the quality of consulting services, and further augmenting consulting skills.

MSME's can Succeed in Export of Engineering Consultancy Services

Amitabha Ghoshal
Immediate Past President
CEAI

Preface

Engineering Consulting services have been practised or, rather, monopolised by Consultants from Developed countries, when the differences in technology level between the countries were apparent and insurmountable. The developing countries of Asia, Africa and South America had been receiving engineering consultancy services from Europe, America and Japan till towards the end of the twentieth century, when the situation started changing. The advancement of communication technology made transfer of technology faster and the differences between the developed and developing countries started closing.

Countries like India, liberated from Colonial rules, with meagre foreign exchange reserves and almost zero export potential, had to develop their own consultancy capabilities with the help of technology updates at individual level by working in the offices of consultants in European countries, and later in USA.

European countries were facing shortage of trained manpower after the World War and Indian engineering graduates, with proficiency in English language, jumped at the chance, in hordes to fill up the gap. It was that trained man power, that started the consulting engineering firms as 'Start ups' in various urban centres of India, to replace the consulting services being imported in the country.

Few of the consultancy firms, emboldened with their success in the domestic field, and some others with superior confidence level and vision, started operating as Consultants beyond the shores of the country. Competition had been intense and initial results were not always happy, however success came to those who sustained their efforts.

Government appreciated the benefits of exporting Consultancy services, as export of construction services and construction materials followed that of the consultants. Institutions like the Consultancy Development Centre (CDC) and Federation of Indian Export Organizations (FIEO) actively supported consultants with financial concessions in the form of tax relief and helped by arranging marketing delegations abroad. MSME consultants made their inroads along with large consulting bodies like MN DASTUR, DCL, TCE, EIL, MECON and WAPCOS.

The success trend got stymied during the last decade and there is therefore a need to review how success can be recreated by the Consulting Engineering fraternity, particularly the small and medium consulting firms who are facing constraints of survival and growth, with the interim slowing down of infrastructure development and a fast increase in the number of consulting firms and individuals, during the period of rapid growth of domestic demand.

The article intends to recount the factors that made export of consulting engineering services by firms in the MSME sector possible, supplemented by the personal experience of the author who had participated in export of Consultancy services to more than twenty countries in South East Asia, the Middle Eastern countries and also in Africa, and to many of them for the first time by an Indian consultant.

Export of Consultancy Services - Why and How

Consultancy is a knowledge based operation and the output of a consultant is guided by the codes and common practices followed by the country in which the project is located. It is convenient for a consultant to operate in his own country, as the technical manpower is conversant with the rules and systems followed, and productivity can be optimised, hence initially working abroad is a challenge.

Operating in a foreign country has its attractions and advantages. The type of work that is sourced out from any country are the ones they are not conversant with or in sectors where there is shortage of trained manpower and it is possible to earn better fees than one can get in one's own country.

Working for another country challenges the capability of own manpower as they are required to study and master the codes of practice followed in the client's country and satisfy the owners with the quality of work. The knowledge horizon broadens and the manpower becomes more versatile, which helps in enhancing the productivity and efficiency of personnel, entailing long term gains for the consultant.

A sense of pride and happiness permeates in the staff and they become more conscious of quality, once they realise that the reputation of the country is linked with their performance. The self esteem of the staff rises and there is always silent competition for getting selected for foreign assignments. The image of the Organisation grows among intending job seekers and it becomes easier to recruit more capable personnel.

Apart from these indirect gains, the organisation earns greater respect from domestic clientele as well and they tend to allow wider license to the exporting consultant in so far as delivery on their domestic projects are concerned.

It is important to assess and plan the marketing strategy to get entry into the exporter group. For medium and small consultants, it will seldom be possible to obtain a project by quoting against open invitation of bids. When selecting a foreign consultant, price will never be the only consideration, and it is extremely difficult to compete in the domain of past experience, specially where experience of working abroad is a criterion.

The MSME consultants have to choose carefully the countries they want to target and the type of jobs they should aim for. One must first make an evaluation of the technical capability they have over others and identify the capabilities that would attract the potential clients in a foreign country. With limited funds availability, it is important for a MSME consultant to be careful in selecting the marketing strategy so that success can come before one exhausts one's resource and gets frustrated with failures.

While selecting the target country one must examine accessibility for Indians and whether Indians are respected as technical achievers.

Indians have two advantages that make them attractive to outsiders:- Indians can freely communicate in English and that makes them acceptable for all projects with investment from Multinational Banks.

India as a country is also viewed as a long term dependable player, largely self sufficient (Atmanirbhar) and having expertise in a very broad spectrum of disciplines.

The Indian presence in IT sector across the world and the fact that persons of Indian origin occupy high positions globally in high technology sectors have added to the image of India.

As a first step, it is useful to identify and participate

effectively in engineering conferences in the target countries, where decision makers would be present, and make a mark by presenting a high quality paper based on case studies of successful projects. Follow up meetings after the conference with personnel of importance can open the doors initially with very limited investment of time and money.

Once the potential of the country, as possible source of business, is realised, opportunities for follow up visits would have to be created. In that respect, close interaction with the Indian diaspora can prove to be very helpful. Persons of Indian origin are spread out almost in every country and generally they hold good positions. It is heartening to find that Indians, who had migrated generations earlier, still retain fond sense of belonging and wish to help Indians, and the country, through them.

The other effective route is to follow up projects that are funded by multinational banks like Asian Development Bank (ADB), African Development Bank (AfDB) and others. All Banks have the declared objective of adopting regional diversity in choice of Consultants and some of them have an undeclared quota system, while shortlisting Consultants. While the competition among Europe and the Pacific country (USA, JAPAN, ANZ) consultants are stiff, one faces less competition among the 'Asian' or ' Developing Country' quota, that are seldom publicised in the open. Shortlisting by the bank easily opens the door for reaching the Government officials and others in authority and one can establish rapport faster. Again, in making inroads amongst the Bank officials, for getting selected in the shortlist for a funded project, a link through known persons can be explored judiciously.

Such contacts need to be nurtured by frequent in-obtrusive communications and by extending help for solving the issues that they may be having, and also by taking small, inexpensive but attractive, gifts from India.

An easier route is to piggyback with an Engineering contractor searching for EPC contracts abroad. Success of the contractor ensures entry of the consultant as well.

Government of India extends financial aid/ loans on easy term to other developing countries and such financial packages are tied with use of Indian consultants, suppliers, and contractors. Selection of consultants in such cases are controlled by Ministry of External Affairs and the payments in equivalent foreign currency are done by EXIM Bank. This route can help Indian consultants to make their entry abroad.

Once an assignment is obtained, it is very important to make it successful, at whatever cost and effort. A successful assignment, well publicised to future prospective client/ authority, can become the best marketing tool and lead to continuity of business. During marketing, it is a good strategy to publicise successful projects done by other Indian consultants as well, as it is important to create trust on Indian engineering capability and that would indirectly create trust on the candidate firm.

While it is important to focus on success, it is equally important to be careful of the challenges that may be faced, and prepare for them in advance.

It is important to understand the financial arrangements and the hold ups that can happen in release of payments. The payment records of the client should be carefully understood as it is extremely difficult to chase and realise payment from a difficult client abroad.

It is also important to identify the currency of invoicing and payment transfer. Currencies of some countries fluctuate unpredictably and can cause unexpected losses to the consultant, who has limited flexibility for absorbing loss.

It is very important to watch for the satisfaction level of the client at all stages, and often such dissatisfaction can arise from poor communication and misunderstandings arising thereof. The best way out is to maintain a systematic communication protocol punctuated with visits to the client's office (this was in the pre COVID era; a modified approach will be warranted now).

Profitability for a consultant is a tiny sum compared to the project value and should not be a concern for any client. For a consultant, this is the difference between his earning and the expenses. It is very important to watch the expenses closely, as these are not always estimable readily because of lack of knowledge of the local cost components. For an export project it is important that visits are made ahead of the preparation of the financial bid and then the expenses watched closely.

The challenges notwithstanding, export jobs almost always are more rewarding compared to the domestic assignments, and it is hoped that Indian engineering consultants will be able to reap the benefit of the very large technical manpower available in the country, as the IT sector has been able to develop over a relatively short period.

Learnings from Past Experience

It may be worthwhile sharing the Author's personal experiences, as a part of an organisation that qualifies as a MSME unit, based on current definition.

The previous experience of the Author, when the first attempt was made to export Consultancy services to mostly uncharted territory, had been limited to his participation in export of Construction services on behalf of his previous EPC contractor employer, and those experiences had not been uniformly happy.

The first exposure was at Malaysia, a country that has English as a major communication medium and therefore easily accessible. The initial target was to establish communication, and realise dues against deputation of multiple engineers who were helping the Consultant client to handle the first high rise building supported on transfer girders. Some third country consultant had taken the advantage of our absence at senior level and tried to point out errors in the design approach and bag the job midway. Timely intervention by multiple travel and arranging presence of a strong technical team for joining the technical debate, saved the situation, and thereafter our strong relationship with them continued for almost fifteen years. While working for this client on projects in transport sector and power sector, we could reach five more local consultants and worked with them in industrial sectors and Railway sector. We also continued to work with IRCON who had been working for strengthening old railway corridors and also were working on new high speed meters gauge corridors in Malaysia.

Establishing relationship with Asian Development Bank (ADB) proved very helpful. We created relationship with a talented technocrat settled in Manila, as our local representative. He assisted us for the bids and securing very interesting projects financed by ADB in countries like Bhutan, Indonesia, Laos, Vietnam, Federated States of Micronesia, Marshall Islands, Bangladesh and the work period extended for more than twenty years. Our foray at ADB had started with delivering of slide presentations (PPT was not in vogue yet) to ADB officials to highlight our capabilities and how we could be providing appropriate technical solutions to developing countries at much lower cost. That paid rich dividends.

By joining with contracting organisations on an EPC contract we could reach Sri Lanka, Maldives, Afghanistan, and some Middle East countries. Follow up, after visiting as part of Government of India delegations, also brought jobs in countries like Sudan. We could do projects in Papua New Guinea based on friendships with Indian origin personnel settled abroad.

Epilogue

The purpose of my sharing so many personal details is only to convey that MSME consultants from India can succeed with sustained efforts, and spread the Indian expertise.

Export of Consultancy services can help utilise the huge technically trained manpower, presently underemployed or unemployed, and at the same time it can benefit clients in developing countries who had been over the years paying heavily for services from Developed country consultants and often getting solutions that are not optimum for their Economic and social conditions! The result can be a win-win situation for both parties!!

The Nascent Years of Export of Consultancy from India – FE issues

K K Kapila
CMD
Intercontinental Consultants and
Technocrats Pvt Ltd. (ICT)

A handful of Consultants started export of Consultancy Services in the early 1990s, although some had been operating abroad even earlier. In those days, a Dollar account could not be opened in India and if one wanted to open a Dollar account, it had to be opened in New York, which meant a considerable outflow in terms of bank charges from small export earnings.

When I got my first Technical Assistance Project funded by the ADB in Nepal, as a strong India supporter I opened a separate account for the TA in Punjab National Bank, converting the Dollars received as payment to Indian rupees. The logic behind that action was that when I needed to pay in Dollars then I would reconvert to US Dollar by paying necessary charges. That way the money would remain in the country.

The exchange rate then used to be 1 USD = Rs. 11, if my memory serves me right. However, when it was time for reconversion to US Dollar to make salary payments on the Project, the Dollar had become much stronger at 1USD = Rs. 19 and instead of the earnings, there was substantial loss due to the foreign exchange conversion, besides the bank charges.

I then met Dr. Montek Singh Ahluwalia, the then Additional Secretary, Ministry of Finance Government of India, and narrated the sad experience of export of consultancy services and requested him to facilitate opening of US Dollar account in India to save businesses from the ordeal. He deserves all the credit to have worked relentlessly and got the necessary approvals to start an EFC Dollar account in India by Indian Entrepreneurs. Accordingly, I opened a Dollar account with the PNB and the EFC account number was 0001. Thus, began the commencement of Dollar accounts in India operationalized by various Banks.

However, what still remains an enigma is that when a Dollar payment is released to the Dollar account held by an Indian at the same Branch, it is debited from the Dollar account, without any routing to the USA. However, if Dollars are sent to a different Branch of the same Bank or to a Dollar Account in another Bank, it is routed through the USA. I have not been able to understand the logic behind this, although I have written to the Governor of RBI and as well as others in the system pointing out that this needs an urgent correction. However, the position continues as it was.

Let us work overtime to get this correction done, so that valuable foreign exchange which is being passed on to the US Banks in these Dollar transactions can be stopped besides considerable saving of time.

Precast Segmental Bridge Failures – An Introspection

V N Heggade
CEO
STUP Consultants Pvt Ltd

Introduction

There has been an alarming number of failures of precast segmental construction in the country with seven of them reported since November 2018 (Figure-1). Of these three of them belong to the category of spine and wing construction.

The latest failure on 28th March 2021, the expressway flyover at Dwarka, New Delhi was dramatically captured on CCTV camera without which it would not have been possible to assess that the trigger for collapse originated from already installed back span.

Some of the commonalities of these failures are:

- Belong to the category of pre cast segmental construction using span-by-span method of erection.
- Compression failure due to crushing of concrete during construction.
- Only one stage of prestressing, inducing complete prestressing force into the section when only around 50% of the load was there on the structure.

A synthesis of the probable causes of failure has been attempted and some recommendations given.

Figure-1: Precast Segmental superstructure failures during construction

Synthesis of probable design & construction causes and recommended remedies

Cracking normally triggers the mishap in post tensioned segmental construction. Cracking in segmental box girders may occur due to the inadequacies arising in the design for construction stage, construction techniques adopted and quality and workmanship of construction.

Design for construction stage

Inadequacies during the design stage may initiate cracking, consequently resulting in mishaps.

- Inappropriate consideration of stresses due to moment redistribution,
- Thermal stresses not considered during construction stage (expansion or contraction),
- Effect of thermal gradient effect during construction stage not considered.
- Over or under estimation of initial prestress resulting from optimistic or conservative coefficients of friction and wobble.
- Under or over estimating relaxation loss in prestressing.
- Tendon profiling where a large variation of prestress eccentricity occurs and not checking the stresses at critical locations.
- Forces of Bridge Deck Equipment (BDE) due to the coupling of BDE with the permanent structure not considered.

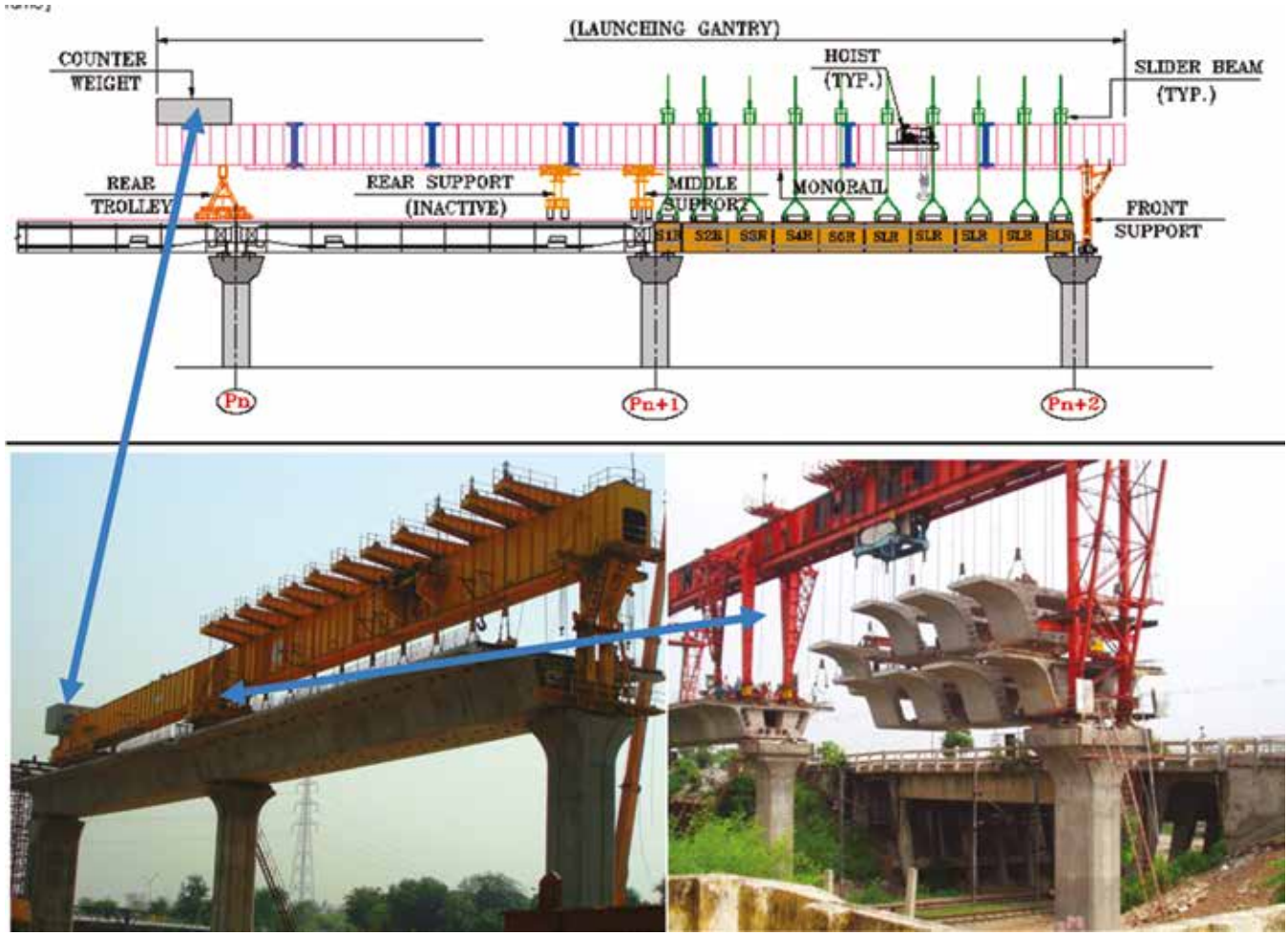


Figure-2: A stage of Kinemetics of launching

- Wind action on BDE and its effect on permanent structure during construction stage not considered.

It has been widely reported that there is a conservatism in assuming the wobble and friction coefficients leading to more prestressing in reality than actually assumed in design calculations.

In the span by span method of precast segmental construction, invariably one stage prestressing is adopted thus stretching the section to its limits when only around 50% of the load is allied on the section, but much of its time dependent prestressing losses are yet to occur. Further, during the launching of the segments, as can be seen from the Figure-2, the coupled actions between launching girder can induce unscheduled forces in the girder which is under erection during the load transfer and also on the already installed back span.

While the segments are being erected in the span Pn+1 to Pn+2, the launching girder may induce restraints on the already installed deck by virtue of its fixity at 'middle support' location and friction by 'counter weighted trolley' at the rear end. That may induce additional compression in the back span.The lauching girder is supported on the middle support and the rear trolley by portal frame action in the transverse direction. For any reasons, if the middle support and rear trolley are not exactly on top of diaphragm segments, there is a possibility of torsion being induced due to the wind action on the 2 to 3 m deep launching girder.

Uniform temperature variation during day and night and thermal gradient acoss the depth would also induce further stresses in the girder.

The spine and wing construction in the country started with JJ Hospital fly in which the deck width was only 16.20m. Nowadays, the spine and wing constructions is being adopted for much larger widths even up to 36m with very large cantilever wings. In that kind of construction, only the spine cross section has to accommodate the entire prestressing force as wing cross sections do not contribute to the property of the section but act as superimposed Dead Load. Thus, the problem of one stage prestressing for less than 50% of the service is further aggravated in the spine and wing construction. The higher widths warrant twin celled box whether it is spine and wing construction or single transverse box segment.

At around 1/3rd or 1/4th the span, the prestressing cables are profiled vertically thereby inducing a vertical component of prestressing. The distribution of shear stresses for such vertical component is made conventionally with the assumption that the rigid cross section is transversely not deformable (Figure-3 Left). However, depending upon the stiffness of component parts of the cross section this assumption may not be correct (Figure-3 Right). The rigid un-deformable cross section in transverse direction, assumes that a centered vertical component of the prestressing is evenly distributed among the webs. In fact, a center vertical component of the prestressing may induce a transverse deformation in the top and bottom flanges with a displacement of the center web larger than that of the external webs, leading to cracks in the flanges.

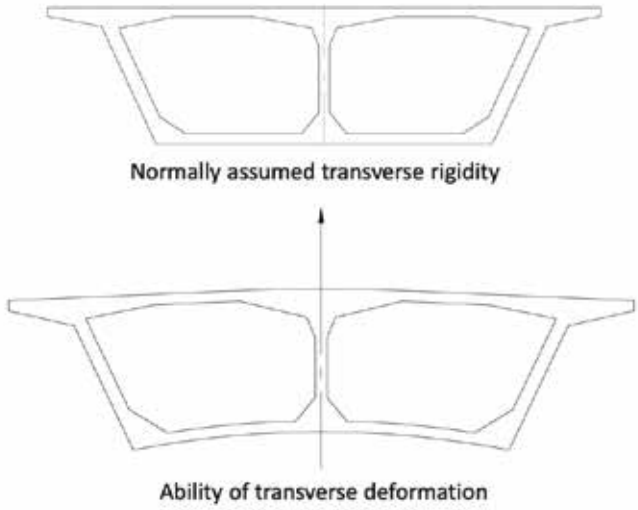


Figure- 3: Transverse stiffness of wide two celled box

Thus there is a very likely possibility of additional prestress being induced in to the cross section for a variety of reasons explained above. Taking this into cognizance, IRC: 112 not only specifies ULS checks for construction stage but also SLS checks in its Annexure: A-6 which is reproduced below.

A6- 3.3 Serviceability limit states

(1) Serviceability criteria for the completed structure need not be applied to intermediate construction stages, provided that durability and final appearance of the completed structure are not affected (e.g., crack width and deformations) and comply with applicable provisions of the Code.

(2) The idea of frequent combination does not exist during construction and also limit states related to durability are not pertinent for short term-phases as such limiting stresses in concrete to 0.48 fck(t) and steel to 0.8 fyk under rare combination during construction is adequate.

(3) For bridges or element of bridges in which limit state of decompression is checked on the completed structure, tensile stresses less than fctm(t) under the quasi-permanent combination during construction is permitted.

(4) Prestressing effects may be taken as $\gamma sup = \gamma inf = 1.0$ during the construction.

Taking in to consideration all the uncertainties as explained above, it is recommended that the clause (2) of A6-3.3 be modified to read as follows:

(2) The idea of frequent combination does not exist during construction and also limit states related to durability are not pertinent for short term-phases as such limiting stresses in concrete to 0.48 fck(t) and steel to 0.8 fyk under rare combination during construction is adequate. However, for span-by-span precast segmental construction for one stage prestressing under the rare combination, stresses in concrete shall be limited to 0.36 fck(t).

During Construction stage

Inadequacies, as listed below, during the construction stage also may initiate cracking, resulting in mishaps.

- Fabrication defects in pre-casting yard.
- Inappropriate and timely (within pot life of epoxy polymerisation) epoxy jointing of segments.
- Breaking of shear keys during handling of segments.
- Inadequate Geometric control during matchcasting.
- Non uniform temporary prestressing between the segments.
- Lower strength of materials.
- Over or Under prestressing
- Unscheduled forces on permanent structure due to faulty operation of Bridge Deck Equipment (BDE).

Most important distinction between full span precast construction to that of segmental construction are the joints between the segments that have to be perfectly fitted with each other.These joints have to transfer the compression through 100% contact area which is ensured by match casting, either by long line method or by shortline method.

Guidelines for design and construction of segmental bridges, IRC:SP:65 covers in detail the design and construction requirement for precast segmental bridges. Despite the elaborate guideline, there seem to be perennial issues regarding the quality of match casting of the segments leading to mishaps during the construction due to following reasons.

- Concrete not properly reaching the bottom slab and also honeycombing at the edges of the segments near the end stopper.
- The epoxy formulation for wet joints not properly applied and temporary prestressing not done within the pot life leading to less than 100% contact area between the match cast surfaces.
- The shearkeys being broken while deshuttering or handling the segments leading to imperfect fitting of the segments.
- Less than 100% contact area between the compression joints leading to longitudinal cracks after final prestressing.

There are some specialities which make the match casting of precast segments sensitive to certain types of defects. Due to the short pouring cycle between segments (usually a day) the whole process of segment construction can lead to different type of construction

defects if specific inspection and adequate quality measures are not taken. Some of the most common defects during the fabrication and erection of segments are:

- The continuous reuse of movable parts of the formwork might affect its water tightness after several reuse cycles. This can lead to a leak of the grout component of the concrete mix.
- The segment pour sequence, particularly if a self-compacting concrete mix is not used, is very sensitive to workmanship skills. The compaction and pouring sequence within each segment, honeycombs, voids or cold joints due to improper spacer fixing are common problems that might arise.
- In match casting of very wide segments there can be 'bow effect'. The segment cast first which acts as a shutter face may undergo curving at the joint face due to thermal gradient and induce that curvature permanently in the newly cast segment. The segment cast first would come back to its original shape after cooling to ambient temperature. This effect is particularly severe when the ratio of width to length of the segments is more than 6.
- The placing of the preassembled segment reinforcement within the formwork and the difficult access for inspection and location of spacers can lead to lack of cover in some locations.
- During the segment movement to storage or erection, damages can arise from improper handling of the segment, such as chipping or breaking of shear keys and local cracking if temporary lifting points and support points are not adequately designed or detailed.
- The 'glue joints' with epoxy resin is provided from durability considerations to ensure water tightness in the joints to avoid any ingress of water into internally post tensioned tendons. Normally, the preparation, application and temporary prestressing of epoxy glue to induce uniform pressure across the jointed surface should be completed with in an hour before the hardening of epoxy glue. The delay in the process or the non-uniform pressure across the depth of the segment would result in an undulated surface.

The segments should be repaired prior to their erection as long as the defects do not affect the contact faces between segments that are match cast. The contact faces should not be repaired prior to erection and prestressing of the segment since there is risk of damaging them further. Conventional concrete repairing techniques such as the use of micro concrete or grout mixes with low shrinkage, after cleaning the affected area, are common repairing strategies.

Additional precauations are called for to control the 'bow effect'. For the segments whose width to length ratio is more than 6, segment casting mock ups have to carried out with special concrete mix designs producing low heat of hydration, appropriate cooling and curing method of concrete in the regions of high ambient temperature and measurements recorded of the heat of hydration to predict the thermal gradients.

In many of the bridge failures refereed to above, it has been reported that the epoxy glue application was found to be inappropriate. The external prestressing with dry joints could be a solution to avoid epoxy glued wet joints.

Quality control during design and construction

In comparison to other conventional prestressed concrete bridges, for precast segmental bridges, the influence of construction method, construction sequence and construction accuracy are significant. Therefore, it is imperative that qualified engineer(s) with good knowledge, experience and demonstarted capability are constantly involved in the design scrutiny and Bridge construction engineers are stationed at the construction site to provide appropriate construction management.

The design and construction of precast segmental bridges require a tight integration between several interfaces as part of an industrialised process, and

requires specific measures to be taken into account in the quality control of the geometry, materials and erection and also specialised workmanship in different areas.

Detailed documents including method statements, fabrication and erection procedures and testing requirements need to be detailed in the contract documents to assist the relevant teams involved in the project to reduce the risks during construction.

The current organisation structure for managing the EPC contract consist of a design consultant to the contractor, proofchecking consultant to approve the design of the contractor's designer, safety consultant to approve the project highway safety and finally Authority Engineer (AE) representing Authority acting as a supervision consultant including final design approval and quality control at the site. The contractor engages the prestressing system supplier and Bridge Deck equipment supplier. Some times contractor has his own BDEs.

As the proof consultant and safety engineers are engaged and paid by the contractor, invariably choice is made on low cost criteria, not on the qualification and experience in precast segmental construction. The expectation from proofchecking and safety consultants is that the design has to be approved immediately after being submitted by the contractor's designer. There is a strong need to look in to the prequalification of proof checking and safety consultants.

The EPC contract specifies that the entire design with approvals and the 10 % of the work has to be completed within 180 days of the award of the work including geotechnical investigations, surveying, etc. In many cases, this is impractical and the haste leads to designs that are incorrect, quick approvals and bad quality of construction, which all are the causes of the mishaps. This criteria has to be reviewed going forward for safe construction and the bridge to perform as reuquired for its design life, albeit with regular maintenance.

The Bridge Deck equipment design including launching system is a very important part in precast segmental construction. There are instances where the design consultant and the supplier of BDE are the same. Even when inhouse design is done by a contractor, the BDE is also supplied by the contractor in some cases. There is a strong conflict of interest here and this practice of design consultant and BDE supplier to be the same agency should be discontinued from a safe construction point of view. Presently, there is no system of proofchecking the launching system or BDE and that needs to be introduced with immediate effect.

In the present Authority Engineer (AE) contract, there is no provision of structural engineer with necessary qualification, experience and demonstarted capability as a key personnel. This needs to be introduced with immediate effect.

Conclusions

The bridge failures of precast segmental construction during construction are continuing to occur and that is a matter of great concern to the engineering fraternity. The recent collapse in Dwarka, New Delhi is one too many and that too when the best of the designers and contractors were involved. As per the adage 'Those who ignore the history will be condemned to relive it', as such it is a time for serious introspection for the engineering fraternity.

After due analysis of the probable causes of failures, some recommendations are given below to prevent such occurences.

- Even for construction stage, SLS check for rare combination involving wind and thermal loads has to be carried out as per IRC:112. However, for span-by-span precast segmental construction for one stage prestressing, stresses in concrete should be limited to 0.36 fck(t).
- There are certain aspects which make the match casting of precast segments sensitive to certain defects. The segments should be repaired prior to their erection as long as the defects do not affect the contact faces between segments that are to be

match cast. These faces consequently should not be repaired prior to erection and prestressing of the segment to avoid the risk of causing further damage.

- Incase of segments with width to length ratio higher than 6, the mock ups for match casting of segments to arrive at optimum mix design of concrete should be made mandatory.
- For the time being wet joints should be prohibited and dry joints with external prestressing should be encouraged for span-by-span method of precast segmental construction.
- There is a strong need to look in to the prequalification criteria of the proof checking and safety consultants.
- The criteria in EPC contract to complete design with approvals and the 10 % of the work within 180 days of the award of the work including geotechnical investigations, surveying, etc. needs to be reviewed and modified.
- The designer for the EPC contractor and supplier of BDE or launching system should not be same.
- The design of launching system or BDE must also be proof checked and also load tested.
- A qualified, experienced structural engineer with demonstrated capability has to be introduced as key personnel in Authority Engineer (AE) contract.

Acknowledgement

Author wishes to record the grave concern of CEAI at the unabated bridge failures in the recent past and their drive to help the authorities to find a solution to the same.

The New Education Policy & The Role of Consultancy

Prof. Mainak Ghosal
Governing Council Member, Indian Association of Structural Engineers
Jt. Secretary, Coal Ash Institute of India
Secretary, Consulting Engineers Association of India (E & NE Region)
Faculty in Engineering Colleges under Maulana Abul Kalam Azad University of Technology (MAKAUT), West Bengal

Prof. Arun Kumar Chakraborty
Associate Professor
Department of Civil Engineering
Indian Institute of Engineering Science & Technology (IIEST), Shibpur

Introduction

The National Education Policy-2020 has come at the most challenging times of the century that is when we are faced with the pandemic situation which we have not witnessed in the last 100 years. India has seen changes in its education policy first in 1968 and then in 1986 with a little amendment in 1992. So, after 1986, at least after 34 years our education policy has been changed. Though Subramanian started the consultation process for the New Education Policy, but based on the Committee report, in June 2017, the draft NEP was submitted in 2019 by a panel led by former Indian Space Research Organisation (ISRO) Chief Krishnaswamy Kasturirangan.

The National Education Policy 2019 envisions an India-centred education system that contributes directly to transforming our nation sustainably into an equitable and vibrant knowledge society, by providing high quality education to all.

Brief Discussion

The NEP 2020 has seen the light of the day after passing various consultation and deliberation processes for more than 5 years. The NEP 2020 documents had several stages of consultative procedures like consultation with organizations like NCERTs, SCERTs, Boards of Assessment (BoAs), the proposed new National Assessment Centre, expert bodies such as National Institutes of DEPwD, MHRD, Central Advisory Board of Education (CABE), State Governments, etc. Some salient features of NEP 2020 are as follows

i) 10+2 system has been dropped and replaced by 5+3+3+4. While the 10+2 system has start at the age of 6 the 5+3+3+4 system has start at the age of 3 years(pre-primary) only.

ii) 5+3+3+4 system has been divided into 4 stages namely – Foundational Stage, Preparatory Stage, Middle School Stage and High School Stage.

iii. Foundational Stage is of 5 years duration which includes 3 years of pre-primary and 1 year each of Grade 1 & Grade 2. The age group is 3 – 8 years. No examination is to be taken at this stage and the pre-primary level is only of gaming and no school dress is mandatory.

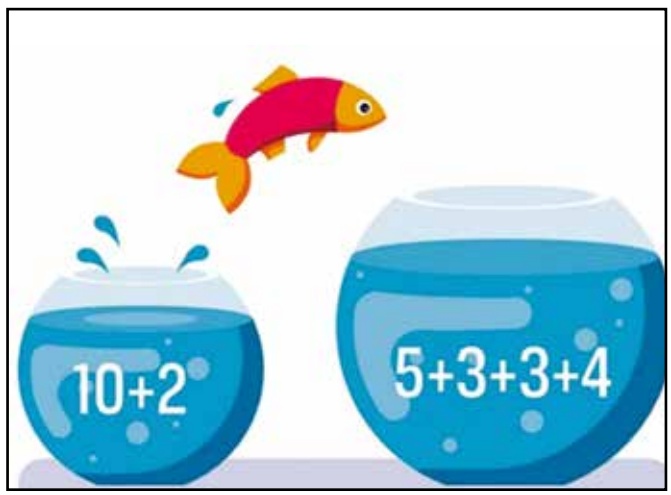
iv. Preparatory Stage is of 3 years duration and includes Class 3, Class 4 and Class 5 of 1year each. The age group is 8-11 years. Annual Examinations start from this stage and importance given to mother tongue/National Language at this stage (up to Class 5). If any student wants to pursue with English as a National Language instead of his mother tongue the student can do so.

v. Middle School Stage is of 3 years duration and includes Class 6, Class 7 and Class 8 of 1year each. The age group is 11-14 years. Computer coding will be taught to students from Class 6 onwards and as a result it is expected that they will learn to develop software and application from their early age. Vocational courses are introduced from here like carpentry, cooking, sewing, poultry, etc. and if any student wants to take practical experience in their fields of interest like painting, computer coding, etc., they can take training (Internship or Practical Experience Training) from experts during their schooling periods. Subjects of Maths, Science, Arts, etc. are also introduced at this stage with a compulsory Indian Language and continuance of Annual Exams.

vi. High School Stage or Secondary Stage is of 4 years duration and includes Class 9, Class 10, Class 11 and Class 12 of 1year each. The age group is 14 - 18years and it is divided into two phases. Semester system of Examination introduced – Each year is divided into 2 semesters and students will have to appear in 2 exams per year with a compulsory foreign language. 360 Degree Assessment Report Card introduced – In the Final Report Card not only the quantitative assessment but also the qualitative assessment of the students will be recorded. A student can opt for any subjects of any stream of his/her interest. For example, a student can take a combination of accounts, history and physics which was not possible in the old system.

vii. 4-year Bachelor Degree Course (Multi Entry -Multi Exit) and No Stream System– On the exit of doing 1 year course, student will get "Course Certificate". On the exit of doing 2 years course, student will get "Diploma Certificate". On the exit of doing 3 years course, student will get "Bachelor Degree Certificate". On the completion of full 4 years course, student will get a "Bachelor Degree & Research Certificate". Re-entry which was not possible in the previous system is possible now and after completing any number of years (say Certificate or Diploma) one can start from the next course (say Diploma or Bachelors) through Credit Transfer system after taking re-entry. Credit Transfer & Academic Bank of Credits – Credit Transfer is the acceptance of prior learning represented in course units or credits applied and articulated (denoted) on a student's academic transcript.

viii. Post-Graduation is of 1- or 2-years duration depending upon the Graduation Course one has completed. If one has 3 years Bachelors then he has to pursue 2 years of Masters but if the student had completed 4 years with research in the last and 4th year, then 1 year of Post-Graduation is allotted for the student as the student has done research in the last year of Graduation, thus giving an impetus to research.



ix. Teachers will have a common central level pooling where they will be given 4 years training on how to teach the students and a provision of students' feedback on teachers will be introduced.

Conclusions

The positive points of NEP 2020 are as follows.

i) Though about 3% of India's GDP goes into the education sector the New Education Policy proposes to use 6% of the GDP through consultation with various Ministries.

ii) Ceiling on arbitrary school fees introduced just like MRPs (Maximum Retail Price) of consumer products so that no school can charge exorbitant fees subject to the governmental approvals in consultation with the State Governments and Home Ministry.

iii) Practical knowledge which is very important is introduced through Vocational training courses which will go a long was in the development of the consultancy in the basic levels.

iv) Qualitative assessment has options of self-assessment, friends' assessment and lastly teachers' assessment, which has highlighted the importance of human and public relations-a subject very relevant for our consultancy fraternity.

v) Though liberalisation-privatisation-globalisation was introduced by Dr. Manmohan Singh's government way back in 1990s but the same was prevented in the education sector by the opposition due to the security money issue, the NEP 2020 has approved top level Foreign Universities to open their departments in India. Consultancy which is extremely relevant in the developed countries should help Indian counterparts in strengthening their consultancy framework further.

vi) Multidisciplinary approach to teachings and research has been introduced which would go a long way in addressing the diverse perspectives consultants need to have a wide knowledge-base.

vii) In concurrent with the adage, 'catch them young', Practical experience training or Internship is introduced as early in Middle School Stage. That is most essential so that not only engineers but also all other professionals undergo compulsory practical training. Only then can they be called a professional in their line.

Emphasis on critical thinking has been introduced and is most welcome since it is the bread earner of the consultancy fraternity. In the foreign language category, Chinese language has been omitted from the list. Keeping in mind the developments made by the Chinese consultants and contractors within China and also in the global arena, it would be advisable to include it.

An Anniversary with a Relief

Amitabha Ghoshal
Immediate Past President
CEAI

March 17, 2020, a date etched in memory, as we entered voluntary lockdown, becoming Level 2 contact of COVID 19, having shared the same house-help as was working for the first registered COVID case in Bengal, at Upohar!

One year is over today of the troubled times, when we kept indoor for months together, mortally scared of breathing in the Corona virus, the moment we ventured outdoors to pick up a newspaper or the fruits and sweets we were missing! We would sanitise our palms the thirty fourth time by evenings and pull the fancy looking mask on our nose despite difficulty in breathing.

Human beings are slaves of habit, and we get to pickup as habit any act we do a few times over. So, we learnt to accept the New Normal, where we got used to wake up late and then have a leisurely breakfast, immediately researching on how to make the lunch menu attractive, with the few ingredients available, after scrounging the stores list for items available on mail order. The statistics of affected patients across the world and the percentage of mortality in developed countries became the most important take away from the multiple news channels that we poured over again and again! Repeated extensions of lockdown and beating of steel 'thala' to express 'solidarity' over, life started to return to sanity. Work from Home (WFH - new coinage for us) became the way of life; Webinars replaced Seminars and " ZOOM " became the household word. Initially diffident, we started to adapt.

Personally for me, having lost the advantage of using a computer at the office and the constant support of my IT savvy colleagues, I had to seriously pursue home training on use of the laptop installed in the living room of Upohar apartment, got hold of an ergonomic chair to be able to sit for long hours gazing at the monitor screen and started communicating on daily basis with CEAI office where I had the responsibility of completing my term as President and keep CEAI alive as an organisation for supporting the engineering fraternity. The task of looking after the bridges and flyovers in Urban area around Kolkata had to be resumed, and my earlier commitments to other engineering bodies fulfilled.

Slogging through the various obstacles, that looked insurmountable in the beginning, we have crossed one full year- and today I look back happily that so many of us have been able to overcome the biggest challenge thrown to us in 2020- that of emerging alive,- as defined by Industrialist Ratan Tata!

Well, as we take stock, one has to examine whether COVID was a disaster or a blessing!!

At CEAI our target was to have two seminars a year and if we could do three, we used to pat our back!

After the lockdown was slowly withdrawn from the month of May'20, CEAI could launch 12 webinars with speakers from India and across the world, and each drew large interested audience. In place of having bimonthly GC meetings, we held Core Committee meetings every alternate week and the effectivity was evident in the results. The Diamond Jubilee celebrations, once considered beyond us, got completed with a great concluding session that will be cherished for a long time by the attendees! Elections got completed in time and a new energetic GC committee took over from January and business is on 'as usual'.

In my personal life, despite all the frustrating thoughts through the year, on taking stock I find:-

- I could complete writing one book for CRC PRESS (Taylor n Francis) a maiden venture! Ready for release in May.
- Could contribute four serious papers in peer reviewed journal of ICE UK.
- Wrote four papers in journals of engineering bodies like CEAI / IAStructE, etc
- Delivered six lectures in all India forums like IEI / IAStructE/ ICE/ IITG/ IIEST apart from CEAI
- Participated in one TV live show for one hour duration on Use of IT in Engineering
- Moderated and participated as panellist in a number of webinars
- Visited one bridge site after accidental hit by a loaded truck
- Attended number of meetings of Bridge Committee, including one at Nabanna
- Contributed to activities at Upohar complex as member of Infrastructure team
- Finished task as Committee Member of Annual Awards review for IAStructE
- I know these are not enough for a whole year but what is worrying me more is that the forthcoming reduction of tasks as I am moving out from positions of prime responsibility from CEAI/ STUP/and various TAG of Central government projects!
- I shall have to reorganise time by getting into swimming/ club functions and some technical events to keep myself busy- hoping "something will turn up" in line with Wilkins Micawber in Charles Dickens's David Copperfield!
- The Shadow of COVID 19 should now move out making us free of that Unknown FEAR!

CEAI Diamond Jubilee Celebrations

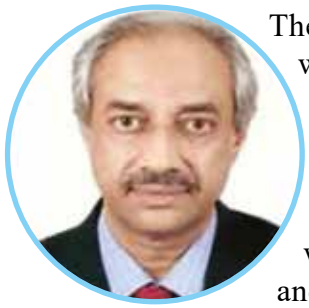
The Consulting Engineers Association of India (CEAI) celebrated its 60 years of existence by organizing the Diamond Jubilee concluding event on 26th February 2021.

The celebrations had begun as seminars which got transformed into webinars on account of the Covid-19 pandemic. They covered various facets of interest and use to the fraternity.

The theme to mark the culmination of the Diamond Jubilee Celebrations of CEAI was ***"Contribution of Consultants – Fast Tracking Atmanirbhar".***

Inaugural Session

The Chief Guest for the occasion was Dr. Sukhbir Singh Sandhu, Chairman, NHAI & Ex officio Secretary, Government of India. The Guest of Honour was Mr. Akhilesh Mishra, IFS, Additional Secretary, Ministry of External Affairs, Government of India.



The event was started off with Dr. Harshavardhan Subbarao, Member Governing Council, CEAI and Chairman CEAI-Western Region Centre welcoming the dignitaries and the participants. Taking a leaf from Wikipedia, Dr. Subbarao said that ***Atmanirbhar Bharat***, implied 'self-reliant India' and was a term used by the Prime Minister of India Mr. Narendra Modi in relation to economic development in the country. He added that the term is used in relation to making India "a bigger and more important part of the global economy", pursuing policies that are efficient, competitive and resilient, and being self-sustaining and self-generating. ***Atmanirbhar Bharat*** does not mean "self-containment", "isolating away from the world" or being "protectionist".

He further added that the first popular mention of the term came in the form of the '*Atmanirbhar Bharat Abhiyan*' or 'Self-Reliant India Mission' during the announcement of India's COVID–19 pandemic related economic package on 12th May 2020. Dr. Subbarao recalled that COVID changed the world order and affected us all. After the first package, two more packages were announced on 12th October and 12th November 2020, taking the total stimulus to Rs. 30 lakh crores (USD 4 billion). The phrase had been used by the government in relation to the 2021 Union Budget of India. Dr. Subbarao then invited Dr. Ajay Pradhan, President CEAI to take over the proceedings.

The President CEAI, Dr. Ajay Pradhan also welcomed the dignitaries and the participants from across the globe who had joined for the celebrations.

"I welcome Dr. Sukhbir Singh Sandhu, Chairman of National Highways Authority of India (NHAI) and am grateful to him for kindly agreeing to grace the occasion in spite of a very busy schedule. Thank you, sir. I also extend a warm welcome to Shri Akhilesh Mishra ji, Additional Secretary in the Ministry of External Affairs, Government of India. I also welcome my dear and respected colleagues Shri KK Kapilaji, Chairman & MD of ICT Ltd., Shri Girish Mishraji, Secretary CEAI and Dr. Harshvardhan Subbarao, Chairman of CEAI Western Region Centre. He is also the VP of International Association of Bridge & Structural Engineering. Dr Subbarao would be the Moderator for the Technical Session.

The Consulting Engineers Association of India (CEAI) is the apex body of Consulting Engineers in India. It represents the Indian Engineering Consultancy professional at the International Federation of Consulting Engineers (FIDIC). CEAI is the voice of consultants and consulting engineering companies of India.

CEAI came in to being by virtue of merger of the two erstwhile professional bodies of consulting engineers, the Association of Consulting Engineers (ACE) and the National Association of Consulting Engineers (NACE) in 1996. CEAI thus has, over 60 years of accumulated knowledge and experience behind it.

CEAI's aims and objectives are to enhance the status of consulting engineering profession in India and also advance their business interests. It is equally concerned with quality development, productivity enhancement and promotion of ethical practices. CEAI advocates fair procurement, balanced contractual procedures, and the removal of barriers of doing business. We in CEAI have been pursuing these over all these decades during which the Consulting Engineering fraternity has also come of age and today pervades all disciplines and sectors of engineering. Consulting Engineers from India are also providing their expertise to many developing countries.

CEAI started celebrating their Diamond Jubilee with three seminars on very topical themes in the first quarter of 2020.

January 2020 started with the ***"Workshop on Global Vision 2030 – Engineering & Construction Services"*** in New Delhi. February 2020 Conference on ***"Water Infrastructure for Urban Areas & Industries"*** at Bhubaneswar in partnership with the Kalinga Institute of Industrial Technology (KIIT), Bhubaneswar. March 2020 had CEAI's thought provoking seminar on ***"Goodbye L1 - A Route to Sustainable Engineering Development"*** with the support of NITI Aayog, NHAI, CVC, BRO, MES, CPWD, IEEMA and ECI.

Later in the year against the backdrop of the Covid19 pandemic, CEAI organised a series of webinars aligning with the ***Atmanirbhar Bharat Abhiyaan*** or **Self-reliant India** vision of a new India envisaged by the Hon'ble Prime Minister Shri Narendra Modi. The clarion call for that was given on 12th May 2020, by the PM when he announced the Special Economic and comprehensive package of INR 20 lakh crores or USD 300 Billion - equivalent to 10% of India's GDP to fight the COVID-19 pandemic in India. He announced the five pillars of ***Atmanirbhar Bharat*** – **Economy, Infrastructure, System, Vibrant Demography** and **Demand**.

The 5 Webinars conducted during 2020 were:

1. **SAFETY IN ENGINEERING**, 29th September
2. **EMERGING TECHNOLOGIES IN INFRASTRUCTURE SECTOR – AI/ML, IoT, AR/VR**, 16th October
3. **DAM SAFETY & INSTRUMENTATION**, 6th November

4. **ASSET MANAGEMENT - NEED OF THE HOUR**, 19th November
5. **DIGITALISATION IN ENGINEERING**, 18th December

The pandemic pushed people to adopt new ways of interaction and working from home, at work, in public, in fact in all spheres of activity. People learned that greater collaboration and synergy was essential between experts from different domains in the public and private sectors.

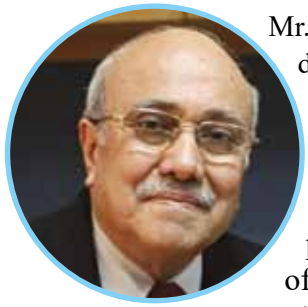
Consulting Engineers' focus on finding solutions to various problems faced by mankind - from climate change to critical infrastructure including health starting from primary level, mobility, energy, community development, and helping in improving service delivery at the grassroots level. CEAI offers a platform where Members seeking to expand their sphere of knowledge and operations can interact.

CEAI represents the interest of Consulting Engineers to make the decision-makers and all other relevant stakeholders aware not only of the necessity of sustainable development in transforming of the society but, at the same time, of the stellar role that the Consulting Engineers play to fulfil the *Atmanirbhar Bharat* vision.

To achieve the 5 trillion-dollar economy by 2025, Consulting Engineers are working alongside with the government towards reimagining the agriculture with a focus on diversification of crops, water conservation and security, improving urban infrastructure, digital connectivity, energy mix, manufacturing, etc. We, Consulting Engineers are supporting the creation of physical infrastructure through the National Infrastructure pipeline and PPP projects.

Last but not the least we must keep in mind that Human Resource Development plays a major role by virtue of first providing proper education and thereafter skilling, upskilling and mapping requirement of resources globally to enhance export of Engineering Services." Dr. Pradhan then thanked all for their kind attention.

Dr. Subbarao thereafter invited Mr. K K Kapila Chairman, Diamond Jubilee Celebrations Committee and a Past President of CEAI, to give his Keynote Address.



Mr. K K Kapila addressed the dignitaries and participants and made his Keynote address.

"The initiation into the principles and practices of Engineering are as old as man's quest to make a shelter against the elements of Nature.

The term Engineer *per se* has been in use for a little less than 1000 years. As the knowledge of Engineering grew and split into various disciplines a need was felt to not only theorise but also prepare schemes to make the concepts materialise. Initially, it was the government that employed and deployed engineers since all the development works were undertaken by the government. Later, when private initiatives started, opportunities emerged for private individuals to perform the role of Consulting Engineers.

The existing individual practices and engagements had physical limits hence it was considered necessary that it was time to consolidate efforts and also bring in greater semblance in the practices. Thus in 1960, the Association of Consulting Engineers (India), (ACE(I)) came into being and it focused on strengthening the profession in India as well as overseeing the larger interest of the Fraternity. It comprised of small and medium sized Independent Consulting Engineers, who were neither aligned to any Public Sector organizations nor to any industrial or construction organisation.

Later on, the authorities recognised the important role that the consultancy firms had to play in the development of the country as a whole. Hence, an expert panel was set up by the Planning

Commission, which suggested in early 1970s, that an all-India body of consulting engineers should be set up. In early 1976, the National Association of Consulting Engineers (NACE) was formed with 15 leading consulting engineering firms. NACE joined hands with CII, FIEO and the Exim Bank and mounted consultancy missions abroad to present Indian capabilities and in the process earn valuable foreign exchange for the country.

In 1995, NACE and ACE decided to join hands to strengthen the consultancy movement in the country and thus in 1996, the Consulting Engineers Association of India (CEAI) was created.

In the last 60 years, the Consulting Engineering practice in India has progressed from just buildings and roads to encompass highways, bridges, tunnels, rail and metro rail, airports, ports & harbours, thermal & hydro power plants, nuclear facilities, oil & gas complexes, chemical & industrial plants, mining, minerals and ferrous & non-ferrous plants, space, etc. Besides maturity in capability and ability to deliver the best, it has grown in leadership to take on greater ownership of widening their venture into newer fields as and when the need arose. The bilateral and multi-lateral development banks (MDBs), national and international governments, etc., are directly engaging Indian Consultants, in competition with consultants from developed countries.

It is widely acknowledged that Engineers are the keystone for a project and their contribution in making the country *Atmanirbhar* is essential.

With the ever-expanding scope of work of Consulting Engineers there is a continuous need to keep the fraternity abreast of the developments in the technical as well as the non-technical areas. CEAI as per its aims and objectives is assisting the consulting fraternity to bridge the knowledge gaps and also assisting their foray into other developing countries. Exim Bank and SEPC are a great help in this endeavour. Some countries - the so-called developed ones are facing acute shortage of engineering work force. There again CEAI is interacting with associations of other countries for the mutual benefit of both.

CEAI has been engaged in providing professional assistance to its Members as well as others by conducting training and professional up-gradation courses, workshops, conferences, seminars, webinars, etc. and provides technical training as per the need felt from time to time. As mentioned by the President CEAI, webinars have been held to help Members and others to address the concerns created by the lockdown and 'work from home' on account of the pandemic. Individual assistance was also available to whoever desired for digitalising their consulting engineering operations.

CEAI being the only Member Association of FIDIC representing the Consulting Engineering Fraternity in India, conducts courses on FIDIC forms of Contract through accredited trainers. CEAI awards Certificates to those who attend the course *in toto*. Besides FIDIC forms of Contracts, CEAI also conducts workshops and seminars on project and contractual issues such as Risks & Risk Mitigation, Delay Analysis, Claim Management, Dispute Resolution, Arbitration, etc.

CEAI has been active at the FIDIC and ASPAC platforms at high levels with our Members becoming Members of the Board, the highest body of FIDIC, Chairing and also being members in various Committees. Our Members have been assisting in preparing documents on Engagement of Consultants and Contractors, as well as providing valuable contributions to various publications of FIDIC.

On the Contract front, CEAI has been advocating the need for fair and equitable contracts. CEAI is also pursuing against the practice of awarding contracts/ works to the lowest bidder. FIDIC is promoting the concept of award of works at lowest workable rates in their publication on the subject.

CEAI is also working on changing the pattern of award of works for Consultants as well as for purchase of goods. These are in advanced stage of consultation in

the Government and a positive outcome is expected before the end of the year.

We at CEAI believe that the growth and development of home grown companies will be a direct measure of success of the *Atmanirbhar* Campaign. CEAI commends the Government's initiative to set a threshold of Rs. 250 crores of its works for only Indian companies, excluding the earnings from the foreign works to qualify under the MSME category. This is indeed a positive move.

However, an important question comes up in this context – what is the definition of an Indian Company? Is it any Company with an office set up in India? The ideology of *Atmanirbharata* calls for a clear mandate on what constitutes an Indian Company, so that the revenues generated by the entities remain in the country, thereby contributing to the economic growth, besides their own growth. As at present any company registered in India and paying taxes in India, even if it is a 100% owned subsidiary of a foreign company is considered as an Indian company. We strongly recommend that a company with a minimum of 60% holding stake held by an Indian national in the venture should only qualify the definition of an Indian company. CEAI has already represented this to the concerned in the Government and await necessary policy directive.

To boost growth of infrastructure in the country, a massive outlay has been planned. This inescapably warrants PPP mode for as many projects as possible. To facilitate this investment, the Government needs to bring in two corrections on an ad emergent basis:

1. It must go for an amendment in the Constitution to clearly bring out that the Government of India will never resort to retrospective taxation;

2. The PPP Agreement must explicitly bring out that in the event the Government restrains the Concessionaire from collecting toll in Highway Projects and refuses to buy Power from the Power Producer the quantity at the agreed rate as stipulated, the Concessionaire will be compensated in a graded manner, say, if Toll collection is stopped in the 2nd Year and there is a 20 years Contract, he would be paid an X amount of compensation, if it is stopped in the 3rd year then Y amount of compensation so on and so forth without any ifs and buts. Similarly, in the Power Sector the compensation should also be in a graded manner.

Such corrective measures are imperative to give confidence to both the foreign investor and the domestic private sector investors.

The profession of engineering is very demanding and the role of the consulting engineers is extremely critical. CEAI has been reminding its members and the fraternity to be ethical in all their works and dealings. It has also been propagating the various aspects of Safety and the Environment in all sectors.

Further, in order to improve interaction and collaboration, bring in accountability and responsibility plus ensure continued Professional Development in the profession of Engineering, CEAI has been advocating and pursuing a legislation for it. It was primarily for the cause above, that the Engineering Council of India (ECI) was formed in 2002. CEAI is a founding Member of ECI. The matter relating to the legislation is long pending with the Ministry of Human Resource Development, and CEAI would like to urge the decision makers to push The Engineers Bill through the Parliament on post haste basis.

As a part of its efforts to improve the quality of life, CEAI has decided to create a CEAI Foundation with the slogan ***"Engineers Go Social"*** to enable the Consulting Engineers to share in the work of improving the built environment.

Let us resolve that in the spirit of common good, we will continue to provide unflinching contribution to the betterment of life by making our country truly *Atmanirbhar* and a leading resource for Consulting Engineers."

Dr. Harshavardhan Subbarao, then projected and read out the Message from Mr. Narendra Modi, Prime Minister of India.

सत्यमेव जयते

प्रधान मंत्री
Prime Minister

MESSAGE

I am pleased to learn about the Diamond Jubilee celebrations of Consulting Engineers Association of India (CEAI) in the virtual format. The topic – "Contribution of Consultants in fast tracking Aatmanirbhar Bharat" is relevant.

The celebrations are a proud occasion for the community of consulting engineers. India is proud of our hardworking engineers. The dedication and dexterity with which they are contributing towards nation building is praiseworthy.

Technology and innovation have been powering every sphere of activity. Our Government has been taking numerous steps to create a vibrant ecosystem that nurtures the ideas and skills of our young technical workforce.

To add strength to the nation's collective resolve of building a strong and prosperous nation, there is a greater need for our engineers and experts to find innovative and technology-enabled durable solutions which can improve and save the lives of millions and can save the country's resources.

In the post COVID world, India has emerged as a major global player in the field of Science, Technology, Research and Innovation. There is, hence, an increased need for even bigger contribution from Tech Start Ups and innovators to come up with such indigenous technologies that upscale infrastructure, enhance 'ease of living', minimize damage to the environment and fulfil the changing demands and aspirations of New India.

As India rapidly strides on the path of development, it is an opportunity, as also a responsibility for our consulting engineers to integrate their efforts with the clarion call of an Aatmanirbhar Bharat.

I am sure that the Diamond Jubilee celebrations will encourage the participants to take inspiration from the organisation's journey of six decades and continue working with renewed zeal and dedication for larger good.

Best wishes for all success of the celebrations.

(Narendra Modi)

New Delhi
फाल्गुन 07, शक संवत् 1942
26th February, 2021

A video message from Mr. Nitin Gadkari, Hon'ble Minister Ministry of Road Transport & Highways and MSME was projected for the benefit of all. Mr. Gadkari conveyed that

"It is a pleasure to know that the Consulting Engineers Association of India is celebrating its Diamond Jubilee on 26th February this year. With lakhs of Engineers stepping out of the portals of Engineering Colleges and Institutions every year the numbers in the profession is on the rise to contribute their mite to the vision of *Atmanirbhar Bharat*.

Indian engineers have gained many credits by providing solutions to complex issues. In the Highways sector they are creating records in the design, construction and deployment of equipment of roads, bridges and tunnels which are welcome developments. They are keen and quick to adapt to changes in requirements such as digitalisation which has been necessitated by the changing environment. In fact, it has been a blessing in disguise since it propelled the country to improved and faster completion of works. The younger engineers joining the ranks should take these learning as their stepping stones.

I would request all of you that this is the time for the country to accept new technology, innovation and standards. We need to reduce the cost without compromising with the quality by using different material. Presently the Steel and the Cement industry are exploiting the situation and taking advantage and making cartels. We need to find out options and alternatives such as using carbon steel or definitely using different types of soil stabilization, as finding alternatives for cement and steel are very important.

I wish the Consulting Engineers Association of India and all its Members all the best in their future endeavours and at the same time I am giving my best wishes to them to contribute for future reconstruction of our country. I am proud of you and give my respect for your dedication and commitment."

Dr. Subbarao then invited the Guest of Honour, Mr. Akhilesh Mishra to share his thoughts.

Mr. Mishra applauded the leadership of CEAI for their Diamond Jubilee celebration's theme of *Atmanirbhar Bharat*. He termed it is a most heartening message to the country.

Adding that he was an engineering student himself, he was aware of and proud of the pioneering role of CEAI and Consulting Engineers of India as thought-leaders in Nation building. He quoted a shloka-

यधदाचरति श्रेष्ठः तत्तद्देवेतरो जनः।
स यत्प्रमाणं कुरूते लोकस्तदनुवर्तते।।

What the thought-leaders like you do creates a path
for others to follow
what standards you set others observe that

He expressed his confidence that other professional bodies of India would be inspired by CEAI's example to focus on their respective role in fast-tracking the *Atmanirbhar Bharat* mission.

Stating that Hon'ble PM had called for Make in India earlier and had enacted several reforms and taken a number of far-reaching reforms to promote manufacturing in India, promote local traditional products and grass-root level entrepreneurship. It was very important to understand that *Atmanirbhar Bharat* Mission was not merely an extension of the ongoing processes of reforms and economic transformation in terms of business as usual. The context of *Atmanirbhar Bharat* was the Corona pandemic wake up call to the Nation that a comprehensive strategy was needed and be implemented on a war footing.

He went on to say that as all were aware, the Corona pandemic had been an unprecedented challenge for the entire world and among other things, it had an economic impact and forced a very sharp behavioural change. It was

i. Truly a global crisis which impacted all- developed, undeveloped, poor and elite.
ii. Not merely a health crisis – but major disprution in normalcy in every situation and exchange – not just among countries, but also domestically – brought in change in lifetyle and behaviour.
iii. Impacted not only economic – but social, cultural, political, paradigm shift in the notion of National security as well.

The Corona pandemic has forced a sharp behavioural change – mask, work from home, e-business, webinar, virtual meetings, even summits, changed the social interactions.

The pandemic had also drastically altered the notion of National strength, power and National security. It bacame painfully obvious that National security depends not only on the defence of external frontiers and hard military power, but also several non-military factors such as strength of the nation's healthcare system, reliability and security of the digital networks and resilience of transportation and supply-chains, etc.

He further stressed that *Atmanirbhar Bharat* was Hon'ble PM Modi's way of converting challenges into opportunities and prepare the people as a country against future pandemics and disasters.

He remarked that though the country has been fortunate to have the decisive foresighted leadership of Mr. Modi and that the current pandemic has been addressed quite well, much better than most others globally, there was no doubt that the existing institutional and systemic capacity to deal with such disastrous manmade or natural contingencies need drastic revamping. He recalled the lines:

साहिल के तमाशाई हर डूबने वाले पर।
अफसोस तो करते इमदाद नही करते।।

Moving on he mentioned that given the size, scale and complexity of India, no other country in the world could rescue it from any real crisis – others may send sympathy, condolence messages but it is the people of India who would have to fend for themselves. He then quoted another shloka-

अत्मैव अत्मनो बन्धुः अत्मैव रिपुरात्मनः।।

Mr. Mishra suggested that to be better prepared for the future a three-pronged strategy was necessary; not at the government's level but at the people's level.

- First of all, at the individual level, no matter what work one is doing, one has to very minutely review, re-assess and re-calibrate various processes to minimise the vulnerabilities due to the impact of any potential disruption caused by natural or economic forces.

- Secondly, restructure the supply-chains, diversify, create redundancies which must be addressed simultaneously.

- Thirdly, in any crisis situation, just as engineers learn to optimise - they make do with whatever is available at hand and not wait for the best solution that is feasible; hence as a learning from that the people must pre-emptively localise, maximise use of local resources and create locally sustainable business models.

Mr. Mishra clarified that *Atmanirbhar* did not mean existence in complete isolation or disconnected with the world, rather it meant being resilient and robust to be able to withstand future shocks and be a reliable partner, provider and first responder so as to be in a position to help others. That was also India's civilisational ethos. He added that even in the current crisis because India had revamped its medical facilities and had also converted many facilities into manufacturing units to cope with the current crisis, India supplied medicines and corona assistance (PPEs, testing kits, ventilators, etc.) to over 150 countries; and made vaccines available to other countries even

while implementing the mammoth task of its domestic vaccination drive to vaccinate 300 million people in six months. Therefore, the efforts to make India resilient and robust in terms of its own internal capacities was going to be the biggest strength in engaging the rest of the world.

He further added that the ethos, the spirit of PM Modi's vision was very much 'Local for Global'. That was why everyone has a special role - that the local and affordable products must also adhere to the global standards of quality and finishing.

Mr. Mishra then spelt out as to what CEAI could do. Mentioning that engineers are working at the grass root level in a cross section of nation building activities Mr. Mishra urged them to:

1. Review, revive local traditions, help re-design, restructure business models of those who can't.
2. Participate in DPA Projects/ tenders. He clarified that the Government of India's Development Assistance Programmes for other countries provides about $31.6 billion Line of Credit, around $8bn for Grant Funded Projects and about 14,000 Scholarships for short term Technical Training programme for foreign country participants in a whole range of developmental issues. He welcomed greater participation from the business community A separate meeting could be held with CEAI to work out a strategy whereby opportunities created by DPA in Government Funded Projects are available more widely and there is wider participation from private sector community
3. Engineers are engaged in so many sectors and have a real feel for what is working and what is not working at the Central level, at the Provincial level at the Grass root level, engineers could really help MEA by sharing innovative solutions for development that is seen in India at any level. If there is something that is happening that is fascinating which is working in India, there is no reason why that cannot be incorporated in our basket of developmental cooperation projects and shared with other like-minded developing countries.

He added that it was not enough for the PM and the Government to believe in *Atmanirbhar Bharat* – all of us have a role – those who produce they have a responsibility to maximise local content; those who consume – prioritise maximum use of local produce; all of us can be part of promotion and branding of unique products of our locality and native place.

Mr. Mishra closed by exhorting everyone to join the mission for our country's sake, for India's glory and the PM's dream. He ended by reciting a couplet.

कामयाबी उनको मिलती है जिनके सपनों में जान होति है।
पंखो से कुछ नही होता सपनो से उडान होती है।।

Dr. Subbarao thanked Mr. Akhilesh Mishra for his rousing call and assured that CEAI would not be lacking in coming up to the mark.

Dr. Sandhu began his address by stating that it was heartening to know what CEAI had contributed towards Nation building in the last 60 years and added that the topic selected was very pertinent – *Atmanirbhar Bharat*, was most relevant to CEAI because India was moving more and more to consultancy based services even in the Government Departments and if the country, the Nation, the government have to become *Atmanirbhar Bharat* the role of consultancy was going to increase in the future, there was no other alternative. He went on to say that NHAI was one of the most outsourced organisation in the country. It was a new model when it was created, after being debated - with most of the services being outsourced. He was happy to share that the model had succeeded to a great extent.

He then shared his experience in working with the different consultants working with NHAI. India had done a very good job as far as Infrastructure creation was concerned, where consultants had played a

great role. There are very good roads, very good infrastructure projects and many other projects where consultants have played a very big role and which made India proud. For NHAI also as per their model it's team work between the NHAI, the contractor concessionaire and the consultants. Even if one of the three pillars was weak, the project execution would not be good. On the point of being a little blunt and practical, he said that the experience of NHAI had been a mixed one. As mentioned earlier there were many projects. which the whole Nation, after seeing them, would be proud that they could be with Indian people but there were certain where the execution was not good.

Dr. Sandhu informed that there is a monthly *Pragati* review, which the Prime Minister takes and in that there are many Projects which have been languishing for more than a decade where the original time period for execution and completion was two years or three years or at times four years. There was need to introspect as to what went wrong because the Nation pays a huge price for the delayed projects. He clarified that although the major fault lay with the government organisations but the role of the consultants was also very important for timely completion of projects.

He drew attention that for *Atmanirbhar Bharat,* the execution should be world class, of International standards. Hence it was necessary to first look into ourselves as to why, if there are deficiencies, why they are there and how to overcome them; only then we could become world class and call ourselves *Atmanirbhar,* otherwise, whenever we go abroad, we would keep noticing the difference between international standard of execution of projects and what we see in India - a lot of introspection was called for and was very essential for becoming *Atmanirbhar.*

Dr. Sandhu then mentioned that in the recent past because of some bad performance some very harsh steps had to be taken against some consultants, which was never the intention but there was no option. He remarked that it was a painful experience. He called upon the Association to have some internal mechanism to improve the quality to take care of those issues which are leading to bad quality. As an example, he said that in certain projects the quotes received are so low that if the salary of the people who were supposed to be employed was calculated, the quote did not even justify the salary. Therefore, all kind of information keeps coming regarding who pays the salary of those people and how the quality would be ensured.

He suggested that the Association develops some inhouse mechanism to take care of all these issues because if some Members are doing an excellent job the whole Association gets part of the credit and if some of the Members are not doing a good job or are slow or below standard, then the whole Association gets part of the blame. He stated that since CEAI is a part of the country so the whole country shares part of the credit or otherwise. Saying that it was therefore necessary that collectively NHAI and CEAI reflect if there was any role to be played by NHAI, Dr. Sandhu added that NHAI was more than willing to do it but to become *Atmanirbhar Bharat* the most important issue of quality needs to be addressed.

Another thing which he shared as to what had been developed to improve quality. Some of the consultants had done a great job, very high quality job and NHAI wants to reward them so a Vendor Performance Evaluation system has been developed, where the consultants, the companies who are doing excellent work, extraordinary work, world class job would be given credit in terms of award of more projects wherever possible but the facility would not be available to everyone, one would have to qualify by scoring high on quality. By this step NHAI would be leading everyone nearer to the goal of *Atmanirbhar Bharat.* He also informed that in the recent past NHAI had had detailed discussions with CEAI and other consultants in which many good suggestions emerged as to how NHAI could improve quality. He added that as everyone was aware that wherever it was possible to accept a suggestion NHAI had accepted within one day and issued circular changing the policy. Hence, the team work between the consultant and NHAI can result in better work.

Dr. Sandhu also informed that a portal "*Gati*" launched

where any suggestion could be given or any grievance put. He added that he also checked the portal personally and whatever general grievance were there, they tried to address it so that ultimately it would lead to better project execution.

He further said that it was in the interest of NHAI that CEAI increases its membership and promotes quality requirements amongst its Members, hence wherever CEAI would want or suggest as to the role that NHAI could play would be welcome. All the changes could be discussed to further the objective of quality.

Dr. Sandhu while wishing CEAI and its Members all the best for the Diamond Jubilee Celebrations, added that NHAI was their well-wisher, and wanted CEAI Members to grow and become *Atmanirbhar,* make the country *Atmanirbhar* and conquer the world. He informed that now a days many consultants were coming from abroad for many specialised or even non-specialised jobs to work here. He then said that he looked forward to a day when CEAI and its Members rise to a level that Indian consultants can capture the major part of the work of the world market in consultancy. He offered that for achieving that if any role was to be played by NHAI, they would be more than happy to play. He ended by wishing CEAI and its Members all the best.

Dr. Subbarao, thanked Dr. Sandhu for his address and assured him that CEAI were partners to NHAI and in nation building would stand shoulder to shoulder with NHAI in their visions and ideas and in the goals of the government and the development of the country. He went on to add that CEAI would in its part definitely do what it takes. He then invited Mr. K K Kapila to respond to Dr. Sandhu's suggestions.

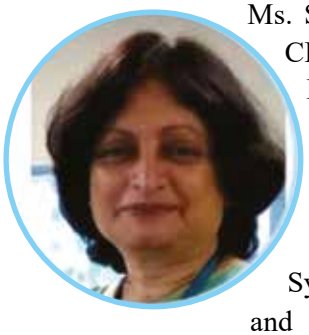
Mr. Kapila thanked Dr. Sandhu for reposing confidence in CEAI. He added that CEAI did realise that there have been some lapses by some of the consultants but that was a very big issue because the manner of award of work itself needed to be looked at. A relook at things as he had mentioned in his address was needed to carefully look at process of the award of work to the contractors. Some contractors quoted abnormally low rates and were awarded the works and when they are not able to deliver everyone gets the blame - the client as well as the consultant for the contractor's inefficiency because it is not that the contractor did not want to work, but because he had picked up the work at unworkable rates and later, he is unable to sustain working at those rates. Mr. Kapila then said that he would put up a number of suggestions, which everyone could look into and see what could be practically done to change the mode of award of work. Some systematic changes in the system were necessary so that these problems could be resolved. He requested for some time to discuss them in more detail for collectively finding solutions as to what needs to be done to reform the system which would help in achieving *Atmanirbhar Bharat.*

Mr. Girish Mishra, Secretary CEAI thanked Dr. Sandhu and Mr. Akhilesh Mishra for their insightful and inspiring talks. He also thanked Dr. Pradhan and Mr. Kapila and all the organisers for their untiring efforts to make the event successful.

Dr. Pradhan while thanking the Chief Guest and the Guest of Honour said that all the points mentioned by them had been noted and CEAI would revert with suggestions.

Dr. Subbarao informed that the Technical Session would commence.

Technical Session



Ms. Sayona Philip, Past President, CEAI spoke on the **'Key Features of *Atmanirbhar Bharat* – Role of Consultants'**. Listing the five pillars of *Atmanirbhar Bharat* - Economy, Infrastructure, System, Vibrant Demography and Demand, she explained how Consulting Engineers contributed to each one of them. She also briefly described the Government of India's special economic and comprehensive package under the *Atmanirbhar Bharat* initiative and the reforms planned across the sectors to drive the country's push towards self-reliance.

Examining the role of Indian Consultants and their capability to provide the requisite engineering services she mentioned that in some of the conventional Sectors like Buildings, Roads & Highways, Water & Environment, Power – Thermal, Hydro, Renewables and Steel the necessary expertise existed with Indian companies. In those they are self-sufficient and do not require tie ups, however, they need to enhance their service offerings and provide value added services like digitalisation, asset management and so on.

However, in the case of large infrastructure projects, for other conventional Sectors like Airports, Ports, Metros, Process related sectors like Oil and Gas, Coal gasification, Coal to chemical, there is need for technical and financial resource upgradation and process know how is involved, Indian companies need to partner with International companies for additional resources, in order to improve qualification credentials. However, the endeavour should be for the Indian companies to gradually build up their own competencies and capacities in order to become self-sufficient and provide value added offerings.

Ms. Philip's added that some of the challenges faced by Domestic Consultants in case of large Infrastructure projects are the Pre-qualification criteria tailored to limit Domestic Consultant chances of becoming the LEAD Consultant. That automatically eliminates their future chances of becoming the LEAD. Further, subsidiary companies use their International credentials to win projects, but use Indian resources. The perceived intended benefits thus do not really accrue to the project.

Another major challenge faced is the Government of India's L1 policy whose outcome results in low fees. A consequence of the low remuneration paid to the Indian Consultants causes them to give low compensation packages to employees. Over a period of time, that results in the company losing its talent to the Multinational companies in India.

The Government has its own guidelines designed to pre-empt some of the issues that companies face such as its Make in India policies. However, they are followed more in the breach than in the practice by most Government agencies, especially at the State level.

In addition to interventions during the COVID pandemic, the Government of India has planned for private sector involvement in new projects under liberalised regimes. These diversified opportunities are in the Coal Sector, Defence manufacturing, World Class Airports, Global hub for Aircraft Maintenance, Repair and Overhaul (MRO), Green Energy, Space related activities, etc.

Thus, Consulting companies should explore new/ niche sectors, look beyond their comfort zones. They could partner with Expert companies, build resources, develop expertise and imbibe international best practices. The need to take on the responsibility of continuing education of employees or collaborate on formalised skill development training with Associations rests with the companies.

Ms. Philip put forth the Consulting fraternity's suggestions to the Government of India that the Way Forward for ensuring *Atmanirbharta* are:

- Quality and Cost based/ Quality Based Selection of Consultants
- Mandate that Clients follow GOI's policies including Make in India
- Setting benchmarking criteria for entry of new players to operate in the country within WTO parameters
- Howsoever, complex, Indian companies to be encouraged to bid, if required, in JV with an International Company which has state of the art Technology

In JVs, mandate that transfer of technology to Indian partner takes place, and the conditions of contract and terms of payment should enable the process to be streamlined. with transfer of technology demonstrably established.

Ms. Philip said that on account of Indian MSMEs and other companies facing unfair competition from foreign companies, Global tenders are disallowed in Government procurement tenders upto Rs.200 crores. Necessary amendments are to be effected in the General Financial Rules. These would be a step towards Self-Reliant India to support Make in India. Suggesting further regime changes relevant to the consulting engineering industry for-*Atmanirbhar Bharat*, she suggested, where no new technology is necessary, that bids be restricted to homegrown Indian companies regardless of value.

Ms. Philip concluded with requesting for some interventions to be made for MSMEs to address their problems of marketing and liquidity due to the pandemic and even otherwise. These would essentially require continuous monitoring & settlement of dues from Government and Central Public Sector Undertakings so that the receivables from Government and CPSEs are released in 15 days (as against the current order mandating 45 days) and the same should also be followed by State Governments and Bodies. She also suggested that the onus of payment of GST be that of the Payer just as deduction of TDS and its payment is done.

Ms. Shubhrata Prakash, IRS, Director, NITI Aayog laid out the ***'Road Map to Achieve'*** *Atmanirbharata*. Ms. Prakash recalled that some months back the Hon'ble Prime Minister had given a clarion call for *Atmanirbhar Bharat* which was basically to focus on self reliance, especially to achieve the full vision where there is strength - in manufacturing, since it is important for growth of the country, the development of economy and also for creating jobs in various sectors. A lot of other steps had also been taken by GOI and there were certain bold policy initiatives taken for achieving those aims. Some bold reforms had been undertaken in the last few years across various sectors – Foreign Direct Investment, Labour, various Industrial policies as well as logistics reforms. Those had helped India reach a rank of 63 in a total of 190 nations as per the Ease of Doing Business Report 2020. All the reforms that had been taken up were all steps on the Road Map that was being discussed.

India has one of the most liberal FDI policy across the world. It's very important to be able to attract more since it's the investments that would help the industry to grow and the policy is tailored in such a way that the investors find India an attractive destination. The Government had also set up an Empowered Group of Secretaries which irons out any inter-ministerial issues. This would bring in faster clearance for project proposals. A lot of labour reforms had been undertaken; they had been brought under four broad labour codes to help industry to sort out issues that arise and provide a fair and equitable base. That would help the government in its bid towards Ease of Doing Business.

She went on to add that taking about economy one needs to talk about infrastructure (power, utilities, roads, etc.) which is critical for development. There also the government had been taking up a lot of projects and a lot of initiatives which would strengthen the sector further and all that would go towards the vision of *Atmanirbhar Bharat*. One of the areas where a lot

of work has been happening in the past few years had been the development of dedicated industrial nodes. A GIS enabled land bank was under preparation which would have areas marked out as to where an industry could go and set up. These areas would provide a plug and play model for the industry vis-à-vis the utilities required.

Logistics is another very big factor and there had been a lot of studies about the places where it could be strengthened further. Studies had shown that logistics add a lot of cost in doing business. Bring down that cost and standardizing the mode of transport – multi-modal logistics was what was being looked at. A lot of work was being done in NITI Aayog and the Ministries to smoothen the whole process of logistics so that industry finds it easier to transport goods.

With a lot of these initiatives there was great hope that *Atmanirbhar Bharat* would come through, inspite of the so called manufacturing led group, inspite of so many years that the manufacturing sector had not grown as it was expected to. Hence, everything that was being done was with the hope that the manufacturing sector would pick up. It was with that in view that certain schemes such as the Production Linked Incentive Scheme (PLI) and the Phased Manufacturing Programme (PMP) had been announced.

The *Atmanirbhar Bharat Abhiyaan* itself came in stages. The first stage *Atmanirbhar Bharat* 1.0 included the PMGKP and other packages. The second stage *Atmanirbhar Bharat* 2.0 extended it to a few other packages and finally all the PLI schemes that had all come up. In the *Atmanirbhar Bharat Abhiyaan* all the packages are not just for the industry but are there for all – labour, healthcare, etc. Ultimately the *Atmanirbhar Bharat Abhiyaan* packages would lead to Self-reliance in all sectors where allocation had been made.

The Government had also been doing a lot of hand holding for the investors – a case in point was Invest India which is a one stop shop for all investors. It helps investors figure out how to get the investments done. They are doing good work in facilitating investments in the industry.

PMP is another programme which is happening and is basically for Cellular Mobile Handsets and e-Vehicles manufacture. There has been rationalization of Basic Customs Duty to incentivize the industry to put its best foot forward in this area.

PLI, a flag ship scheme of *Atmanirbhar Bharat Abhiyaan,* had received a lot of interest from the industry. It is based on the idea that the industry, especially the manufacturing, faces a lot of fiscal disability when it comes to comparison with a lot of other parameters. Hence, the scheme had been formulated to help them overcome fiscal disability. 10 sectors were covered at present under the PLI Scheme. These are: Advance Chemistry Cell (ACC) Battery, Electronic/ Technology Products, Automobiles & Auto Components, Pharmaceuticals drugs, Telecom & Networking Products, Textile Products: MMF segment and technical textiles, Food Products, High Efficiency Solar PV Modules, White Goods (ACs & LED) and Speciality Steel. The rules are framed by the concerned Ministry to best administer the project. It's a revolutionary scheme and it is hoped that the manufacturing in these sectors would multiply. There were three sectors in which the PLI schemes were introduced even earlier. Those were Mobile Manufacturing and Specified Electronic Components, Critical Key Starting materials/Drug Intermediaries and Active Pharmaceutical Ingredients, and Manufacturing of Medical Devices.

With these schemes it was expected that there would be more that 2 lakhs direct employment opportunities, to grow by about 30% or so. Those are the success stories that all are looking for.

In conclusion Ms. Prakash said that the Government has been trying through various policy and reform initiatives to set up an attractive investment climate as well as a good industrial base. Certain

economies in the last centuries are examples that manufacturing led growth had really helped the economy to leap frog into the future and grow really big. The whole idea of *Atmanirbhar Bharat* was and is to help India grow in the same way and towards that end a lot of cooperation is expected from everyone across industries and closed by saying that "I am sure that CEAI will have a big role to play there as well".

Dr. Subbarao thanked Ms. Prakash and suggested that CEAI be invited to be a part of the policy making process. He requested Mr. A P Mull to give his views. Mr. Mull responded that it is well known money makes the mare go. He then added that Consultants have to pay GST even before the payment is received and for that they have to dig into their pockets. He suggested that GST be made payable after receipt of payment or be deducted and deposited by the payer as for IT.

Dr. Subbarao introduced Mr. Sudhir Dhawan and requested him to make his presentation on **'Adopting FIDIC for Fast Tracking"** *Atmanirbhar Bharat Abhiyaan.*

Mr. Sudhir Dhawan said the India was poised to implement large multidisciplinary infrastructure projects in the coming years for which the investment expected was about $1 trillion. Since implementation of large projects was always a challenge, therefore proper conditions of contract such as FIDIC contract conditions should be adopted. He added that the Union Budget had identified 7400 projects covering 20 sectors as a part of the National Infrastructure Pipeline (NIP), which envisaged a total spend of Rs. 100 lakh crores over the next six years. He listed out the Budgetary allocation of Rs. 5.5 lakh Crores for infrastructure development.

Roads & Highways	**Railway**	**Urban**	**Power**
Highest ever outlay of Rs. 1.18 lakh crores Economic Corridors in Tamil Nadu, Kerala, West Bengal & Assam	Outlay of Rs. 1.07 lakh crores Additional support Rs. 1.00 lakh crores through external resources National Rail Plan to create future ready railway system by 2030	Rs. 1000 cr for augmentation of public Bus Transport Funding to be provided to Kochi Metro, Chennai Metro Ph-2, Bengaluru Metro, Nagpur Metro Ph-2	Launch of comprehensive National Hydrogen Energy Mission Launch of revamped power distribution scheme with an outlay of Rs. 3.05 lakh crores over five years

Mr. Dhawan drew attention to the different Contract Conditions used in India. The Government agencies use their own conditions of tendering; Private Companies have individually drafted contract conditions; Multilateral funded projects use FIDIC Conditions of Contract and the Contract conditions also vary on type of project. Thus, there are many types of contract conditions prevalent in India. He highlighted the implications of using different Contract Conditions - Bidders spend time in evaluating cost implications; Different Conditions, mostly in favour of client; Payment delays without any safety mechanism, and Closing of contract was difficult. He then explained that by using the FIDIC Conditions of Contract there were Guidelines available for

Consultants, Contractors and Owners, which dealt with Qualification Criteria, Bidding Procedure, Evaluation Procedure, Post Award Management, Dispute Resolution and Ease in Closing Contracts. He therefore recommended the use of standard conditions of contract for all engineering and construction projects.

Mr. Dhawan spelt out that the major requirements for any Project were- Safe & Robust Design to be fit for Purpose intended; Technical Specification to ensure Sustainable Development; Quality Implementation; Completion within scheduled Time period; Control Escalation of Cost; Avoid Disputes; Easy Arbitration and Conciliation; and, Data and Information.

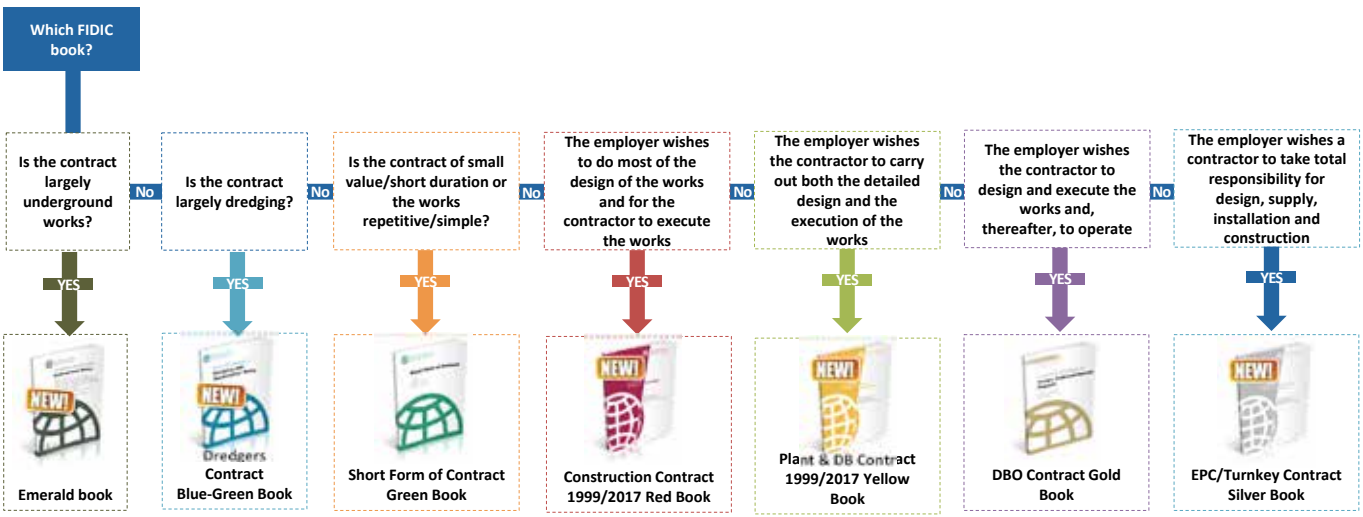
He then explained that as per the FIDIC contracts, the Procurement types are Single Contract, Framework, Multilateral, Partnership, Alliancing and Strategic Partner. The choice depended on the scale of integration and cooperation. He dealt with a Projects Lifecycle - Conception and Initiation; Definition and Planning; Construction; Operation and Maintenance; and Decommissioning and/or Renewal. Mr. Dhawan thereafter explained as to how to choose as to which FIDIC contract was to be used.

The big question then arises as to why FIDIC? Mr. Dhawan's response to that was that:

- FIDIC Contracts have been developed over 50 years as the international standard for the Consulting Industry.
- They are recognised and used globally in many jurisdictions, on all types of projects.
- The fundamental principle behind the FIDIC contracts is the use of General Conditions of Contract, deemed to be suitable in all cases, based on thousands of successful projects around the world.
- FIDIC Contracts are very clear and detailed and cover all kinds of issues that can occur during the process of construction in order to reduce the risk of any future disputes.
- FIDIC contracts include the best practices in the industry and the common issues and concerns that may be found in similar projects.

Hence the advantages of using FIDIC Contracts were Savings in Time and Cost on repetitive transactions; Frequent use gives common understanding amongst stake holders; Tenderers do not need to allow for unfamiliar contract conditions; Fair to all parties, thus give greater contractor confidence and lower risk

Which FIDIC contract to use



contingencies; and, Ethical Practices. He spelt out that the disadvantages are Tenderers often dispense with legal advice; Widespread use of standard forms used as a gauge of market prices for certain construction items, products or processes, thus creating a cartel-like aspect; and, Use of some standard forms was so widespread and common that it was as a form of "private legislation".

For correct usage he advised certain Precautions such as Amendments should not be made to standard forms, because the General Conditions of standard forms are copyrighted intellectual property and should not be modified by retyping. Besides, whatever the reason for amendments, the resulting document can be disastrous and likely to have unintended results. Another advice was that the Construction of the Contract is a complex task with many interlinking and inter-dependent clauses, and hence, the contract/ tender documentation should not be prepared in parts by different professionals or firms.

Mr. Dhawan explained the Characteristics of FIDIC Contracts, which are:

Applicability: Project Delivery & Contracting System. The Red Book can be used in any kind of Engineering Construction Contract; The Yellow Book applies to the Contracts, where the Contractor is responsible for Design also; and the Silver Book is applicable to EPC/ Turnkey Projects.

Specific Provisions - Parties' Obligations and Rights. The requirements for the Contractor are Quality Assurance System and Monthly Progress Reports

Requirements for the Employer are Financial arrangements and the Engineer is part of the Employer's personnel.

The Engineer. In the Red Book, the Engineer's role is increased for solving the problems during the Contract. The Engineer cannot be replaced with another Engineer against which the Contractor has reasonable objections. The Engineer is part of the Employer's personnel- not impartial(!!). He has to act fairly in making determination/s. In the Yellow Book the responsibilities of the Engineer remain the same as in the Red Book except increased responsibility for review of design and the Yellow Book any 'consent' to the design does not discharge the Contractor of his obligations and any errors in the design are the Contractor's responsibility.

Disputes Resolution. FIDIC stipulates the use of DAB (Dispute Adjudication Board). The DAB members are to be independently chosen by each party and paid by each party. In Red Book the Engineer is required to mediate the disputes. If the mediation fails then the dispute/s go to DAB.

User Friendliness. Common definitions for all defined terms; Use of identical wording while considering the same topic; Incorporate as much text as possible in General Conditions; Elaborate Guidance notes are provided to prepare the Particular/ Special Conditions (PC); and PC can be modified to suit specific requirements of the project

He then informed regarding Training on the FIDIC Conditions of Contract, CEAI imparts professional training to all stake holders - Clients, Consultants and Contractors. He added that India has a FIDIC Accredited Trainer who has conducted many training sessions and that CEAI has well designed & managed training system covering various technical subjects.

Mr. Dhawan recommended that

- Finance Ministry should adopt FIDIC Conditions of Contract as part of GR rules
- L1 system of selecting bidders should be replaced by QCBS (Quality and Cost Based Selection) system
- Consultancy Contracts to be awarded using QCBS principle of 80:20; 80% of weightage for Technical proposal. For highly specialized projects, ratio could be 90:10.
- Standard Deviation Method to be adopted to eliminate non workable proposals

- Detailed Guidelines for selection of consultants prepared by FIDIC/ CEAI could be adopted.

- Mr. Dhawan concluded by informing that CEAI is available to transform/ simplify Contract Conditions in India.

Dr. Subbarao voiced the hope that Internationally accepted contract conditions such the FIDIC Conditions of Contract would be adopted to enable India get closer to internationally accepted work environment. He then invited comments/ observations from the panellists.

Panell Discussion

Dr. Pradhan assured that CEAI would work closely with the government since there appears to be a need to educate the government sector, the biggest spender for the infrastructure.

Mr. Girish Mishra, in response to a question of ranking of consultants, informed that CEAI has a procedure and qualifying criteria for approving Membership. He also added that the Engineers Bill is pending but CEAI is ensuring that a Member of CEAI is a qualified Engineer and has the minimum number of years of experience. CEAI also has criteria for Ethics & Integrity, for which all Members have to give an undertaking.

Ms. Philip made a point regarding the quality of the work that consultants do, especially in view of the comments by the Chief Guest about how consultants are falling short on that. She informed that very few Indian companies are listed in the Global Rankings such as the ENR Rankings. There were a large number of engineering consulting companies, but people only talk about what the government or someone else can do. Every company and consultant needs to introspect and focus a lot on the quality. It's not only that quantity of work that one does but also the quality which is important. They should identify the shortfalls in their staff/ employees and work out capacity building programmes. CEAI can assist towards that through the Committees that look into the training requirements and also arrange to provide the necessary training.

Ms. Shubhrata Prakash mentioned that a lot of issues had come up for discussion and the focus could be on a lot of different areas. There was however, one thing – the 'no do gap'. All know that a lot has to be done but when it comes to implementation there was a bit of a gap; whether its policy or action using the product or actually doing the work in the industry. That was one area according her that CEAI and its Members could usefully provide their expertise and help bridge that gap. She requested the house to think about that as a point of discussion to take forward.

Dr. Subbarao assured Ms. Prakash that the 'no do gap' would be addressed by CEAI and that CEAI hoped to work with NITI Aayog and Ms. Prakash to improve on the implementation of a policy or a requirement.

Mr. Dhawan informed that based on CEAI's Strategy Plan, the intent was to further energise Consultants and also promote young consultants to take over the running of the Association. The seniors were there to mentor them.

Mr. Amitabha Ghoshal, Immediate Past President, CEAI referring to Mr. Dhawan's presentation said it would be good if specific examples could be given to show as to how adoption of FIDIC contract would help towards *Atmanirbhar Bharat*. He added that one of the issues that various speakers had claimed was that for an Indian consultant, 60% ownership should be by Indians. That aspect was not covered by FIDIC contract. One of the major claims for India to really become *Atmanirbhar* and the consultants to become *Atmanirbhar* was to redefine the Indian consultancy profession itself vis-à-vis what is Indian. He added that FIDIC based contracts definitely make selection of consultants and execution faster; makes implementation faster in the sense that disputes are reduced, arbitration is reduced, but the specific element of *Atmanirbhar Bharat* could only be incorporated if FIDIC based contracts are modified to the Indian conditions in certain manners such as redefining as who is an Indian consultant and also by redefining that there should be no limitation on appointment of Indian consultants or Indian contractors in a project where it is established that expertise exists.

He recalled that Ms. Philip had raised the point. To that extent he suggested that FIDIC based contracts need slight modification. Mr. Dhawan however, clarified that how the FIDIC conditions facilitate execution can be explained but the issue regarding Indian consultants is a qualifying requirement.

In response to Dr. Subbarao's call, **Mr. Mull** said that everyone had been taking about as to what the government should or what the owners should do or what the other stakeholders should do. He suggested that we should start looking at our own selves as Consulting Engineers, as to what we ought to do for our own selves. He queried that "should not we be also looking at developing ourselves so that everybody recognises us instead of us wanting them to recognise us. They should say, yes, our Indian consultants are world class and we do not have to go elsewhere." He counselled that consultants have to ensure that everything they do is of top quality, better than what is even call as world class. He quested as to why that should be a standard? Reposing confidence in Indian consultants, he said "I am sure we can beat that. We have done that in the past and we can do it in many spheres, infact all the spheres. Let's aim for that then only will we be *Atmanirbhar."*

Mr. Umesh Shrivastava, Past President, CEAI quoting couplets said that as a consultant one has to accept challenges and face storms. One can fly only to a limited extent (upto the wall) on borrowed wings, but one can fly in the sky if one has his own wings. He said "That's what our objective has to be all the time. That's possibly what we are doing. We are in the habit of passing on the blame rather that accepting a part of the blame ourselves. We don't clean our own face but the clean the mirror instead." He went on to say that now we are moving, perhaps on the right track, so don't ask the destination. Again, from a couplet he quoted "We have never been defeated nor will we ever be defeated. This is the oath that we take" and that should be the moto for all of.

Prof. Somendra Mazumder suggested that there should be more interaction between the academia and the practicing consultants.

Dr. Subbarao thereafter summarised the proceedings of the webinar and thanked everyone.

CEAI is thankful to all the speakers, panellists, supporters, the CEAI staff and above all to the participants and even those who could not attend but desired to view the recording later. Each one in their own unique manner helped to make each and every webinar during the year a success.

Link of the event: https://youtu.be/HD5UnLiL5uk

Message from Hon'ble Minister Shri Nitin Gadkari

World Engineering Day - "*Healthier Built Environment*"

The World Engineering Day for Sustainable Development was proclaimed by UNESCO at its 40th General Conference in 2019. It is celebrated worldwide on 4th March of each year since 2020. The day offers an opportunity to highlight engineers and engineering's achievements in our modern world and improve public understanding of how engineering and technology are central to modern life and for sustainable development.

The celebration of World Engineering Day is about promoting engineering as a career and how it is an opportunity to change the world for better. There is a great deal to be done specially to achieve the UN Sustainable Development Goals (SDGs) in developing countries to ensure that everyone has access to clean water, sanitation, reliable energy, and other basic human needs. In all countries, there is also a great deal to be done – to deal with the impacts of climate change, environmental issues, our growing cities and the challenges of new technologies including artificial intelligence. There are many opportunities and the Day can be used to engage with young people and say **"If you want to change the world for the better, become an engineer."**

CEAI held a virtual discussion on ***"A Healthier Built Environment"*** to celebrate the World Engineering Day so as to increase consciousness regarding the dire necessity of the SDGs.

Mr. Amitabha Ghoshal, Immediate Past President welcomed all the participants and informed that Dr. Ajay Pradhan, President was to have presented an ***'Overview of progress on Sustainable Development Goals'*** but was unable to attend due to an emergency. He had therefore requested Mr. Ghoshal to present on his behalf. Mr. Ghoshal explained the achievements in the sectors of Water, Agriculture, Energy/ Power, Transport, Education/ Science, Technology and Innovation, Health. The situation with respect to SDG had not changed much while entering into the 10 year count down to the end date of 2030. The World had still not got on the track. India could achieve record food grain production, renewable energy, alleviate extreme hunger, poverty, improve access to drinking water and sanitation. However, due to COVID-19, an unprecedented health, economic and social crisis was threatening lives and livelihoods, making the achievement of these targets even more challenging. India therefore, needed to ramp up the health and education with skill development by doubling the efforts and investment especially in rural sectors. There was also the need to come out of the Water Stress with more innovative Water Conservation and Storage Schemes. Mr. Ghoshal also conveyed Dr. Pradhan's message that engineering had taken a lot of effort out of the uncertainty created by the pandemic however with 2021 there was new hope, new vision and all are looking forward to a better life and there is hope all over the world.

Mr. A P Mull, Past President discussed the ***'Role of Engineers in enhancing the Built Environment'***. A technical glitch at the start made him remark that "Technology has changed our living but let's not be totally dependent on that". He added that the past year had proved that Human actions are fallible and can cause untold hazards – the research being conducted in bio laboratories was an example; Control systems, automated or not, are also not reliable – blasts and tragedies due to sudden stoppage of plants and industries have occurred which could have been avoided if Hazop had been done; Human actions adversely affecting nature can rebound with terrifying results. The examples were Heat island due to unbridled construction, Depletion of water bodies, green cover and reduction of waterways, and Melting of Chamoli glacier, Freezing of southern USA, breaking of icebergs in Antarctica, etc.; Human social interaction and office work could take place remotely thanks to technological developments; and Human physical activity and mental wellness had shifted bases to be carried out from the comfort of homes; however, the Invigorating Breath of Nature had not been incorporated into the built environment. He added that ***'Green lungs'*** in urban areas are essential to create ecosystems that balance the effects of urbanization.

Dealing on what the outlook was like, he said that Development was necessary since urban population was increasing. However, Past occurrences caution that Mankind must not tamper with Nature beyond a certain point. It was possible that the Rate of increase of Urbanisation may see a dip due to the change in work and life pattern caused by the pandemic. Ultimately it was for the Engineers and Scientists to show where to Draw the Line, and How to make Informed and Smart decisions.

Mr. Mull presented the definition –

"*Sustainable development is development that meets the needs of the present without compromising the needs of future generations to meet their own needs.*"

- *Our Common Future*, the Brundtland Report.

He informed that as per the National Building Code 2016, Part 11 'Approach to Sustainability' Sustainability is 'The state in which components of ecosystem and their functions are maintained for the present and future generations.' It highlights the difference in approach of developed nations and has recommended as how it is to be applied in the Indian context.

Based on that he advocated that every development planned must be scrutinized holistically to address not just its impact in the local context but on a wider region of influence. Moreover, since the effects of climate change and natural calamities can be felt over vast areas; hence every development must carry out a detailed risk assessment and hazard mapping. The projects should withstand for a sufficiently long period of time so as to deliver its purpose without compromising on quality. Even a very small probability could have catastrophic effects a few decades or centuries later. That applied to all areas on Earth and also in Space.

With reference to SDG's, Mr. Mull suggested as follows.

Goal 11-Make cities and human settlements inclusive, safe, resilient and sustainable: Development Planning to be holistic and not atomistic; Governance & Regulations to Permit only planned development; Adopt Norms & Byelaws in all cases, whether temporary or permanent all must follow the bye-laws; Safe & Affordable Housing & Transport; Public & Essential Facilities to be easily accessible and Safety & Health considerations must be given prime consideration.

Goal 12-Ensure sustainable consumption and production patterns: Material usage in engineering works – maximize natural renewable materials and recycle materials that are not renewable; Choice of Materials to be done very carefully – environmentally conscious; Design Life to be such that it lasts a few generations; Life Cycle Costing to be done accordingly; Initial Construction Quality & Regular Asset Maintenance to be monitored; and Wellbeing of the population was a key factor in ensuring sustainability.

Goal 13-Take urgent action to combat climate change and its impacts: Plan, Design, Develop, Operate and Maintain in sync with nature; Every development planned must be scrutinized on a Global level holistically; Global implies that the effect on a very large area surrounding the project area must be taken into consideration; For a Natural event, a few kilometers or hectares is like a drop in an ocean - the effect could be over hundreds of kilometers or hectares; Global Risk & Hazard Mapping and Analysis to be done; Time period should be for a few centuries, so that what is being built could be truly termed as Sustainable Construction; Even a very small probability could have catastrophic effects a few decades or centuries later; and they apply to all areas on Earth and Space.

Mr. Mull concluded by cautioning that it is upto to the Consulting Engineers to channelise their technical knowledge to make holistic, sustainable choices with an aim to improve not only the design and development of built environments but to cater to the longevity of their designs and for maintaining the health and wellbeing of the end users of that built space. He stressed that Responsible Engineers should take upon themselves to choose consciously the natural replenishable materials, recycle materials from structures to be rebuilt and develop new materials that effectively puts our designs

and built environments to withstand the test of time like our ancestors who built some of the structures that have proved this time and again.

Mr. Mull exhorted the engineers to ***"Be Responsible Engineers".***

Dr. S Chatterjee, Past President, talking on ***'Expectations of Society from Engineers'*** stated that this was an opportunity to look into the role that Engineers have been playing for benefitting the human society and proceed to assess the expectations of the society from the Engineers in the context of present times. Engineers have been constantly striving for rapid development dictated by the prevailing techno-economic climate. In the process, alongside development serious damages have been caused to the environment and the ecosystem of our planet resulting in climate change and a host of other catastrophic situations. It has posed huge challenges to the health and safety and in the long run even sustainability of our civilisation. All future developments need to be fully sustainable. UNESCO report of Engineering Sustainable Development - Delivering on the Sustainable Development Goals cited 17 Goals and lays the guidelines for all future development. Discuss Goals, 7,8 and 10 ---. Expectation of Society from Engineers would be based on the contribution made by the Engineers hitherto for the benefit of the society and societies perception of Engineers ability and accomplishments. He quoted:

"The largest contribution to the quality of life we enjoy today is made by the engineers. Clean, safe water, efficient transportation system, flood hazard control, waste management, aseismic buildings, electric power generation and distribution schemes and so forth."

- William Lewis, President FIDIC 1995-96

Dr. Chatterjee discussed on How has the society been perceiving the Engineers role traditionally. Till the last few decades of the last century, Engineering was widely perceived as the profession of technology experts who worked to satisfy the growing desire for products and services that ensured improved standard of living. Next was How is that perception changing in the 21st century. In recent times fear of environmental destruction and uncontrolled development have become very high (widespread) in the minds of the society. However, the Engineers are the key factor that save our society. Having witnessed their technological expertise and skill, the Engineers are now being looked upon as evolved innovators who are more conscious of their environmental responsibilities and focus on solutions that are sustainable.

Regarding the key challenges that the 21st century engineers are up against, Dr. Chatterjee said the Key Challenges were Ensuring clean water and sanitation for all; Ensuring affordable and sustainable energy sources; Creating strong, resilient and sustainable infrastructure; Building inclusive, livable and smart cities/ regions; Protecting environment and ecology from further degradation; Adopting green and smart technologies for all future initiatives; and Bridging the digital divide and the North-South divide.

The core expectations of the society from the engineers are not only to improve existing technologies and discover new ones but also to find synergies between existing options that can drastically increase efficiency. It expects Engineers to work effectively across disciplines and challenge old assumptions by considering gender equality, globalization, climate change and other ecological and socio-economic conditions, protection of environment, and assurance of sustainability. He explained that those could be met by Capacity Building- Engineers must remain abreast of the latest development in the profession, keep acquiring new skills sets, Engineers of various disciplines must be able to work in unison, to assure efficient and sustainable realization of projects; Digitalisation in engineering operations and Adopting New Technologies (VR, AR, AI, 5G etc.); Skill Upgradation and Training; Green Approach - Restore, Replenish, Recycle (Minimise Consumption and Wastage), achieve zero wastage; Social Justice Across Borders so as not to increase the difference between two sections of society; Technology Transfer to Less Developed Countries/ Regions; and Clean and Renewable Energy.

Talking about Renewable Energy in India he said that India is the 2rd or 4th in the World, with USA and China being at the top. As of 2020, he said that the total installed capacity of renewable energy was 136 GW which was 38% of total energy capacity of 373 GW. The breakup of that was:

- Hydro 46 GW (Potential 148 GW)
- Solar 36.91 GW - 100 GW by 2022
- Wind 38.43 GW - 60 GW by 2022
- Biomass 10.14 GW (Potential 20 GW)
- Small Hydro 4.74 GW - 5 GW by 2022

Apart from these there are Bio Fuel and Waste to Power.

In conclusion Dr. Chatterjee called upon ***"Engineers to pledge to strive for a Happy and Healthy Society and to keep our World Clean, Green and Sustainable for our future generations"***

Mr. Sudhir Dhawan, Past President dealt with ***'Projecting Engineers Contribution to Society'*** and stated that what the Engineers do is not known to the society at large. The issue of climate change was becoming very severe and is affecting all regions of the world and so also India. It's a task about which we must start doing something to save the environment in every possible way. India has been over a period of time trying to meet the basic needs of the people. India has achieved self-sufficiency in food, milk, etc. Indian Engineers had been contributing a lot for the upliftment of society for many years. Many of their contributions are not well projected and known to common person. Almost every aspect of the environment has been built by engineers – housing, water supply, sewerage, electricity, roads, railways, metro rail, air travel, apart from various common use items and industrial products.

QoL (Quality of Life): This is very important. Till now Indians did not bother about Quality of Life since they were concentrating on meeting the basic needs for their family. India has achieved a lot in education and Indians are in high positions in the world. The time has now come to improve the quality of life. For that it would be necessary to increase the social, environmental and economic values by leveraging Social Innovation Business solutions.

Quality Education in Engineering: Education is a prime requirement for all citizens, even the poor. The Government is spending a lot to give free education upto the secondary level. However, everyone is still not getting educated partly due to their need to start earning or join the family business. However, a time will come when they will realise the importance of education. Beside general education, that in engineering is important to create good engineers. For that some of the steps required are Well Educated Teachers. Due to lower remuneration good people do not become teachers; Laboratory and workshop facilities; Availability of appropriate software and hardware; Dynamic curriculum which would change with change of technology; and, Practical training which was essential during the engineering course itself is an essential ingredient but is not there now a days. He requested that companies must take in students and train them.

Upgradation of Skills: It is important that continued education process should be followed by the engineers. Since technology is changing very often, therefore upgradation of technical skills is essential. Companies, including consulting engineering firms in India need to implement this.

Women Engineers: A number of women are joining engineering profession in the last about 15 years. They are playing an important role in various sectors and are heading some of the complex areas of technology such as Space. The top management of engineering companies should ensure equal development and promotion of all irrespective of gender.

Sustainable Development: Climate change has drawn attention to sustainable development for all new projects. Engineers need to provide solutions keeping in mind - Provide economical designs to reduce consumption of materials; Recommend materials which can reduce carbon footprint; Design with 'ZERO' waste; Design

should protect existing environment including forest, eco systems, etc.; Loss of Bio diversity to be avoided; Introduce smart systems to conserve water and electricity; Design to ensure least pollution; and, Adopt cleaner fuel.

What is CEAI doing for Society? Apart from indirect contribution by CEAI Members in development of society CEAI has set up a Foundation with the voluntary support of its members. The theme and logo of foundation is

The Activities of CEAI Foundation would be Take up projects for upliftment of infrastructure in selected areas; Provide free of cost engineering solutions for small projects such as water supply, drainage, waste treatment, solar power, etc.; Generate funds through donations to finance its activities; and, Regional Centres of CEAI would also take up such activities in their regions.

Summing up, Mr. Dhawan appealed that all engineers should ***"work to improve the quality of life of the people in India."***

Mr. Amitabha Ghoshal summing up the deliberations said that the presenters covered what engineers have done, what society expects and what engineers can do further. He added that there is a need to look forward to what is future engineering and how the future will be engineered since it is the engineers who engineer the society. The pandemic had shown that when there was a challenge, humans achieve much more than their normal goal. The vaccine had been produced in less than a year and was also being administered. Nobody could have thought of that at the start of the pandemic; human capability is infinite. What will be the future face of engineering, cannot be seen today, it can only be imagined! The advent of 5G had brought in other tools. It would not be very far when virtual event would be held with people sitting next to each other on a virtual table or in an auditorium. There would be a time when the entire surface communication (transportation) would go underground and hence there would be no pollution. Alternative energy sources would ensure that there would be no pollution from generation of energy. Water is a big crisis today and it would not be far when largescale desalination would fill that void and the shortfall of potable water would be a thing of the past.

Mr. Ghoshal putting it in a nutshell said that **"We cannot change nature but we can certainly innovate in our own way so that life becomes more liveable and life becomes something to cherish. That's what we are looking forward to and the future of humanity depends on the future of engineering. We as engineers must take that responsibility which all the speakers have highlighted. Be Responsible – that was the more important thing to learn. We all engineers have got to understand that and accept our responsibility to the society."** He thanked the participants and said that their participation had generated enthusiasm to go forward for celebrating the World Engineering Day every year and thereby assess what Engineers are doing for the society and where engineering is taking the world forward to a much higher level of existence.

Link of the event: https://youtu.be/n0dvO9HPwJs

WEBINAR ON *"SAFETY IN CHEMICAL INDUSTRIES"*

The Consulting Engineers Association of India (CEAI) in its endeavour to draw attention and educate engineers and personnel at all levels engaged in planning, design and operations of chemical plants or infact any industrial plant on Safety aspects had through its Western Region Centre organized a Webinar on ***"Safety in Chemical Industries"***, which was held on 19th March 2021. The topic had been selected based on requests received after the earlier webinar on *"Safety in Engineering"* held on 20th September 2020, in which BIS had also participated. The main reasons however, were the large number of fires, blasts and other malfunctions which have occurred since the lockdown began, all of which have been reported by the media. The accidents and other instances were the results of transgressions relating to safety in designs, operations and maintenance in chemical industries and also others.

CEAI's Western Region Centre (CEAI-WRC) organised the webinar with the support from Center for Chemical Process Safety of American Institute of Chemical Engineers, Tata Consulting Engineers Limited, Chempro Expertise Pvt. Ltd. and Centre for Workplace Safety and Health, Mysuru.

Mr. Jeffrey Nambiar, Director, Chempro Expertise Pvt. Ltd.; Hon. Secretary & Treasurer, CEAI-Western Region Centre, the Moderator introduced the theme and invited Dr. Ajay Pradhan, President, CEAI to give his opening address.

Dr. Ajay Pradhan welcomed everyone and said recalled that the stoppage of plants as a result of lockdown on account of COVID 19 brought to the fore the procedures that need to be followed for closing down and restarting a plant. In HSEQS – Health, Safety, Environment, Quality & Security, Safety stands out as the most important factor.

Mr. Umesh Dhake, Regional Manager - Asia Pacific & Middle East, Center for Chemical Process Safety (CCPS) of the American Institute of Chemical Engineers (AIChE) explained ***"Normalisation of Deviance in Process Safety".*** He mapped the Process Safety journey commencing with 'Standards and Procedure's and moving on to 'Process Safety Management Systems' and then to 'Process Safety Risk Based Approach'. He added that a recent evolution had been the emphasis on a 'Strong PSM Culture'; since in the Process Safety Culture Normalisation of Deviance (NoD) is an important aspect. He called it the 'hidden tiger' because it's very subtle, since it is not understood nor is it evident when process safety is being implemented. However, when an incidence occurs many of the causal factors are found to be normalising of some of the situations. The challenge for the industry was how to identify a NoD situation.

He informed that CCPS had identified 12 features for building a Process Safety Culture in an organisation.

Establish Practice:

1. Establish Process Safety as a core value.
2. Provide strong leadership. Starts at the top.
3. Establish and enforce high standards of performance. [Combat Normalization of Deviance]
4. Document the process safety culture emphasis and approach.

Develop and Implement a Sound Culture

5. Maintain a sense of vulnerability. Very important
6. Empower individuals to successfully fulfil their safety responsibilities.
7. Defer to expertise.
8. Ensure open and effective communications.
9. Establish a questioning/learning environment.
10. Foster mutual trust.
11. Provide timely response to process safety issues and concerns.

Monitor and Guide the Culture

12. Provide continuous monitoring of performance.

Mr. Dhake said that translating all the features would show that a Committed Culture Begins with Senior Executives; Drives Operational Discipline; Maintains a Sense of Vulnerability; Combats Normalization of Deviance, and Strives for Continuous Improvement. He lamented that proper attention is not given to NoD.

The term was coined by NASA after the Challenger incidence when they realised that practicing to lower standards had become a cause of failures.

Mr. Dhake stated that the definition of NoD as per CCPS is ***"A Gradual erosion of standards of performance as a result of increased tolerance of non-conformance."***

NoD has three Characteristics – it is a Human Based Deviation; Occurs repeatedly over time; and there is No immediate incident or noticeable process effect. Since no adverse effect is seen in the short term, the deviation is assumed to be in order. However, NoD is a long-term phenomenon and there is always an element of human factor. Mr. Dhake gave two examples to illustrate how NoD creeps in.

Example -1 was of a Tank overfilling due to misuse and malfunctioning of a Safety Instrumented System, which had no history of overfilling in the past 10 years. Earlier during a PHA study the team had evaluated the overfill scenario and determined that there were insufficient layers of protection to meet the company's risk tolerance. Hence, an SIS was installed to close a block valve in the feed line and stop the flow into the tank on high level. However, two years later, the tank overfilled. Investigation of the incident revealed that the Level transmitter malfunctioned and the SIS did not trip. Over a period, the operator had begun using the SIS as a normal means of level control. The operator had been allowing the tank to fill to its trip point of 95% level and let the SIS trip to shut off the feed. Thus, the SIS was put in a high demand mode since the 95% level filling resulted in fewer fills per shift. As a result, overconfidence crept in. The Operator did not understand the intent of the SIS as an IPL. Besides, the Industry practice was not followed while installing the SIS i.e., dedicated level transmitter and block valve for use in the SIS.

Example -2 concerned a Routine Inspection activity for checking of tell-tale pressure gauges to identify the potential breach of a rupture disk underneath a PSV. The Check-list was regularly completed with check marks to indicate that zero pressure was verified. However, in reality some pressure gauges had no indicator needles and some had fogged faces that prevented a clear view of the needle position.

Analysis shows that some of the Roots of Deviation lie in Lack of Operational Discipline; Over confidence; Human nature; Risk versus Reward Perception; Insufficient Procedures, Training & Resources; and Insufficient knowledge about associated hazards & consequences, basically a lack of sense of vulnerability.

Mr. Dhake then moved on to the Practices to reduce NoD and first dealt with Operational issues such as Reward Rigor in the MOC process; Leverage the Near miss reports; Use Behavioural safety observation data; Perform Job Task Analysis for job positions handling hazardous process; Emphasis on Employees participation; Support workers for raising NoD; Recognize all those who combat NoD; When to Stand Down? Halting Operations to fight deviation; Pay attention to Troubleshooting; Recognize and Manage Organizational Changes (OCM); Anticipate-Human tendency towards NoD; Promote Transparency and Accountability; and arrange Workshops on recognizing early warning signs. He cautioned that herd mentality to do troubleshooting must be avoided so that no solution which has not been fully analysed is accepted.

Another important aspect that was brought out was that there must be a Focus on Operational Discipline. With reference to the Process Safety Metric Pyramid, he advised that Focus should be on the base of the Pyramid to leverage the Unsafe Behaviours or Insufficient Operating Discipline and Near Misses in operational discipline so as to be able to identify NOD.

An important aspect was maintaining a Sense of Vulnerability through the various Techniques such as publicly available incident databases (CSB, e-MARs, PSID); Company incident library; Hazard of the week; The Process Safety Beacon; Bow tie diagrams and the Use of incident warning signs to help recognize process safety vulnerabilities.

In conclusion, Mr. Dhake said that creating a sense of vulnerability and educating on Normalization of

Deviance are an important part of building the Process Safety Culture. In India, to build a good Process Safety Culture one should start with focusing on a few of the elements discussed so that Vision and Mission to avoid catastrophic incidences in the Chemical Industry are achieved.

He also informed that CCPS has been Leading Process Safety since 1985 and that the CCPS Guideline and Concept books are published by John Wiley & Sons. More information was available on the CCPS-Wiley website www.wiley.com/go/ccps

Dr. Rabindra Nath Sahu, Head EHS Department, Shriram Alkali and Chemicals, Jhagadia (a unit of DCM Shriram Limited), advised on the importance of the need for ensuring ***"Useful Communication for Safe Handling of Chemicals"***. He mentioned about some of the worst disaster of toxic gas releases and explosions due to runaway chemical reactions, which have occurred in chemical Industries in last 20 years and emphasised that lessons learnt from them can be used by existing chemical plants to prevent their recurrence. He presented the statistics of the Chemical Plant Explosions, Fires, Toxic Releases over the past 20 years including the ones that have occurred in recent past.

Hazards Factors	Incidents	%
Plan site Problems	16	3.5
Inferior Plant Layout	09	2.0
Poorly Designed Structures	14	3.0
Faulty Material Evaluation	93	20.2
Process Problem	49	10.6
Material Handling Problem	20	4.4
Operational Failure	143	31.1
Weak Safety Programme	37	8.0
Total	460	100.0

A critical evaluation of the incidents shows that there has been some communication gap between instruments (DCS) or between people. In 1984, there was the Bhopal incident where half a million people were exposed to the MIC gas. The findings were that it was due to Failed Communication vis-à-vis Standard Operating Procedure, Preventive Maintenance Schedule, Risk Analysis, etc. He also mentioned about the incidence of 1974 in Flixborough, UK where sudden release of 30 – 50 tonnes of cyclohaxane resulted in a massive explosion, shattering all structures to Kilometers. During the pandemic and after the lockdown that ensued the governmental restrictions during plant restart and continued operation, communications failed on the shop floor/ plant. The implementation of Covid guidelines the Number of people (employees) were reduced, there was social distancing, new people joined, use of masks and many other factors resulted in erratic communication. Therefore, when people started operating plants after April 2020, one or more chemical accident has been occurring every alternate day. He added that even on 18-03-2021 there was an acid tank failure in Dahej, which caused release of fumes and affected a number of persons. That morning, on 19-03-3021, there was a reactor blast in Vadodara, the effect of which is still to be ascertained.

The incidence of May 2020 in Visakhapatnam was comparable to that in Bhopal. On 7th May 2020, an accident caused uncontrolled release of Styrene vapor at a Polymer industry in Visakhapatnam District of Andhra Pradesh from one of the Styrene storage tanks. Due to the Covid 19 pandemic and the consequent lockdown the plant had been shutdown for 20-25 days and then restarted. The scheduled Preventive Maintenance had been postponed. Chemical stability of the monomer had not been assessed. The learnings were that Chemical stability of any chemical should be assessed before handling it and also during its storage. Process condition must be maintained throughout the storage/ operations as pre SoP. Deferring of Preventive Maintenance should be based on a Risk approach and alternate plan should be developed to maintain the integrity of the chemicals and the processes.

The second incident he talked about an explosion and consequent fire in a Pesticide plant in Dahej on 3rd June 2020 due to mixing of two incompatible

chemicals in a storage tank. Many people got affected and were hospitalized and there were some fatalities. The learnings were that Engineering controls and Administrative controls should always be in place during chemical loading and unloading operations. Decisions should be prompt whenever there is any deviation from safe operating conditions. Safe distance between facilities should be maintained (CCPS Facility Sting, PESO Guidelines for inter safe distance to be referred).

The third one was the of explosion and consequent fire that had occurred on 23rd February 2021 at an agrochemical factory in Jhagadia, Bharuch District due to the rupture of a vessel caused due to a runaway exothermic reaction. Safe distance had not been maintained between facilities. In this case the learnings were that Pressure Relieving devices should be designed based – the vent size should be for Criticality Class (4, 5) synthesis reactions. To control run away reaction reactants dumping, reactants quenching and inhibitors to be made available and kept in healthy condition.

All the incidences show that there had been lack of communication regarding the possibility of a hazard, the operating criteria and consequences of not following them. Mitigation measure seldom help once an accident such as a Bleve occurs. The Safety Data Sheet of the chemical being used must be clear and understood by all the people who are using that chemical. The Safety Data Sheet contains information regarding Identity of chemical, Physical and chemical characteristics of the hazardous chemicals, Known acute and chronic health effects and related health information, Exposure limits, Whether the chemical is considered to be a carcinogenic, Precautionary measures, Emergency and First Aid procedures, Hazard pictograms, Danger symbols, Hazard statements, Risk phrases, Safety phrases, Precautionary statements, and Give advice to ensure safe use. Dr. Sahu stressed that if the Safety Data Sheet of a chemical is followed then accidents would be rare.

Apart from generating the Safety Data Sheets and communicating it to all the persons it is also necessary that the Precautions be also followed. All containers should be clearly marked or labelled. Harping on the necessity of that he said that plant personnel at times mistake an unmarked or unlabelled container/ Jerrycan to contain water and drink it. The other precautions that personnel must exercise are to Read the label before handling or using, Keep chemicals in cool and dry place away from heat, Avoid storage in open sun, Provide adequate ventilation, where hazardous chemicals are stored/ used, Keep containers in their original containers, Check containers for leaks and open carefully with right tool, and, Maintain high standard of housekeeping and avoid spillage. Housekeeping was also very important since incompatible chemicals should not be stored near each other so as to prevent the chances of their mixing and causing a disaster. An accident on account of such storage happened in a Chloro-Alkali plant in Thailand where Sodium Hypo and Hydrochloric Acid were stored in the same dyke. Sodium Hypo leaked where Hydrochloric Acid had already been spilled. Chlorine got generated and a person was affected. The persons operating in the Tank Farm should have been informed about the chemicals and their compatibility before being assigned to handle them in the Tank Farm.

Dr. Sahu moved on to the UN Transport Code which is an international code of practice. It is followed for exports and is also adopted in India. The UN classification of hazardous materials for transport (United Nations-1977) has 9 Classes depending on the nature of the hazard. Knowing the Class of chemical enables the precaution to be followed. Hence this is a Must.

Toxic Limits of each chemical should be defined and known to every individual handling that chemical. It should also be communicated Online in real time so that a person knows as to what chemical is present in the atmosphere and take action accordingly and use proper personal protective apparel/ gear/ instruments/ equipment. Dr. Sahu explained the toxic limits in India for some of the chemicals. The International standards have been revised and although the industry is following

the latter the Indian standards have still to be revised. There are two main types of toxic limits: Limits for brief exposure to potentially lethal concentrations are Lethal Concentration & the Lethal Dose; Those for prolonged exposure to low concentrations over a working lifetime as the "Threshold Limit Values".

Thereafter Dr. Sahu dealt with the HAZCHEM CODE used for the marking of tank vehicles and dangerous substances. Although the scheme is at present voluntary but is widely accepted. The HAZCHEM code is a colour coded quadrilateral and gives information regarding requirements for Firefighting, Personal protection, Reactivity and Evacuation.

He showed the old and the new 9 Hazard Pictograms and explained as to what they mean. These have to be incorporated in the label.

He also explained the practice in the industry for colour coding of pipes, marking in manifolds and display of DO's and DON'T's during an eventuality. These are also marked in local language for easy understanding by the plant workers.

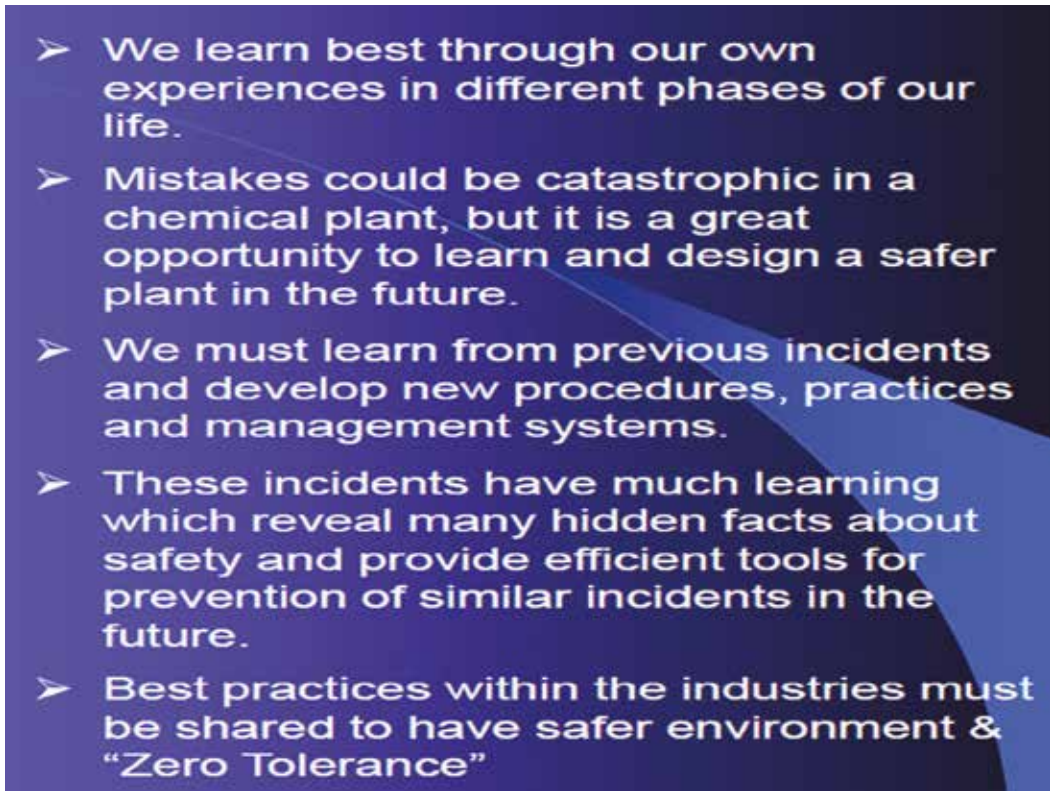
Dr. Sahu then talked of a Disaster Management Plan (DMP) if all mitigation measures fail. The DMP is necessary because it is good business management; to reduce the amount of thinking time necessary after the incident has occurred; to contain the incident and to minimise the extent of the damage to the resources and the business; and to meet our obligations under the various regulations. The DMP should be communicated to all the locals and the internal stakeholders. It comprises two parts.

On-site Emergency: The emergency situation which arises is within the plant premises and hence the effects of the disaster are within the plant.

Off-site Emergency: The emergency situation arises in the plant but escalates and spreads beyond the compounded wall of the plant. Disaster, which can affect more than a few kilometers like toxic dispersion, vapour cloud explosion, flash fire, BLEVE, etc., are typical examples.

In both cases Emergency Plan must be documented with all Hazards, control mechanisms, inventories, etc. and assigning specific jobs with responsibilities for immediate action during emergency situations. Regular drills should be conducted to check the effectiveness of the plan.

While winding up his talk, Dr. Sahu reminded the following:



He summed it all up as ***"RIGHT COMMUNICATION IS KEY TO SAFE OPERATION".***

Mr. Nambiar commended Dr. Sahu for highlighting the importance of communication to all so as to improve safety.

Mr. P A Murali, Vice President – Safety and Industrial Hygiene, APAC Region and Head of Country ESHA – India, Clariant covered the implementation aspects of ***"Safety in Chemical Industries".*** Mr. Murali said that it was necessary to get everything into their correct perspective and showed a long list of accidents that had occurred since April 2020 in the chemical industries in India during the initial period of the pandemic. They highlight the need of skilled manpower in the chemical industry and that in India many operations are still done manually and have not been automated. They pose a challenge of getting the right people and also making sure that the equipment is working properly. The list showed that most incidents were on account of things getting out of control; there were casualties as a result. The Visakhapatnam incident showed what the effects of styrene leakage can be. Few accidents occurred while restarting plants during the lockdown, on account of the pandemic and had a big impact in the industry.

Mr. Murali enumerated key learnings from the recent chemical incidents were - Importance of Plant siting and layout arrangements which would also include the area in which the facility is located so as to be aware of the hazards of other plants in the neighbourhood; Periodic review of all high-risk processes and operations including facilities like storage tanks, warehouses; Identifying and investigating leading and lagging Process Safety Events; Clear understanding and adequacy of SOP's including start-up and shutdown; Competency and training of operators including contractors; Adequacy of monitoring and measuring instruments as well as their failure to function; Preventive maintenance of Safety critical equipment's; Management of change; Focus on Occupational health and hygiene requirements; Emergency preparedness and drills and Community engagement which is very essential so that the messages go out correctly.

The next area he covered was regarding setting clear ESH Priorities. He explained that the Governance & Managing Processes involved Recognizing & Prioritizing Risks for Managing Operations, ensuring and Managing Asset Integrity and Managing People. Along with these there is also the need to Manage Change; Manage Emergencies & Business Continuity; Manage Incidents and ensure Continuous Improvement. There needs to be an Audit Process also, to ensure that the processes are well understood and implemented.

Mr. Murali then discussed Hazard identification and control programs which involves Hazard Inventory, with a list of all Processes and workplaces at each chemical facility along with their related hazards; Safety concepts and hazard reduction measures identified and implemented with clear line of responsibility. Requirements for workplace assessments, medical surveillance and record keeping to be clearly defined; ESH training programs covering Employees and Contractors. The risks must be reviewed once a year and signed off by the Site Head, to ensure control measures are identified, understood and adequately implemented.

The next activity that helps in improving Safety performance is implementing Leading Indicators, in which all levels of personnel must be engaged. One such Indicator is Safety Walk by Managers and Supervisors for which the Target is Unsafe Behaviour/ At Risk Behaviour/ OH risks/ Improvement/ Gaps / Positive observations; and Number of Safety Walks in a month. For Safety Deviations/ Safety Count cards, the Target to be fixed for each site; Safety Deviations/ Safety Walk observations compliance to be > 80%- and Contractors to be also encouraged to report deviations and cards to be made available in the local language. This is a powerful tool in the hands of shop floor workers as they can also report without giving names and the deviations are to be reviewed directly by Site Head; Work Permit Inspection by Line Managers Targets are Number of Work Permits Issued, Number of Work permits Checked, Number of Observations, and Work Permit Compliance. Targets are also defined to have minimum number of Emergency Drills to

sharpen the emergency response capability. Those leading indicators are reviewed at the site level and at the country level within the organisation and hence has a sense of importance and ownership at the sites. The Lagging Indicators Lost Time Accident and Lost Workdays must be zero. Incidents are to be investigated and lessons shared across the learning platform.

Mr. Murali spoke about another initiative on implementing **'Golden Safety Rules'** which have to be followed and checked by all**.** They are - I am safe; Permit to work; Energy Isolation; Confined Space Entry; Working at Height; Safety System Overrides; and Traffic Safety. He added that continuous engagement and involvement of employees is important for improving safety performance and creating a good safety culture in an organisation. Initiatives such as Safety Committee Meetings, EHS trainings, Safety Deviation Reporting system, Safety talk at the shop floor, Campaign such as National safety day, Fire services day, Environment day, Road safety week, Rewards and Recognitions help in achieving the desired results.

Employee Health initiatives are equally important in chemical companies due to the nature of chemicals being handled and they should also include wellness programs specific to the site. He explained them at length, the way they need to be run and must cover all employees.

He talked about another very important initiative of chemical industries worldwide - Responsible Care program. It started in Canada in 1985, but the reason for starting it was India, the Bhopal Gas tragedy in 1984, followed by couple of other major incidents which occurred across the world during that time. Responsible Care (RC) program in India, was implemented by the Indian Chemical Council (ICC) and it is a flagship programme for the chemical industry as it covers all aspects of safety. The seven RC Codes include Emergency Response, Employees Health & Safety, Pollution Prevention, Product Stewardship, Process Safety, Security, and Distribution. Implementing Responsible Care helps to sharpen the focus on Safety.

Mr. Murali concluded by saying that "Aiming towards Zero Injury and Zero Harm is a continuous process and requires a systems approach; There is a learning lesson in every problem and an opportunity for improvement; You get the level of safety that you demonstrate you want. Managing safety involves changing the way employees think; and Strong commitment from the leadership team and clearly identified ESH programs goes a long way in greater productivity, better employee relations and an overall operation improvement." He advised to start implementing these proactive Safety initiatives and not wait for some incidents to occur.

Mr. Nambiar thanked him for presenting a very structured approach to Environment, Safety & Health covering all aspects.

Mr. Jeffrey Nambiar, Director, Chempro Expertise Pvt Ltd; Hon. Secretary & Treasurer, CEAI-Western Region Centre dealt on the ***"Statutory Regulations & Approvals"*** for Chemical/ Industrial Plants. He had also undertaken the task of moderating the webinar.

Mr. Nambiar spelt out the 33 statutory regulations and approvals, some of which are Mandatory, some Essential and the others are Optional. They are the State Industrial Development Corporation (SIDC), Factory Inspectorate, Chief Controller of Explosives, State Electricity Board/ Electrical Inspectorate, Chief Inspector of Boilers (CIB)/Boiler Inspectorate(for IBR only), Central & State Environmental Pollution Control Boards (PCBS), Oil Industry Safety Directorate (OISD), Food and Drug Administration (FDA), Ministry of Environment and Forest, Central/ State Insurance Companies, Financial Institutions, Nationalized Banks, Excise Registration, Central/ State Sales Tax Department, Local Fire Brigade, Local Police Station and Department of Telecommunications. He also presented a tabular format as an *aide memoir*.

Mr. Nambiar advised that a conceptual study be done to determine the size of the plot required before buying a plot so that safety distances can be maintained. He gave an example of a plant where the safety valve was 5m from the MCC across the road. One still day when there was no wind there was release from the safety valve

and the cloud just hung there and reached the MCC and an explosion occurred. In a nut shell his message was that safety distances and other requirements must be adhered to so as to prevent accidents from occurring.

Ms. Shubhanjali Umrao, Scientist B, Chemical Department, Bureau of Indian Standards gave an ***"Overview of BIS Standardization Activity in the Field of Safety in Chemical Industries"***. She informed that the Chemical Division Council is the oldest in BIS. It has 25 Sectional Committees. Of those two of them cover Chemical Hazards, and Occupational Health & Safety. CHD 7 is for Chemical Hazards formulate Indian Standard for i) Terminology, methods of sampling and test codes of practices and guidelines relating to chemical hazards and Occupational Health and Safety related to chemicals, ii) Classifications of hazardous chemicals and chemical hazards, iii) Code of safety for operational hazards in chemical industries and chemical laboratories, etc., and iv) Safety data sheets and cards for hazardous chemicals.

CHD 8 is for Occupational Health & Safety formulate Indian Standard for i) Terminology relating to Occupational Health and Safety, ii) Specifications and code of practice for testing of safety equipment, iii) Code of safety for operational hazards in industries other than chemical industries, and iv) Occupational health and safety management system, procedure and practices.

Ms. Umrao explained the standardization process and the activities of CHD 7 & CHD 8 - the standards published, under revision or under preparation. Talking of BIS's role in International Standardization she informed that CHD 8 is the national mirror committee of ISO TC-94. Thereafter she explained how comments could be sent on Indian Standards, the provision for requesting to become a new member of a sectional committee and submitting proposals for new work items.

Mr. Nambiar thanked her for sharing the list of new standards which would be useful to the industry.

Mr. Anupam Kaul Strategic Advisor (Quality & Standards), Former Head & Principal – Quality Metrology Standards, CII Institute of Quality informed about the new rules that were in the offing and also the initiative by Confederation of Indian Industry (CII) for developing a code for safe transportation of chemicals by road.

Talking about new rules that are coming up he said that those exporting chemicals would be aware of the REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals) regulations of Europe which were laid down in 2006 and enforced in 2007. Any chemical that lands in the European market must be known to the authorities. Complete information about the chemical should be available and they also track the quantity being supplied within the European Zone every year. All chemicals need to be registered; some would get into the list of restrictions and some banned. Other countries later came up with their own regulations Korea, China, Japan, New Zealand, Canada, UK, et al. In India the discussion started in 2013 by CII and Ministry of Chemicals and Petrochemicals. Then Indian Chemical Council (ICC) and later Chemexcil also came into the picture. Chemexcil had an inventory of 5000 – 6000 chemicals in India but nothing beyond that.

There was no enabling Act in India except that the Environment Protection Act had some general provisions under which such rules were possible for Safety Management Systems. CII and one more organisation were asked to prepare the rules and the draft was given in early 2019. It went through many iterations and later DCPC after researching found that the EP Act was also administering The Manufacture, Storage and Import of Hazardous Chemicals Rules 1989 (MSIHC) and The Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996. Though the rules were there, their implementation was not very good hence it was decided to amalgamate all in to one common set of rules for better administration. That's what had been done in the 5th Draft. The draft Chemical (Management and Safety) Rules, are for Notification, Registration, Restrictions or prohibitions as well as labelling & packaging requirements related to the Use of Substances, Substances in Mixtures,

Substances in Articles and Intermediates Placed or intended to be Placed in Indian Territory. A National Chemical Authority would be set up under the DCPC with a formal Chemical Regulatory Division. It would be mandatory for the Industry to notify and register the Chemicals as per the Schedules.

The deviation from Europe is that there are two streams here. There would be notification requirement for all chemicals and there would be a list of priority substances (more hazardous ones) that would need to be registered. The latter would require much more documentation. The initial notification period, once the rules come into being would be 180 days. For new substances it would be 60 days prior to placement in the market. Annual updating would be necessary. Substances which are already covered in other Acts and Rules would also require to be notified but would be exempt from registration or restriction. He enumerated the data that would be required to be given for the notification / registration of a chemical.

Mr. Kaul next explained about the code for transportation of hazardous chemicals that CII had prepared so as to consolidate all the rules, etc. in to one document. A very elaborate document has been prepared for road transportation (and not rail transportation). The standard defines toxic chemicals, flammable materials and explosives, draws references from the CMVR and the UNECE and assigns responsibility to the supplier, transporter and receiver hence it covers loading, transportation and unloading. Provisions are there for emergency conditions and response. It lists 3 levels of emergency situations and 4 levels of priorities. All the aspects that the earlier speakers had mentioned are also included. An issue which is a grey area in India is the certification of the competence of the drivers who are transporting the hazardous chemicals. ICC had once done a certification programme. Nobody else has done it. The code also has specifications for the tanks. It is also intended to develop chemical specific standard. The document is in the draft stage with CII and hopefully it would be published soon.

Mr. Vipin Doshi, Member Safety Committee, Indian Chemical Council. Formerly with Excel Industries. Mr. Doshi said that while there have been discussions about the accidents before and after the pandemic but a number of accidents keep occurring in India industries so the question was why? The reason according to him was that there are numerous industrial units in the small and medium scale sectors and most people do not realise the meaning of the word 'vulnerability'. Chemical industry is vulnerable, which these industries do not understand and only look at profits in a very short term and hence they get into trouble. It can be seen that most of the accidents occur in the industries that do not have clarity on what they are handling, why they are handling and how the material is to be handled safely. Therefore, there was a need to educate the whole industry and for that he had suggested to Mr. Dhake that the large detailed CCPS volumes be converted to small simple ones in Indian languages which can be distributed to all the people to educate them as to what the chemical industry is, what kind of vulnerability are handled and that they have to look at it differently.

Mr. Doshi said that based on his observations, he had zeroed in on 6 situations which lead to accidents.

1. The Marketing Department demands a lot and the Production Department tries to fulfil that without realising the kind of problems that they would be likely to face. These demands create a number of accidents in the industry since they concentrate on production and forget that safety is an important part.
2. Maintenance: there are uncertainties in maintenance because a number of people of different types come together to work, hence the chances of an accident are far more.
3. R&D and Projects: there again there are uncertainties and lead to accidents.
4. Handling of Materials - the Warehousing part: in one audit it was observed that water sensitive material was kept in the middle of other material

which would require water to extinguish a fire. The person in-charge was a fresher with a BSc degree and he was given the task. In an industry there is need to understand that education and training are very important. An analysis of the number of accidents taking place in the European conditions shows that even there warehousing is the weakest link.

5. Pre-Start-up Safety Review (PSSR): people are always in a hurry and no PSSR is done or if done it's done in a slip shod manner. It is not done in detail as required and hence there are problems.
6. Normalisation of Deviance: that is a major problem and needs to be guarded against.

Mr. Doshi summed up by saying that those were the 6 factors which create problems and consequently accidents. There was a need to educate the chemical industry through some means since the industry is going to keep expanding and a number of smaller industries would come up. A way needs to be found to educate the people so as to make them understand the vulnerability which should lead them to be cautious and give adequate importance to safety first.

Mr. D P Misra, Adviser Excel Industries, former DG Indian Chemical Council commenced his talk by informing that he is currently, on behalf of an NGO, pushing forth the cause of the Bhopal Gas Tragedy which occurred 36 years ago but the soil of Bhopal is still toxic. 1.1 million cum of soil in Bhopal is toxic so when it rains the leachate goes into the drinking water stream which is consumed by the residents. 300 tonnes of Di-Methyl Isocyanate are still lying in the factory's storage. It is shameful for the chemical industry that no remediation has been done although files are moving in Government Offices and court cases are pending in the Supreme Court of India.

He then informed that one needs to be fully involved with safety at all stages. The owner, regardless of which part of the world he/ she is in should check whether an employee has returned back home safely. To inculcate that the procedures of Safety Tips, Safety Drill, Fire Assembly, Fire Drill, etc. are the normal requirements.

The chemical industry is changing its paradigm – the scale of operations have increased tremendously and Mr. Misra gave the example of Sulphuric Acid Plants, the capacity of which used to be 10 tpd in 1965 but in 1997 he commissioned a Plant with a capacity 7000 tpd. The Chemical industry has gone in for a lot of digitalisation and the plants can now be operated from homes. The industry's structure is changing and safety has new challenges.

According to Mr. Misra the reason for major accidents could be attributed to:

1. The first is the *chalta hai* attitude and indiscipline.
2. Not reading the Standard Operating Procedure before going to Start-up & Commissioning.
3. Inadequate Staff. The LG plant at Visakhapatnam was started at midnight with by a small group of staff but the seniors were not present. The reason for restarting the plant at mid-night is not known. There have been other cases where there have been problems when plants were started at midnight.
4. Calibration of Instruments.
5. Reporting of Major Accidents. The Indian industry is shy of reporting major accidents. Mr. Misra informed that as the DG of ICC, he was a catalyst for Responsible Care, REACH, etc. and explained to the industries the need to report accidents.
6. Root Cause Analysis of the accident. If an accident is not reported then there would be no root cause analysis.
7. Regular Safety Audit is not taken seriously by all. After accidents so many owners have had to face difficult situations. He queried as to what would happen to the use of the logo of *ResponsibleCare* after an accident? Can the company still use that logo? There has been no answer given to that.
8. Discipline. Safety requires discipline at all levels. People may be very good in their work and

technical knowledge but discipline is apparently lacking. The Tarapore accident revealed that some people were staying with their families on the first floor of the plant. Such things are happening in the chemical industry in the MSME sector.

9. Reporting to District Authorities. In majority of the cases the industry does not report to the District Authority regarding starting or commissioning of a plant. In the Visakhapatnam case it was the community that helped out after the disaster. The District Authority must know all about the Material Safety Data Sheets, what is planned to be done and when a plant is to be commissioned so that they can be ready for any eventuality. What is not being done should be done. The accident should be reported on the individual company's website. They may not like to mention all facts and details but the root cause analysis is a valuable lesson to the others.

10. Audit is a must for one's own sake. There is need to check whether the employees understand the plant? Communication as mentioned by Dr. Sahu earlier is most important. The employees (workers & operators) must know about the process and procedures and the risk side of the operations. Disseminate information to the District Authorities about the plant. The leadership of the plant who plan to commission it, must have a dry run, understand the Standard Operating Procedure, hold a Fire Drill, etc. so that any mishap can be immediately addressed.

11. Refresher Course must be ongoing. An hour every weekend would be good. Every meeting should start with a Safety Talk.

Mr. Misra said that he had been keen to set up a Process Safety Institute by ICC but that did not materialise. The institute would help train people in Process Safety and how to handle various situations. He added that reportedly Mr. Punjawani on behalf of United Phosphorus was setting up some facility in Gujarat, which would have something to do with Process Safety. However, Mr. Misra suggested that there should be a Central Process Safety Institute.

He also informed that all the unsafe incidents in USA are reported to the National Safety Board in USA, which determines the cause and the penalty. However, there was nothing equivalent to that in India. The National Green Tribunal is there but it needs to have representation of persons knowledgeable in Process Safety. Mr. Misra informed that after the Visakhapatnam incidence he had urged, Secretary Chemicals, Government of India to push for a National Safety Board in India. Mr. Misra informed that the "India Chem" conference had been going on for the past three days and there also he had pushed for this with the new Secretary Chemicals.

Mr. Misra closed by saying that there should be actionable recommendations from the programme to take up with the policy makers.

Dr. Harshavardhan Subbarao, Chairman, CEAI-Western Region Centre thanked all the speakers and panellist for the insights and suggestions provided. He suggested that since Safety concerns everyone, all the professional associations/ institutions should come together to put forth the suggestions that have emanated from the webinar. He added that the report would be published in CEAI's quarterly magazine ViewPoint.

Dr. Ajay Pradhan, President CEAI requested that the engineers participating become members of CEAI and help change its face and also help put issues concerning engineers to the authorities. He informed about CEAI's initiative of "Engineers Go Social" to support the government's efforts.

CEAI is thankful to the supporters - Center for Chemical Process Safety of American Institute of Chemical Engineers, Tata Consulting Engineers Limited, Chempro Expertise Pvt. Ltd. and Centre for Workplace Safety and Health, Mysuru, the esteemed speakers and panellist who shared their knowledge, experience and gave suggestions for improving Safety in the Chemical Industries.

Link **https://youtu.be/ZJsyZS5uzlc**

Webinar on "Delivery of Quality Infrastructure & Conditions of Contract"

Discussion on "Delivery of Quality Infrastructure & Conditions of Contract" was organized by Consulting Engineers Association of India - Northern Region Centre in association with International Federation of Consulting Engineers (FIDIC). It was sponsored by Consulting Engineers Group (CEG), Jaipur.

The Keynote Speakers and Panellists were Mr. Amitabh Kant, CEO NITI Aayog, Government of India, Dr. Nelson Ogunshakin, CEO FIDIC, Mr. K. Rajaraman, Additional Secretary, Department of Economic Affairs, Ministry of Finance, Government of India, Mr. R A Rajeev, Metropolitan Commissioner Mumbai Metropolitan Region Development Authority, Mr. Naresh Salecha, Director, Railway Board, Government of India, Dr. Ajay Pradhan, President, CEAI, Mr. Amit Sharma, MD, Tata Consulting Engineers Limited, Mr. Vishwas Jain, MD CEG & Chairman (Northern Region) CEAI, Mr. Sudhir Dhawan, Past President CEAI, and Mr. Omendra Bhardwaj, Chairman CEG & former Rajasthan DGP. Mr. Yaduvendra Mathur, Vice Chairman CEG & former Special Secretary, NITI Aayog moderated the Webinar for which over 600 participants had registered.

In his Inaugural Address, Mr. Amitabh Kant stressed the need for private sector industry to not only deliver quality infrastructure but to collaborate actively in long term management of infrastructure services for nation building and growth. He outlined steps being taken proactively by Government of India for greater professionalism in project and program management through a National Mission. He informed that NITI

Aayog had also constituted two Task Forces – one for Enforcement of Contracts and another on Conciliation Mechanism.

Dr. Nelson Ogunshakin in his Keynote Address gave a global overview of FIDIC activities and complimented the efforts of India for infrastructure development with Quality, Integrity and Sustainability. He assured support to Government of India through CEAI to help improve the Procurement procedures and Contract partnerships. He also gave an update about the new initiatives including 2017 Suite Guide, 2017 Suite Subcontracts, language translations and a PPP Contract document being finalized by FIDIC.

Mr. K Rajaraman in his comprehensive presentation outlined that Quality Infrastructure ecosystem relies on metrology, standardization, accreditation, conformity assessment, and market surveillance. He emphasized the need to enhance global competitiveness of Indian manufacturing inter alia through asset monetization of existing infrastructure and adoption of digital interventions for infrastructure services. Expressing concern on diversity of contract structures within the Central Ministries and more so across State Governments and Local Bodies, he stressed on the urgent need for effective contract management to lay down the foundation stone for Quality Infrastructure. He also mentioned the reforms in PPP contracts. Mr. Rajaraman suggested that the way forward may include a National Quality Infrastructure framework followed by a National QI Mission. He also added that a Task Force on Infra Contract Reforms for consulting industry and ministries may be needed to give recommendations regarding alignment of current contract clauses with international best practices including FIDIC. He also flagged that the National Mission on Project and Program Management to be launched based on the NITI Aayog Task Force Report would strengthen compliance and improve conditions of contracts for delivery of quality infrastructure and services. He opined that NITI Aayog should also review the legacy contract documents being used by many departments and improve upon them.

Mr. R A Rajeev shared MMRDA's best practices and expertise across over 150+ projects and 1500 + contracting documents. He shared challenges being faced by vendors and contractors due to the pandemic and how MMRDA met the emerging situation. Stressing on the need for global best practices to be adopted by consulting engineering firms through adoption of international standards, Mr. Rajeev also sought support of FIDIC for adoption and adapting of local variations in contract conditions. He also flagged regarding the need to review the delays and high costs of the Arbitration route for dispute resolution.

Clarifying the issues raised, Dr Ogunshakin suggested that the Disputes Avoidance and Adjudication Board provisions should be retained in the standard conditions of contracts. He urged that the General Conditions/ Golden Principles under the FIDIC Suite of Contract documents should not be tinkered, though certain Specific Conditions of Contracts provide the flexibility to suit local procurement regulations and practices and they could be prepared in consultation with the local FIDIC association – the CEAI.

Mr. Sudhir Dhawan suggested that the Ministry of Finance should adopt the FIDIC Conditions of Contract as part of Government Resolution Rules and that the detailed Guidelines for selection of consultants prepared by FIDIC/ Consulting Engineers Association of India be adopted.

Key Takeaways from the discussions:

1. The implications of time and cost over-runs in Infrastructure projects is estimated to be 2.3% of GDP. It was unanimously felt that the need of the hour is to promote contractual mechanisms that ensure a fair distribution of risks between the parties through standard procurement documents (SPDs).
2. India's ambitious plans, well-articulated in the Report of the Task Force on National Infrastructure Pipeline, are vital for meeting the target of a $ 5 trillion economy. In the present circumstances,

when increased participation of private investment is expected in infrastructure, it is an appropriate time to review contract documents to promote discovery of efficient pricing mechanisms and bring in such contractual mechanisms that ensure fair and equitable distribution of risks between the parties. Such mechanisms should build confidence between both the parties and would help timely completion and quality infrastructure with fair distribution of responsibilities.

3. Infrastructure projects face problems such as delays, cost overrun and claims due to a number of reasons. Poor quality of Project Preparation due to inappropriate selection of Consultant and Team, Inadequate Review & Monitoring systems, Contract Documents not covering adequate details and equitable risk sharing mechanism, Inadequate provisions for review of design & drawings and construction supervision, etc. are some of the reasons. Errors & Omissions in Contract documents lead to various issues and both parties should share risk so created. All these reasons are linked to Contract Provisions.

4. The Consulting Engineers Association of India brought out that one of the contributing factors to disputes, particularly during current uncertainties, was the uneven distribution of risks and responsibilities between the employer and contractor. The need of the hour was to draft standard procurement documents carefully for infrastructure services in a way where neither party was at a disadvantage during the contract implementation phase. Balanced contracts would minimize disputes, due to the built-in objectivity that would prevent unfairness.

5. Terms of contracts must be balanced and instill a sense of trust and fairness among the Government agencies and bidders alike. The risk sharing framework should be such that a be allocated to the party that is in the best position to handle it. In other words, rules of the game should be fair to both the teams and declared upfront!

6. Enforce the standardized contracts across central ministries and the central public sector organizations, states and also the urban local bodies. A mechanism, is necessary, by which these standard contracts could be mandated to be adopted without making any deviations.

7. To bring in paradigm shift, NITI Aayog Task Force on Program & Project Management had done a detailed exercise and laid down detailed plan of actions with short term and long-term strategies including implementing best international practices in the Indian context.

8. Currently, a few organizations like Delhi Metro, Chennai Metro and funded projects have used FIDIC Documents in India, on account of which they found better price recovery, minimized time and cost overrun.

9. Short-term & Long-Term Strategies for Policy Framework were required to be made for adopting FIDIC Documents by all infrastructure organizations - Government as well as Private. A committee could examine the various type of FIDIC documents with reference to various modes of Contracts such as DBFOT, HAM, EPC, TOT, etc. being followed in India.

10. For implementation of Projects to be built to high standards there is a need to improve the Bid documents. Suitable provisions for Change of Scope, Force Majeure, Safe Exits, Optimum Risk sharing, Provisions for Arbitration are major issues in current bid documents. Adoption of FIDIC documents would pave the way for improving Quality, Integrity & Sustainability for Infrastructure Projects.

11. Adoption of Standard Procurement documents would also bring Indian Companies with Joint Venture to the level of International Collaboration.

12. Disputes Avoidance and Adjudication Board provisions should be retained in the standard conditions of contracts.

The need for a "good contract" remains the key to delivering quality infrastructure.

Dr Ajay Pradhan

Mr Amitabh Kant

Mr K Rajaraman

Mr R A Rajiv

Dr Nelson Ogunshankin

Mr Sudhir Dhawan

Mr Vishwas Jain

Mr Yaduvendra Mathur

Mr Naresh Salecha

FIDIC Training Program at Nepal

CEAI organised a FIDIC Training Program for Society of Consulting Architectural and Engineering Firms (SCAEF)- a Membre Association of FIDIC- at Kathmandu, Nepal from 24th to 27th March 2021. Dr. Dhaval Parikh, FIDIC Accredited Trainer and GC Member of CEAI conducted the program.

The training was organized on the following modules:

Module-1: Understanding of FIDIC 1999 & 2017 Conditions of Contracts for Construction, and Plant & Design-Build

Module-2: Management of Claims and Resolution of Disputes for Construction, and Plant & Design-Build [FIDIC 1999 & 2017 Conditions of Contracts]

View of Participants

Distribution of Certificates by the trainer

CEAI INTERVENTION

MORTH Circular for restoration of 80:20 criteria

With persistent and continuous follow up by CEAI, MoRTH has issued a Circular that for all DPRs, the criteria should be 80:20. MoRTH's circular dated 1st February 2021 is reproduced below.

No. MISC-13/1/2021-Highways
Government of India
Ministry of Road Transport & Highways
(Highways Section)
Transport Bhawan,1, Parliament Street, New Delhi-110001

Dated: 01st February, 2021

To

The Chairman,
National Highways Authority of India,
G-5 & 6, Sector-10,
Dwarka, New Delhi-110075

{Kind attention: Shri Sushil Kumar Mishra, CGM (Tech)-SRD&Q, NHAI}

Subject: Restoration of 80:20 criteria in lieu of 70:30 (Technical Proposal: Financial Proposal) for Quality cum Cost Based Selection (QCBS) in consultancy assignments - reg.

Sir,

I am directed to refer to NHAI letter no. NHAI/11018/01/2008/PQ/(Comp.no. 27879)/308 dated 14.9.2020 on the above subject and to say that proposal of NHAI for restoration of 80:20 criteria in lieu of 70:30 (Technical Proposal: Financial Proposal) for QCBS in consultancy assignments has been approved by the competent authority in the Ministry. RFP document for appointment of Consultancy Services for preparation of Detailed Project Report (DPR) in respect of National Highways and centrally Sponsored road works circulated vide MoRTH Letter No. H-39011/15/2019-P&P (Pt-1) dated 15.2.2019 stands modified to that extent. Rest of conditions/provisions of the RFP document will remain the same.

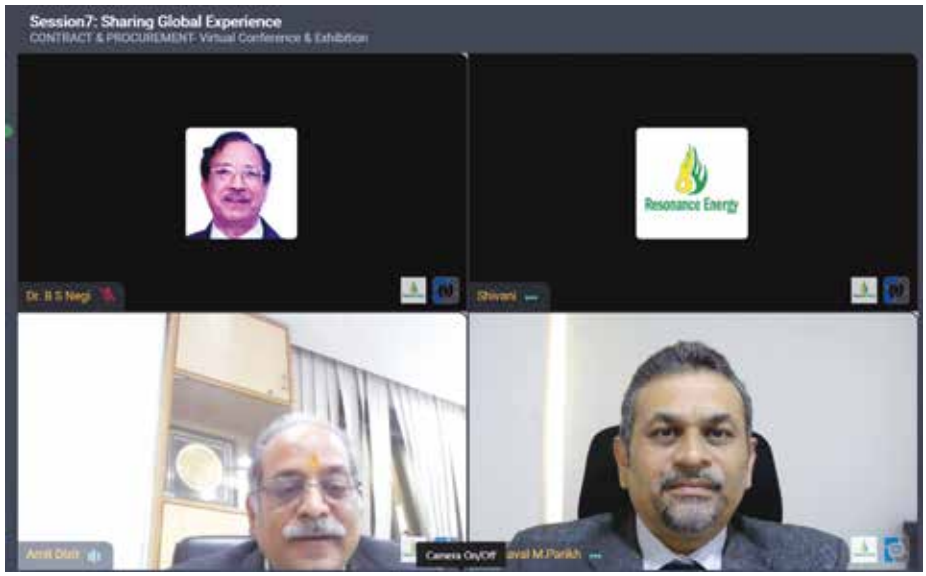
2. Further, it has been decided by the competent authority that the revised criteria will be applicable for other agencies of the MoRTH as well.

Yours faithfully,

(Ramandeep Chowdhary)
Deputy Secretary to the Government of India

MEMBER NEWS

4th Contract & Procurement Virtual Conference & Exhibition 2021



4th Contract & Procurement Virtual Conference & Exhibition 2021 (for Oil and Gas Sector) was organized by Resonance Energy on 12th and 13th January 2021. CEAI representative, Vice President Dr Dhaval M. Parikh was invited as a Speaker in Session 7: Sharing Global Experiences. His talk on ***"FIDIC Conditions of Contracts for Oil and Gas Industry"*** was very well received and many participants and government organizations showed interest in considering FIDIC Conditions for their future tendering.

CEAI participated in webinar organised by British Colombia and World Trade Center Mumbai

In partnership with the Province of British Columbia, World Trade Center-Mumbai and BC-India Business Network, organised a webinar on "BC-India Trade & Investment Opportunity: Infrastructure (Engineering)" on Thursday 21st January 2021.

With a view to promote the Infrastructure (Engineering) Sector between India and British Columbia, the organisers had invited prominent Businessmen and Professionals from CEAI in this sector to exchange views and facilitate technical collaborations, partnerships and investments.

Mr. Sudhir Dhawan, Past President, representing CEAI made a presentation on 'Engineering Sector in India & Areas of Cooperation'. In his presentation Mr. Dhawan highlighted: services rendered by Member Firms of CEAI and their fields of specialisation. He also mentioned that Indian consultants are working in other parts of world and are well recognised for their technical expertise.

There were number of consultants from British Colombia who participated and asked questions about India. He informed them that CEAI would be happy to assist them whenever required.

Mrs. Caroline Andrews President & CEO, Association of Consulting Engineering Companies of British Colombia made a good presentation.

Indian Ambassador to Canada Mr. Ajay Bisaria inaugurated the Webinar. Besides, Government of British Colombia gave presentation and proposed to enter into MOU with CEAI.

Governments of Maharashtra and Andhra Pradesh representatives invited Canadian companies to invest in their respective states.

There were about 105 attendees.

Road Safety needs greater focus – Address by Mr. K K Kapila

Mr. K K Kapila, Past President CEAI and the President Emeritus, of the International Road Federation- India Chapter addressed the participants on the occasion of the inauguration of IRF-IC webinar series on 9th February 2021. The same was reproduced in The Statesman and is given below.

https://epaper.thestatesman.com/c/58562893

Road safety needs greater focus

K K KAPILA

Road safety, though extremely important has still not been able to attract enough attention in India despite the fact that there have been higher fatalities year on year on account of road accidents than due to the Covid-19 pandemic in 2020. In India, more than 150,000 people die every year while 500,000 get injured. A significant point to be noted here is that while over 70 per cent of the fatalities due to road accidents are in the most productive age group of 18 to 45 years, over 70 per cent of the fatalities due to Covid were in the age group of over 65 years.

Globally, road accidents account for 1.3 million deaths and 50 million injuries, with many living their lives with permanent disabilities. Of this, India's contribution to the fatalities is at 11 per cent. In 2010, leaders from 100 countries gathered together and resolved to reduce road fatalities and accidents by 50 per cent by the end of 2020. Though we did not achieve the target, there is now an increased sensitivity and awareness towards road safety. Having failed to achieve the target, a new target has been set to achieve reduction in road accidents by 50 per cent by 2030.

To achieve it, an action plan was contemplated to be prepared in 2020 but because of Covid, this has got delayed and we have only now embarked upon it. In this effort we have the whole hearted support of a number of International and National organisations including Federation International De Automobile (FIA) , Road Safety Organisation of Prince Michael Duke of Kent, International Road Assessment Program (IRAP), International Road Federation (IRF) - Geneva, UNECE and Ministry of Road Transport And Highways (MoRTH) amongst others.

The hard facts of Indian road safety include that the Ministry of Road Transport had issued a circular to build Forgiving Roads, which forgive engineering mistakes made on the roads. Thereafter National Highway Authority of India issued two circulars on the subject - in 2010 and 2012 respectively. In spite of explicit instructions, these have not been adhered to, primarily on the plea of cost increase as well as a casual attitude of the people involved. This is indeed unfortunate.

Moving to vehicular safety, the Union government has initiated provisioning of safety measures in vehicles, aligning them with UNECE standards for both two wheelers and four wheelers. The government must be complimented for mandating crash test standards, identical to Europe. Similarly the provisioning of ABS in two wheelers is a very welcome gesture.

The government's move to encourage use of CNG is welcome. However, if we are retrofitting CNG kits in the market, it is important that these vehicles meet the same crash test safety standards as mandated for all cars. Secondly, many of these kits are imported from China and do not meet basic safety standards. Under Atma Nirbhar Bharat, we need to develop and manufacture these in India so that they meet all test standards, stop their import, and generate local employment.

The amended MV Act 2019 implemented in September 2019 is expected to bring a remarkable change in the road safety scenario in the country when it is adopted in entirety by the States and Union Territories. What is needed is to remove the human interface from enforcement. Extensive use of Intelligent Transportation System (ITS) technologies to capture violations is the way forward.

Our Vision is that Bystander Training Programme should be undertaken in a time bound manner along all National and State Highways to begin with. The tea stall, dhaba and petrol pump staff on main highways in the country should be taught first-aid to help accident victims.

The latest intervention in trauma care is by the DRDO Scientists who have created a Motorbike Ambulance called "Rakshita". The government must promote manufacture of these Motorbike Ambulances in a populated country like ours with massive road network and disproportionately large accidents in order to save human lives. This effort should be launched in the same manner as we have taken up the vaccine drive for Covid 19.

The writer is President emeritus, International Road Federation, a global body working for better and safer roads world wide.

CROSSWORD

NO 28831

The Statesman Sat, 20 February 2021 https://epaper.thestatesman.com/c/58562893

Report on Prof. S K Mazumder's talk at 6th IAHR EUROPE Congress

Prof. S. K. Mazumder, former AICTE Emeritus Professor at Delhi Technological University (DTU), former Delhi College of Engineering (DCE), delivered a virtual talk at the **6th IAHR EUROPE Congress, Warsaw Poland 2020** held from Feb.15-18, 2021. It was organised by the Polish Academy of Sciences and Warsaw University of Life Sciences and was attended by 596 delegates (including 9 from India) from 52 countries. Prof. Mazumder made his presentation on Feb.15th in BS2 session *"Measurements and instrumentation in hydraulic engineering"*. His talk was on **"An Innovative Design of a Proportional Type Flow Meter for Stream Gauging".**

Stream gauging is essential for planning, design, construction and management of water**.** The existing methods of measurement by use of floats, salt solution, ADV, ADCP, PVM, etc. are time consuming and costly. They require periodic calibration and trained manpower. The new meter is a simple devise by which flow can be measured by proper hydraulic design of river and canal structures e.g., bridges, culverts, flow regulators

etc. It is similar to a ***'Parshall type Flowmeter'*** popularly used in irrigation flow measurement all over the world. Several drawbacks of the Parshall flumes e.g. (i) Flow choking and jump formation (ii) sedimentation due to backwater effect in flows other than design flow (iv) erosion in tail channel due to flow separation (v) error due to submergence etc. were pointed out

The innovative flow meter as sown in Figure-1 combines the principles of weir and venturi- and was developed to overcome all the above problems. Formulae derived from specific energy principles for determining flow, optimum geometry of the flow meter to improve performance and the adverse bed slope to prevent flow separation are given by Equations (1) to (3).

$$Bo = [0.7\ (Q_{max}^{2/3} - Q_{min}^{2/3}) / (E_{1max} - E_{1min})]^{3/2} \quad (1)$$

$$= E_{1max} - 3/2\ [(Q_{max} / B_0)^2 / g]^{1/3} \quad (2)$$

$$\beta = \tan^{-1}[(2y_c/B_0)\{(\delta^2+\delta+1)/(2+\delta+\lambda+2\lambda\delta)\}\ \tan\theta \quad (3)$$

where, B0 is throat width, Δ is height of crest above bed, β is adverse bed slope, δ=yc/y2, λ=B1/B0 and θ =Angle of divergence of side walls downstream, E_{1max} and E_{1min} are the specific energies corresponding to maximum flow (Q_{max}) and minimum flow (Q_{min}) in the stream as shown in plan (bottom) and section (top) in Figure-1.

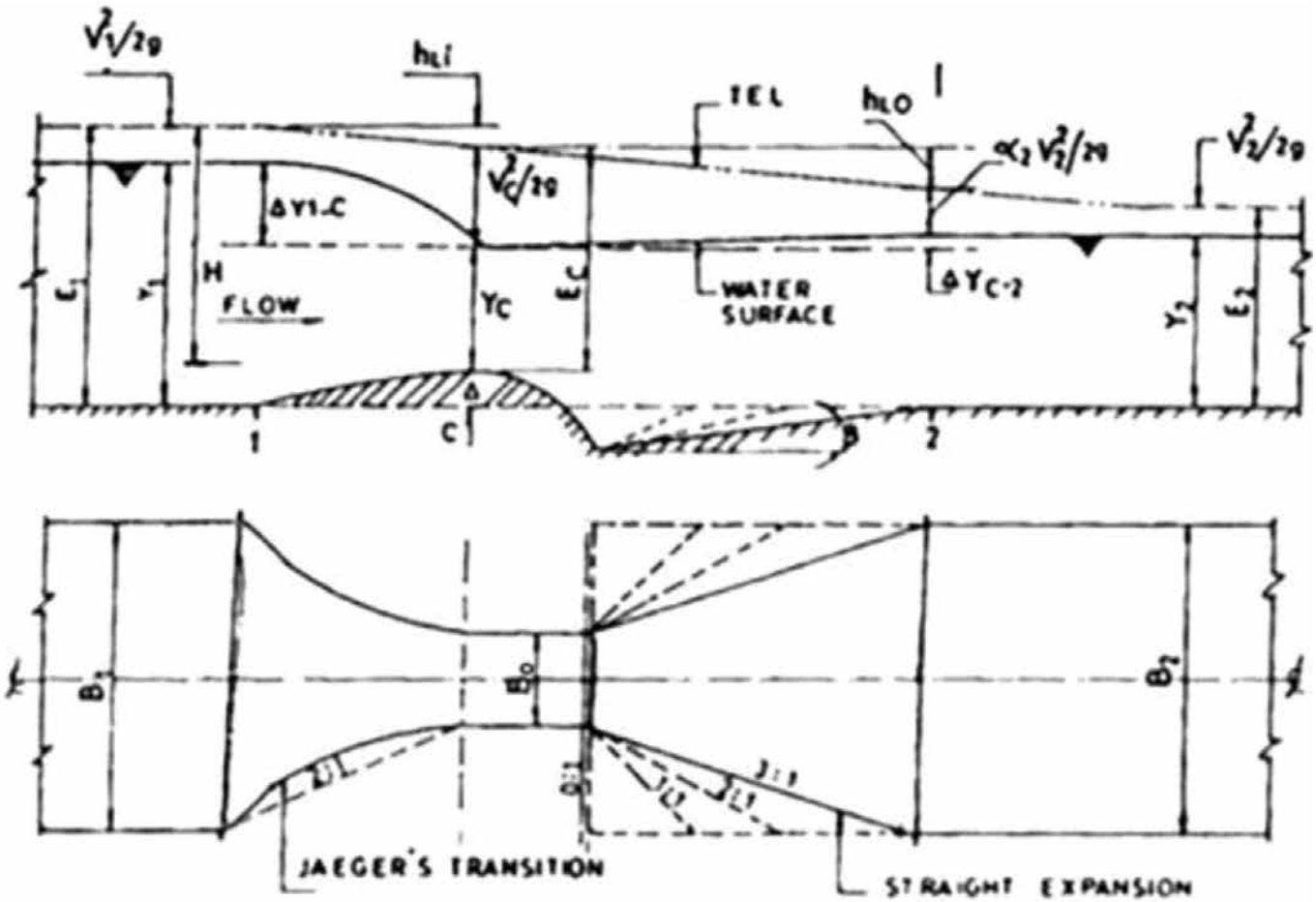
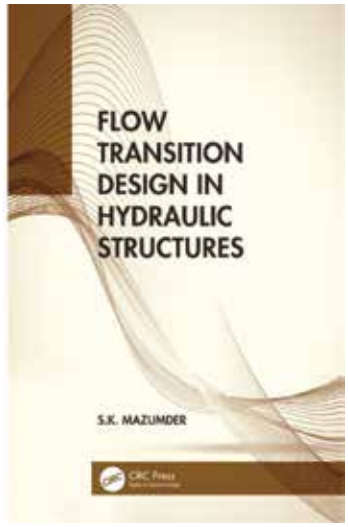


Figure-1 An Innovative Proportional Flow Meter

Flow Transition Design in Hydraulic Structures



S. K. Mazumder
Independent Professional, India

Transitions are provided in hydraulic structures for economy and efficiency. This book covers all types of flow transitions: sub-critical to sub-critical, sub-critical to super critical, super-critical to sub-critical with hydraulic jump, and super-critical to super-critical transitions. It begins with an introduction followed by characteristics of flow in different types of transitions and procedures for hydraulic design of transitions in different structures. Different types of appurtenances used to control flow separation and ensure uniform flow at exit of transition and diffusers are included. Examples of hydraulic design of a few typical hydraulic structures are given as well.

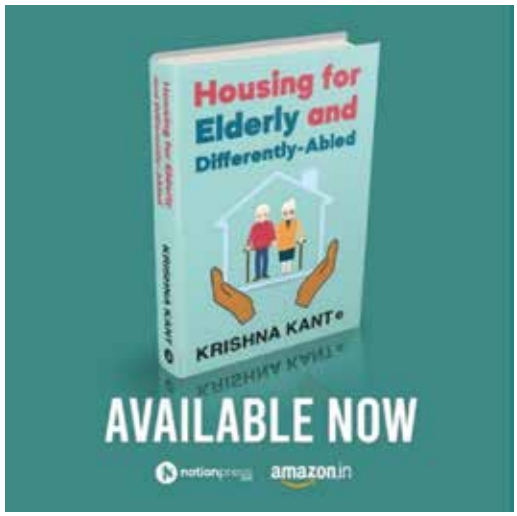
Selected Contents

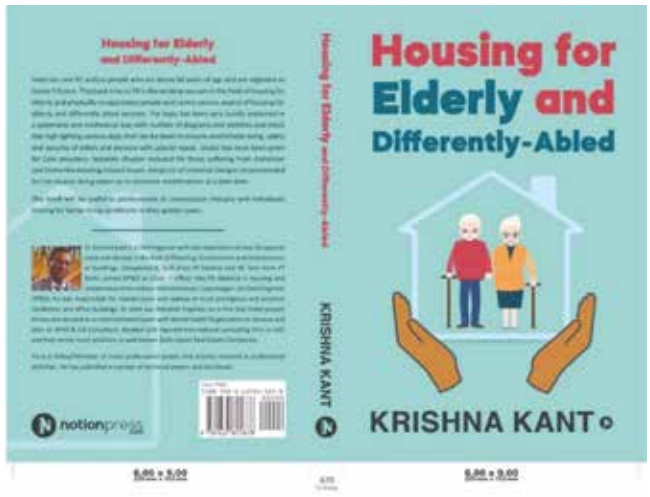
1.INTRODUCTION2.CHARACTRISTICSOFFLOW IN TRANSITION STRUCTURES 3. DIFFERENT METHODS OF DESIGN OF TRANSITION IN HYDRAULIC STRUCTURES 4. APPURTENANCES FOR ECONOMIC AND EFFICIENT DESIGN OF TRANSITION STRUCTURES 5. ILLUSTRATIVE DESIGN OF FLOW TRANSITIONS IN HYDRAULIC STRUCTURES

ISBN: 978-0-3672-3638-0
February 2020, 190 pp.
Catalog no. K422635
$99.95 / £76.99
$79.96 / £61.59
SAVE 20% when you order online and enter Promo Code ENG19
FREE standard shipping when you order online.

Book Published by Mr. Krishan Kant, Life Member of CEAI

My Book Titled "Housing for Elderly and Differently- Abled" has now been published by Notion Press. It has 298 Pages and is available at
https://notionpress.com/read/housing-for-elderly-and-differently-abled
The book is available on Amazon.in and Flipkart. (No discount)
The author would be grateful for reviews and valuable suggestions/observations.





Prof. S K Mazumder received the ISH Journal Reviewer Award from the Indian Society for Hydraulics

OTHER NEWS, VIEWS & NOTES

VIEW POINT

Indian Consulting Organisations and Professionals are doing yeoman services in many developing countries in Africa, Central Asia, South East Asia – the ASEAN countries, and South America. They are providing appropriate solutions which are affordable for developing countries and for that they adapt from or modify the more expensive ones which may not be the right fit. Articles could discuss the qualifying requirements, the sources of assistance for funding for the consulting engineers, the major sectors where opportunities are available, etc. Consulting Engineers are requested to share their experiences – the trials and tribulations, they encountered in the bargain but doggedly pursued their aim and ultimately achieved it. Apart from direct project involvements there are others who are involved with arrangements such as the offshore design services for foreign Consulting Engineering organisations or even foreign Owners directly. Consulting Engineers could also be involved with training etc. Articles are invited on all aspects from CEAI Members and various stakeholders on the subject considering their experience.

Authors are urged to share their knowledge and experience by providing case studies of the works executed or in execution, first-hand accounts of the challenges faced, practical issues experienced and the solutions to those, etc. Photographs, charts, diagrams, drawings, etc. would benefit readers for better appreciation of the issues encountered and the manner in which they were addressed.

The themes for the ViewPoint issues for 2021 and 2022 are given below.

Sl. No.	Theme	View Point issue
1	Export of Consultancy Services	March 2021
2	Risk and Resilience (to cover Climate Change, Natural and Man-made Disasters, Integrated Engineering, etc.)	June 2021
3	Flood Management in Built Environment	September 2021
4	Changing Technologies for Consulting Engineering (to cover Business as well as Technical)	December 2021
5	Becoming *Atmanirbhar* – Concept to Reality	March 2022
6	Contract Management	June 2022
7	Tall Buildings in India (to cover all aspects conceptualisation to end of design life)	September 2022
8	Technology/ Engineering for Sustainability and Circular Economy	December 2022

The articles for an issue need to reach CEAI at least 3 weeks prior to the end of the month of the View Point issue.

Articles need to be in Times New Roman 12 with single line spacing with before and after 6 pt and normal margin, on A4 size. A recent clear and bright passport size photograph of the author(s) is to be sent along with the article.

Advertisement in View Point

VIEW POINT is circulated to all CEAI Members, FIDIC, Ministries of the Government of India, Public & Private Sector Undertakings, Construction Firms, Contractors, Consultants, Foreign Missions and Funding Institutions in India and other organisations related to or dealing with the engineering profession.

Advertising in the VIEW POINT gives the advertiser wide exposure and visibility.

Support from CEAI members and stakeholders are sought in increasing the number of advertisements, such that View Point gain in its stature as a unique Technical Publication.

The rates for advertisements in VIEWPOINT are given below. This is excluding GST @ 5% or as prescribed, which will be extra:

Item	Rate Per issue* (Rs)	Discounted rate at 20% for 4 consecutive issues* (Rs)
Back Cover	25,000/-	80,000/-
Inside Front Cover **	15,000/-	48,000/-
Inside Back Cover **	15,000/-	48,000/-
Full Page	10,000/-	32,000/-

**GST @ 5% or as prescribed will be added to the above rates.*
***Inside Front & Back Covers booked till June 2021 & Sept 21, respectively*

Tech Quiz

1. Which continent has the highest untapped hydro-power potential?
   a) Asia
   b) Africa
   c) North America
   d) South America
   e) Europe

2. When was the first central generating power station established?
   a) 1867
   b) 1877
   c) 1890
   d) 1882
   e) 1878

3. Which was the first Thermal Power Plant in India?
   a) Emambagh Power Station
   b) Bokaro Thermal Power plant
   c) Hussain Sagar Thermal Power Plant
   d) Koradi Thermal Power Plant
   e) Namrup Thermal Power Plant

4. Which is India's indigenous supersonic Light Combat Aircraft?
   a) HF-27 Marut
   b) HJT-36 Sitara
   c) AMCA
   d) Tejas
   e) Rudra

5. When was the first cotton mill established in India?
   a) 1818
   b) 1861
   c) 1870
   d) 1863
   e) 1854

6. Who created the Indian harmonium?
   a) Vidyadhar Oke
   b) Alexandre Debain
   c) Satyaki Kraig Brockschmidt
   d) Dwarkanath Ghose
   e) Bhishmadev Vedi

7. When was PSLV first launched?
   a) 1993
   b) 1978
   c) 1994
   d) 2013
   e) 2000

8. Which was the first car made in India?
   a) Morris 10
   b) Hindustan 10
   c) Fiat 1100D
   d) Austin A 40
   e) Maruti 800

9. Which is the oldest dam in India?
   a) Hirakud Dam
   b) Vaitarna Dam
   c) Peechi Dam
   d) Kallanai Dam
   e) Dharoi Dam

10. Which was the first steel plant in India?
    a) Metal & Steel Factory
    b) Durgapur Steel Plant
    c) Rourkela Steel Plant
    d) TISCO
    e) Bengal Iron Works Company

Contributed by A P Mull

The first person who mails the correct answers to CEAI *info@ceai.org.in* will get a congratulatory mail and will be acknowledged by publishing the persons photograph in the next issue.

Answers to Tech Quiz December 2020 issue
1(d), 2(b), 3(a), 4(f), 5(d), 6(c), 7(a), 8(c), 9(d), 10(d)

Intercontinental Consultants and Technocrats Private Limited

Innovative, Creative & Technologically Sustainable Infrastructure Solutions

Affiliate Member

ACHIEVEMENTS / MILESTONES

- Over 68,000 km of Road Feasibility and Detailed Engineering Design
- Design of over 4,100 Bridges and other Structures.
- Transaction & Financial Advisory for Projects of Capital Value over USD 7 Billion
- EIA / SIA for over 600 Projects.
- Nearly 25,000 km of Road Construction Supervision and Project Management.
- Over 60 Airport Projects Involving Planning, Design & Supervision
- Road Safety Audit/ Black Spots Improvement/ Awareness Campaigns in over 100 Assignments
- Water Supply Schemes for over 500 Towns and Villages
- Design of over 4,100 Bridges, Tunnels and other Structures
- Over 45 Projects of Railways and Metro Rails
- Master Plan and Development Plans for over 77 Cities/Towns
- Irrigation Planning & Design of over 8,00,000 ha. Gross Command Area

KEY BUSINESS VERTICALS

Expressways, Highways and Roads

Bridges, Flyovers, Interchanges and Other Structures

Tunnels

Airports and Aviation Systems

Railways and Metro Rails

Traffic, Transportation and Intelligent Transport Systems

Institutional Development and Capacity Building

Transactions and Project Finance

Water Resources, Water Supply and Public Health Engineering

Building and Architecture

Environmental and Social Sciences

Urban Regional Planning & Smart City Solutions

Incorporated in	Worked on Over	Presence in Over	More than
1987	730 Projects	47 Countries	1000 Employees

Let us work together for a better tomorrow

A-8, Green Park, New Delhi - 110 016 Phone: +91-11-40863000

business@ictonline.com, recruitment@ictonline.com www.ictonline.com

Follow us on

Bentley®
Advancing Infrastructure

AECOM Offices
Orlando, FL, USA

AECOM IS GOING DIGITAL WITH BENTLEY

Reconnecting the people of Miami–Dade County Florida

Going Digital enabled AECOM to improve traffic operations, enhance safety and help protect environmentally sensitive areas at a busy Florida highway, pedestrian bridge and railroad crossing.

AECOM is making every project as good as their best project.

Learn more about AECOM's work
and take your Going Digital assessment
Bentley.com/going-digital-roads

BARSYL - REBRANDING

OUR JOURNEY SO FAR:
In our **Three Decades** of existence, we have evolved as an organization, keeping pace with the times. Today we are bigger - our company consists of **Highly Trained and Talented** individuals, a growing client portfolio that we are certainly proud to serve.

We have footprints in 18 countries across 5 continents.

As we steadily added to our competencies to offer holistic solutions for our Stake Holder's, we decided it was time to present ourselves in a New Avatar to the world.

BARSYL
we innovate

THE NEW LOGO AND BRAND -
THE THINKING PROCESS BEHIND IT ALL:

As an organization that has stayed relevant in time, we have built a **Legacy of Trust** with our clients and delivered new ideas.

This resonates in our new tagline - **"WE INNOVATE"**.

The logo lettering in contemporary with the alphabet "**A**" symbolizing a gateway or an entry point to innovation, newer ideas and more milestones.

Color is an essential element that defines a brand image. We chose the two colors, red and black, with a reason.

Red - a dynamic color that demonstrates our boldness and evokes a feeling of optimism and energy.

Black - a classic color that evokes power but also means professionalism, which is reflected in our work.

However, behind the new look, we are still the same company and team, dedicated to providing the best possible service and solutions.

We are proud of the work we do.

"BARSYL - WE INNOVATE"

TATA

TATA CONSULTING ENGINEERS LIMITED

ENGINEERING
A Better Tomorrow

Since 1962

Tata Consulting Engineers Limited (TCE) is an Integrated Engineering Consultant providing concept to Commissioning Services. With 10,000+ project delivered in more than 55 countries, the company has a double-digit five-year CAGR. TCE, amongst the top 2 consultants in its core sectors - Power, Infra and Resources is a well-diversified firm with equal distribution between domestic and international projects. TCE continues to be a part of the Nation's Strategic Projects across Infra, Transportation, Nuclear, Power, Defence, Space and Urbanisation.

SERVICES WE OFFER

Design & Engineering
Project Concept Development, Pre-feasibility & Feasibility Reports, Detailed Project Reports, Environmental Study Reports, System Studies, Frontend Engineering Design (FEED), OE Services, Detailed Engineering

Project Management & Safety
Project Management, Engineering Review, Construction Management/Supervision, Program Management, Interface Management, Specialised Services, Quality & Saftey Audits, Outage Management

Digital and Advanced Technology
3D Modelling & 4D Simulation, Asset Digitisation, Engineering IT Services, BIM & IIoT, New Machine Development, Machine Localisation, Machine Component Development, Design Validation, FE Analysis, Special Projects

Procurement Management
Procurement Assistance, Quality, Inspection & Equipment Management, Vendor Quality Assessment, Vendor Management,

SECTORS WE SERVE

Power	Thermal, Nuclear, Renewable, Captive, Energy Storage, Transmission & Distribution
Infrastructure	Water, Sewage, Sustainable Infrastructure, Urban Development, Buildings, Industrial & Manufacturing Facilities, Ports & Transportation
Hydrocarbons & Chemicals	Oil & Gas, Petrochemicals & Refineries, Food & Pharma, Specialty Chemicals
Mining & Metallurgy	Ferrous & Non-Ferrous, Geology & Mining, Beneficiation, Material Handling

To know more: Visit www.tce.co.in or send an email to tceconnect@tce.co.in

STUP Consultants Pvt. Ltd.

STUP, established in 1963, an Indo-French organization of international repute which provides design, construction engineering, technology transfer and project management services for multiple sectors.

Sectors

01. Airports & Aviation
02. Environmental and Public Health Engineering
03. Energy, Telecommunication and Space Infrastructure
04. Roads, Highways, Expressways
05. Urban, Rural and Industrial Development including all Types of Buildings
06. Bridges & Flyovers
07. Railways
08. Offshore, Harbour and Coastal Engineering
09. Metros
10. Water Resources and Agricultural Development
11. Construction Engineering, Project Management and Technology Transfer
12. Rehabilitation of Structures and Heritage Buildings


01

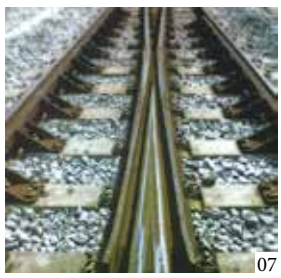

02


03


04


05


06


07


08


09


10


11


12

Regd. Office: 1004 & 5, Raheja Chambers, 213, Nariman Point, Mumbai - 400021. India. Tel: +91 22 40868686 Fax: +91 22 22048424
email: mumbai@stupmail.com web: www.stupco.com

• Los Angeles • Paris • Ahmedabad • Bengaluru • Chennai • Guwahati • Hyderabad • Kolkata • Mumbai • Navi Mumbai • New Delhi • Pune • Port Louis • Muscat • Dhaka • Baghdad