



## CONTINUING PROFESSIONAL DEVELOPMENT OF ENGINEERS – CHALLENGES AHEAD

Held on: Friday, May 27, 2005

Venue: India Habitate Centre, New Delhi

In the present day world, technical break through has revolutionized the engineering profession. Consequently, it is now a complex function of knowledge, skills and attitude. The knowledge base of every profession keeps expanding with the passage of time. Globalization of engineering profession is unavoidable against intense global competition.

In the WTO environment, an engineer is required to continually upgrade his skills for enhancing his/her technical competency together with a commitment of providing an effective and efficient ethics based service to the society.

The Continuous Professional Development Programme (CPD), therefore, has to be so devised as will keep the professional engineers updated with the latest developments in their fields of specialization.

The National Conference on CPD-Challenges Ahead, therefore, aimed at reviewing the critical issues for formulating and implementing the CPD Programmes of matching global standards set by the Engineers Mobility Forum (EMF). The System and Procedures for CPD developed by the ECI which meet the standards set by the EMF were also deliberated.

The Conference focused on CPD-Vision, CPD Activities and Evaluation Mechanism, Role of Professional Associations and presenting of the Action Plan.

The Conference was inaugurated by Shri Oscar Fernandes, Hon'ble Minister of Sate, Minister of Statistics and Programme Implementation, Government of India. The key note address was delivered by Dr. R.A. Mashellkar, Secretary, DSIR and DG, CSIR. Over 300 distinguished participants took part in the deliberation.

Attempt has been made to present the proceedings of the conference as it emerged during the deliberations. However, for facilitating a proper presentation some editing has been done by Lt Col (Retd.) K.K. Chitkara, AVSM, Consultant, ECI and Shri P.N. Shali, Director, ECI.

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**1. INAUGURAL SESSION**

- Welcome Address:** Dr. Uddesh Kohli, Chairman, ECI
- Keynote Address:** Dr. A. Mashelker, DG, CSIR
- Inaugural Address:** Hon'ble Min. Mr. Oscar Fernandes, Ministry of Statistics and Programme Implementation
- Vote of Thanks:** Mr. Chander Verma, President, ICC.

**Dr. Uddesh Kohli**

I welcome Shri Oscar Fernandes, the Hon'ble Minister of Statistics and Programme Implementation, Dr. Mashelker and all the distinguished Session chairmen, authors, guests and delegates to the "Second National Conference on CPD- Challenges Ahead" being organised by the Engineering Council of India. We feel proud of engineers like Dr Mashelker, who have really given recognition to the Indian engineering profession all over the world.

The first Conference was held two years back- when the ECI had come up with "Systems and Procedures for Registration of Professional Engineers". ECI was formed in April, 2002, as an apex body by 25 Professional Association of Engineers, biggest and the most important one being the Institution of Engineers (India). ECI has worked on the two major areas:

1. to develop systems and procedure for the registration of Professional Engineers (PES), which has become very important,
2. to draft the Engineers Bill so that engineering could be recognized as a profession and it can be effectively regulated,

Both these tasks were the focus of ECIs First Conference on Professionalisation of Engineers held on April 30-May 1, 2003. The focus of the Second Conference is on Continuing Professional Development (CPD) of Engineers.

The registration of PEs is now considered necessary in our country. It is already taking place in several other countries. It is for the regulation and recognition of engineering profession and ensuring accountability for their actions. In our country, we have in place the systems for registration of several professions including the medical, the dental, the architects, the lawyers and some other professions; but for engineers, there is no law or Act for governing this profession. The ECI has drafted the Engineers Bill that is being processed by the Ministry of HRD. It is the Engineers Bill that will make registration of the professional engineers mandatory.

In the context of WTO and GATS, if Indian engineers have to take up assignments in other countries, they must meet the professional requirements of the WTO and GATS systems. Many

countries have developed systems and the criteria which regulate the professional engineers and they would like similar regulations to be applied to the Indian engineers working on their projects, or on their assignments. So in the international context, it is necessary to have some similar criteria and systems in place in India for registration of professional engineers.

The criteria and systems for registration of professional engineers, which have been developed by ECI, have been more or less agreed to by all the member associations. There will be both the national and international registration of professional engineers. The criteria for "National Register" and International Register' could be common or different-as some countries have different criteria in terms and number of years of experience. But, the basic criterion everywhere is that there has to be the Bachelors Degree in Engineering or its equivalent from a recognized university, or from an Institution, which is equivalent to Bachelors Degree. There is a specified experience requirement for the International Register all over the world. Some countries have 7 years minimum experience for the International Register, but many other countries have kept the minimum experience of 4 years to come on the National Register of the Professional Engineer (PE). We have thought of 7 years minimum experience so that we are in line with the international practice.

The engineer who has to be a PE will have to pass some examinations. Most of the countries have two examinations i.e. "Fundamentals of Engineering" and "Practice of Engineering" which an applicant has to pass and then qualify at the competency assessment. In our case, we have also kept these two examinations with some exemptions for those applicants who are from the "A Grade Institutions", they do not have to pass the Fundamentals of Engineering examination. Further, those with at least 15 years of experience in the first batch could be exempted from both the examinations.

The competency assessment is very important and that is where the CPD comes. CPD has to be assessed and evaluated and that is one of the themes for today's Conference. CPD could be done through various ways. Further, the PEs' should abide by the "Code of Ethics", which has been developed by the ECI and, all most all the "Member Associations" have accepted it.

CPD is a pre-requisite in the registration and re-registration processes. It has to be done in two stages:

1. before the registration of PEs i.e. when their competency is to be assessed and they have to be approved for certification as a PE; and this registration would be valid for 5 years
2. later, there is also a provision that after 5 years they have to be re-registered and this registration would be valid for 5 years; during that 5 years period their work competency and CPD have to be again reported and assessed for re-registration.

CPD is for updating knowledge, skills and competency. CPD helps in improving the performance of the engineers, who are working on the various assignments. In today's conference, we are covering three aspects in three technical sessions. These are 'CPD - Vision', 'CPD-Activities and



Evaluation Mechanism' and 'Role of Professional Associations in CPD Promotion'. In the concluding session, the Action Plan will be deliberated.

In the CPD Vision Session, we are going to discuss about the performance standards and practices, the expectations from engineers and the type of CPD programmes that will be helpful, so that we look at the total vision.

In the Second Session, we are going to discuss the CPD Activities, which - in addition to the Bachelors Degree in Engineering and on-the-job experience - would include a formal education and training and informal learning. The informal learning could be through attending various conferences, seminars and meetings and the professional service activities like academic activities, teaching, research, lectures, publications, and providing consultancy. All these are to be counted for the CPD.

The evaluation of CPD has to be a continuous process. We also have the credit hours provided for each type of the CPD activity. These credit hours have been given in the background paper prepared by the ECI, which has been circulated.

The role of professional associations is being discussed in the third session. These associations have a very important role to play in the registration of PEs, in their CPD and enforcement of ethics and morality. They will set up the national committees for their respected disciplines. These committees will evaluate the candidates for the registration of PEs. Obviously, they will evaluate the CPD. They will also conduct the competency assessment and recommend registration or re-registration based on their assessment. They will also maintain the database of candidates. They will identify programmes and institutions eligible for running and assigning credits to these programmes. In some countries, for example Ireland, the organizations organise the programmes also.

There are in-house or in-company programmes, which are also eligible for credits. These are identified and certified. Similarly, India also could have the systems which will enable professional associations identify, organise and certify programmes, which will give "Credit Points" to its members who attend such programmes. These "Credit Points" can also be used for evaluating professional competency by these organisations. There is going to be a major role for the professional associations to play in creating awareness for the CPD and consequently for encouraging professionalisation. And this is what we are going to discuss in today's Conference.

[Dr. Uddesh Kohli is the Chairman of ECI, CIDC, CDC and President Emeritus of ISTD. He is former CMD of Power Finance Corporation, Advisor, Planning Commission; Chairman SCOPE), President of AIMA, President of CIE.]

**Dr. R.A. Mashelker**

Thank you very much Dr. Uddesh Kohli for giving me this opportunity to be among engineers, who are the builders of India. Myself, I am very proud to be an engineer. An engineer tries to attain the

unattainable and you can quickly see things which did not exist in the past. Engineers keep the society going because the entire society depends upon the hardware as well as software that is all created by engineers. And therefore, engineers have a huge responsibility to discharge for building the modern Indian Society.

It is often said that technology shifts society; and society also in turn shifts technology. It is an engineer who shifts technology; therefore, it is an engineer who shifts society. The processes and products that engineers create transform society. Just look back 25 years in time; we had no laptop, no internet and no mobile. We find their role in our lives today. Engineers have actually made it possible. It is because of engineers that the knowledge economy is being created. I do not think that it would have been possible, but for engineers. Therefore, when we look at the role engineers have played in India, I must say, it is tremendous. There is misperception that India is a great scientific power. I think, India is a great engineering power. The contribution of Indian science is less than 2%; so we are not great scientific power, but we have a great engineering power. India has highest number of engineers in the world; it is engineers who created designs of our satellites. And, therefore, we need engineers to recognize the tremendous role that they have played and they will continue to play it.

This Conference is all about challenges as well as the opportunities ahead. What are the challenges ahead? The challenge is very simple one; we are talking about globalise world; we cannot talk about different standards any more; and we cannot talk about first class, second class and the third class engineers. There is only one class and that is world-class. If you are not world class, you are out of it. Your products will face competition because with import duties are falling and coming close to zero, the customers have a choice today. He / she can pick up whatever he / she wants. Few decades ago, the Government did not give much choice to buy a car; it said that you can buy either Ambassador or Fiat. Today you have a wide choice of cars to buy from. If you really look back at it, it is the engineers who have made things happen. Fifty years ago, you had British Car which has been and is being sold as the Indian Ambassador on the Indian roads. Today, it is Indica which is being sold in London. We have turned around full circle in the last fifty years. Rattan Tata has trust in several hundred engineers. They never designed a car and now have risked Rs. 1760 crores to create Indica. It is the highest ever investment in the indigenous product in a private sector and you see the magic today. India is producing world-class products. I would say this has been challenge number one, which has been met.

The challenge numbers two, which is something that I do not think the Indian engineers have really looked at seriously, is the challenge in being a part of the developing world, where a significant part of the society is poor. Infact the challenge of being a part of the world where 4 billion people out of 6 billion have income less than two dollars a day, I think, the Indian engineers have not yet taken seriously the job of creating products which should fit a particular price performance envelop. To meet the challenge they should read the book titled "Wealth at the Bottom of the Pyramid" authored by Shri C. K. Birla. If we look at the huge population of 4 billion people whose income is less than two dollars a day, it could become a market of three billion dollars. The Indian engineers should create products and develop services which can actually be of great use to these people.

Recently, you must have seen products called softcom that is what was launched under the new millennium leadership initiatives. I remember five years ago, it was started with the very simple purpose: the title itself described the challenge; the title was "New Millennium Indian Technology Leadership Initiatives". I do not think we can go to any product which has made a global mark or which you have discovered before. Earlier, the government gave money to the public institutions like CSIR to develop products, where technology was available. And thus, we became copy-cat engineers. Now, we have changed the pattern of funding. What happens now is that if you fail, well it does not matter, the money is written off. We have some thing like 225 public/private partnerships- including 65 private sector companies-which are involved today in developing products. I remember five years ago when the price of a PC was around Rs. 60,000 to Rs. 70,000, we said, "make it less than Rs. 10,000 and this challenge was met by an engineer and he has developed the product.

I mean, we imagine the kind of features that we want and put these in a price performance envelop. It is a new challenge; and I do believe that our engineers from the developing world will have to meet such challenges. I was talking to some body on the other day that we could develop sanitary napkin for Rs.1. Imagine the kind of comfort such products can provide to a section of the society. Believe me, engineers will be required to create products in the price performance envelop which the poor can afford. I hope engineers will take up this approach as a challenge and create products which are cheaper, better and smarter.

While looking at the background material provide to me, I was astonished to see the achievement of civil construction where in every five days a floor is raised. With the new materials, the kind of challenge that the engineers are going to have is enormous and, therefore, the points that Kohli Sahib made with regard to what you might like to call as the advancement of our professional skills and knowledge because of science and technology, I think are very crucial.

In fact people say in some sectors knowledge has doubled up every five years. In some other sectors, it has happened every 10 years. What does it mean? It means if you are in the year 2005 and compare it with whatever knowledge was developed till 1995, you will find that in the year 2005 it has doubled. Therefore, getting outdated is something which is a natural process; just like the human body; you know human body has this basic phenomenon where old cells are shed, new cell are generated and that is how we remain alive. Therefore, if you do not continue to develop your skills through the continuing professional development process, you may be completely outdated.

An individual has an opportunity, practically every day to add 1 or 2% to his knowledge. And, therefore, given the availability of Internet, web and personal computers, there is an enormous scope for self learning. I was talking on the other day to a MIT professor as to how they develop the course content of very advance courses in the MIT and make it available to people. I was told that it is done through online consultation with experts located in countries far apart, but all are connected online, and it is like a normal meeting. In one- and-a-half hour, the meeting is conducted without going to London or to any other place. Therefore, we can say that the entire

world is changing and that is why I said society will set technology, technology will set society and engineers will find ways of doing things.

I believe one of the issues that you will talk about is awareness of professional values and ethics. I think that is going to be extremely critical because society depends upon engineers and they will have to work with ethics and values in the competitive economic environment to serve the society better. When the Bhopal disaster struck, around 2000 people died and several hundred thousands suffered. Why this happened? I think, this happened because engineers then did not work with ethics or professional values.

The issue of professional values and ethics is going to be very critical because society is getting more aware of its rights. While I believe in our continuing professional development, it is now going to be one of the key points. And of course, the career advancement is important because we are advancing. An engineer is the President of India today. He is making us proud with the way he has been carrying on the knowledge torch around the world. In the end, I would like to say that the biggest challenge before the Indian engineers today is to build India.

[Dr. R. A. Mashelker is the Secretary, DSIR and DG, CSIR, Ministry of S&T, Govt. of India. He is an outstanding engineer and scientist. His academic distinctions include Fellow of the Royal Society, UK, Indian National Science Academy, Indian Academy of Sciences, National Academy of Engineering. Honours and Awards earned by him include Padmashri (1991), Padmabhushan (2000), Pandit Jawaharlal Nehru Technology Award (1991), G.D. Birla Scientific Research Award (1993), JRD Tata Corporate Leadership Award (1998), Material Scientist of the Year Award (2000), Shanti Swarup Bhatnagar Medal for Excellence in Science by INSA (2001), Dadabhai Naroji Award (2002), IMC Juran Quality Medal (2002).]

#### **Mr. Oscar Fernandes, the Hon'ble Minister of State**

First of all I would like to tender my sincere apology for having kept you waiting. It was due to some technical problem, which resulted in the delay of my flight from Orissa, where I had been on an important public engagement. I am happy to note that in this conference, we are about to discuss the various issues connected with engineers of our country and in the global context. I am not the student of engineering or a technocrat but I have been a keynote speaker and today my Ministry is charged with responsibility of monitoring projects costing more than Rs. 20 crore in India. My Ministry is monitoring implementation of these projects and this is a very big task from the point of view that the cost overruns have to be pegged down so that the country doesn't lose money; and the projects yield returns immediately. In the fast growing economy, we need speedy and cost effective implementation of projects.

I am glad to learn that the various engineering organizations have come together to form the Engineering Council of India. The challenge before us is not only what we have to do within the country but also to seize opportunities that are coming up due to globalization. Engineers from the other countries would like to come and take up work in our country; whereas our own engineers will like to take up projects in the other countries. It is ultimately competence and the

investment that will matter. So, if we are able to handle this well, I think, nothing can stop India from conquering the best position in any part of the world.

There are gaps in technology. We will have to bridge these gaps. This will have to be done by sending people to other parts of the world for learning about their technological achievements apart from continuously learning from the Indian institutions, which are also now world-class. This is a very important aspect. Many a time I talk to people in position including govt. officers in the engineering departments. They tell me that we are not aware of the latest developments in technologies. This should not be the case. If somebody in a high position says I am not aware of this technology or that technology, it really pains me and, I think, with ECI in position today, we will be able to change this position through the continuous professional development programmes that will be undertaken by the various agencies and it will also help in acquiring the latest technologies and skills available in the world. I am happy to note that the ECI has developed the "Systems and Procedures" for the continuous professional development of engineers which are matching with that of the "Engineers Mobility Forum (EMF)".

I am sure you have discussed all aspects of engineering and the challenges before you. Since my Ministry is dealing with this subject, I am always available to you for discussion. There is a point, which I came to know from the other countries and this is regarding the certification. Engineers get the certificate from a university, but the certificate about which I am talking is something different. An engineer should be practicing the subject which he has studied; and he should be able to deliver the tasks which are entrusted to him. Therefore, his competence needs to be certified. The new thing that is coming up for India may not be new for the other countries. I am happy to know that the ECI is seized of this important matter.

An engineer can be a project manager as well; and he is the most competent person to be so. He should be able to handle finance, planning and so on. In other words, an engineer should not be competent only in engineering but also in the project management. If he / she can handle planning and finance, then I think, he / she is more suited to be a project manager. We could think of a process through which he / she can start issuing certificates. This he / she can do through an institution and not by the government. Certification at various levels to handle projects costing say Rs. 500 crore, Rs. 1000 crore or Rs. 10,000 crore depends upon the field experience of an engineer who has dealt with such projects. The other factor is the speed with which we are able to get projects completed; this speed is money. If you are going to take 10 years to complete a project, you will get returns after 10 years. As against this, if by your own innovative skills, you can do it in 5 years; you will start getting returns after 5 years apart from saving money due to the speedy implementation which surely will result in lowering of costs including interest and all other costs.

What we find today is the race for launching projects without going into details. The truth is that we do not plan comprehensively projects as a system. We find that even the land is not available, water is not available and there are no connecting roads. We are not able to complete the project in time as we do not work out the logistics required to complete it. Whether it is a railway project, hydro project or airports, there are various aspects to be considered. Before we take up a project,



I think, whatever is required to be lined up must be lined up; this is a part of engineering and project management.

I would like to go through the proceedings of your conference, because, as I said, I am not a technical person but I am keen to know what the things are worrying us. What are the things we have come to the conclusion? I do not know as to how the Government can step in to see that the ECI grows and helps to achieve its objective within the country and abroad. I would appeal to all of you to study professional literature available in the world, attend courses and the workshops that are organised by the various bodies regularly, particularly in the field of your specialization for your CPD. We go by what is taught to us in the colleges, but ultimately it is the experience and CPD that makes a person perfect in the profession. I think you should go into these and continue to upgrade your skills regularly.

[Mr. Oscar Fernandes is the Hon'ble Minister of State, Ministry of Statistics and Programme Implementation. ]

**Dr. Uddesh Kohli**

Hon'ble Minister Sir, we are really very grateful to you for joining us for this very special session. In spite of all the problems we heard that you had with your aircraft, you are with us this moment. You have very rightly mentioned about the role of engineers in the project implementation that is to make sure that all the development targets are implemented. You have also mentioned about the international markets where the Indian engineers can now take up project assignment. In fact many feel that we have the biggest opportunity available for this today.

In the service sector, after the IT, it is now the age of engineers. Our engineering, our designs and our capabilities are superior. They cost much less and there is a tremendous scope for outsourcing them. What we need is a good encouragement. ECI has put in place the registration process for engineers, which is equivalent to that of the EMF countries.

ECI is processing the Engineers Bill with the Ministry of HRD. From the Government, we need encouragement in various things. We will come to you for seeking your help. The main problem confronting us is that the engineering is not recognized as a profession in our country; where as we have the medical council which looks after the medical profession; the bar council which looks after the legal profession; there is a council for architects; engineers have no such body and that is what for the ECI has been formed. We are now requesting the Government to have a law for engineers; we have submitted the draft Bill in this regard to the Government; it is being processed by the Ministry of HRD. We need your support. Because, when we want to take up a project in the other country, it's not only the "Engineering Degree" but also many of these countries require certified professional engineers by a body like the Engineering Council of India. We are focusing today's discussion on the continuous development of skills and knowledge of our engineers so that they can contribute more towards the development of India.

**Mr. Chander Verma**

The focus of the 2nd Conference organised by the Engineering Council of India (ECI) is on the continuous professional development of engineers (CPD), particularly in the era of WTO. The "Conference" is based on the basic paper prepared by ECI, which is given in the souvenir.

It is my proud privilege and pleasure to thank the Hon'ble Minister for giving us the benefit of his words of wisdom and thought and on accepting our request to grace the occasion with his august presence as the Chief Guest which he made it possible despite his very busy schedule of work, particularly in Orissa. He was kind enough to reschedule his very important public engagement in Orissa for making it back to Delhi for the conference, which he made it possible despite some technical snag in the flight which delayed his departure from Orissa. This shows how important he valued the conference. He gave us his thought provoking address. We are grateful to you, sir, for showing us the way, particularly towards our destination of implementing projects speedily and competitively. The inspiration provided by you, sir, and the recent policy regarding the management of construction works by the professional project engineer-managers is an indication of the scope of things to come in future. ECI will seek your guidance and help in its future work. I thank you once again, sir.

I thank Dr Mashelker- the leading engineer and technologist of the country- for having accepted our request to be the Guest of Honour on the occasion despite his very busy schedule for the day and for giving us the benefit of his thought provoking address. While providing us the inspiration for developing the system and norms required for setting the benchmark for our engineers, he explained the meaning of an engineer and the role he / she has to play in the new economic environment, which was very enlightening. He rightly said that we are an engineering power house; and we have to be world-class in skills and actions, indeed.

I also thank esteemed professionals for contributing their papers which led to the objective deliberations and hence success of the conference.

I thank the distinguished delegates' and guests e, who together represent a vast diversified section of the engineering professional in the country, for making it possible to respond to our call for attending the "Conference" and contributing deeply in its success.

Our thanks go to Dr Uddesh Kohli, Chairman, ECI who has lead the movement and is continuing to do so dedicatedly despite his numerous engagements with very important assignments related to development of India. His has done a yeoman's service to the development of training and development infrastructure in the country apart from his very distinguished contribution in the development of infrastructure, industry, power and other important sectors of our economy.

I thank all the Member Associations and Members of the BOGs of ECI for their guidance and valuable help, I thank Shri Shali, Director, ECI and his staff for organising the "Conference" dedicatedly despite many constraints.



We are thankful to the management of the India habitat Centre for providing us the venue for the conference and for making other arrangements for it.

At the end let me assure you, ladies and gentlemen, that we at the ECI will endeavour to enhance the level of skills through the continuous professional development of our engineers, which is the mission of ECI and the objective of this conference.

[Mr. Chander Verma is the Treasurer of ECI, President of the International Council of Consultants and the Managing Director, Continental Construction Ltd.]

**2. TECHNICAL SESSION-I: CPD - VISION**

- Chairman:** Lt. Gen. A. K. Puri, PVSM, AVSM, (Retd) Chairman, Indian Institute of Bridge Engineers
- Co-Chairman:** Lt. Gen. Utpal Bhattacharyya, AVSM, D.G. (Works) Engineer-in-Chief Branch, Army Headquarters.
- Keynote Speakers:** Mr John Triplet, Senior Professional Associate, Parsons Brinckerhoff, New York.
- Prof C. V. Ramakrishnan, Dean of Applied Mechanics, IIT, New Delhi**

**Lt. Gen. A. K. Puri**

The theme of the conference is 'Continuing Professional Development (CPD) of Engineers-Challenges Ahead'. You will realize that there is difference between development of an engineer from the grass root level and development of a professional engineer with experience who has to attain a certain level of proficiency with the globalization. It shows that there are two major challenges relating to the registration of professional engineers and their continuous development. These challenges are being faced not only by the professional engineers in India but also by engineers all over the world. It is more so in the developing economies of India and China and the eyes of the world are really focused onto India. We have a reservoir of engineers available with us. I think there are three major instruments which govern and facilitate the professional engineer's continuous development. These are:

- a. Knowledge - Knowledge gains at various levels right from the day one when an engineer enters the noble profession of engineering and over a period of time how he develops his knowledge.
- b. Training - It is an apparatus, a tool for an engineer to develop his professional efficiency and competency.
- c. Application - It is the application of engineering knowledge and training which enables achieving the engineering mission i.e. the completion of assigned tasks.

So, Knowledge, training, and application, are the most important for any engineer to be able to face the challenges of the fast changing economic environment.

In a recent study carried out by the MIT, U.S.A., it was found that the strength of undergraduates and the graduates in the engineering profession is dwindling by 10% to 15% every year. It was lower in the Year 2003-2004 than what it was in the previous year. It was basically on account of the outsourcing of work and offloading of the technologies. The engineers are at the core of development of a country like India and China. So, this is the kind of challenge that has been thrown up for engineers to meet in the next 10 years. When we talk of the GDP growth of 10% to 11%, the challenge become more severe, because the growth is related to the technical activities and that has to be contributed by the professional engineers. So, the challenges are: how do we train, how do we change them, how do we bring them to the level where we can meet challenges

of technological advancement and how do we continuously impart them with "ethics". And this is going to be discussed, this morning.

I have also seen the background paper which has been prepared by the ECI. I would like to congratulate Dr. Kohli and his team, who have structured the paper. It identifies ideas, approaches, and tasks ahead. We are going to deliberate on these subjects and for that we have here with us Co-Chairman of the session, Lt. Gen. Bhattacharya, distinguished authors Mr. Triplet and Prof. Ramakrishnan; all of them are eminent persons and, therefore, they need no introduction.

[Lt. Gen. A. K. Puri, PVSM, AVSM. He is the Chairman of the Delhi State Centre of Indian Institute of Bridge Engineers and Advisor to the Centre and State Governments on Highway and Infrastructure Development and former DG Border Roads. He is a fellow of the Institute of Engineers, Indian Institute of Bridge Engineers, Indian Geo-Technical Society & NITHE and a member of the Board of Governors, ECI. He was awarded the Param Vashisht Seva Medal and the Ati Vasisht Seva Medal by the President of India for his distinguished service to the Nation.]

### **Prof Ramakrishnan**

In the next few minutes, I would like to highlight the "Impact of Information and Computer Technologies on Continuing Professional Development". I shall be presenting them under the following heads.

- Introduction
- Importance of Continuous Professional Development in a fast changing Global Environment.
- Impact of Information and Computer Technologies
- Continuing Education Providers and Methodologies
- Difficulties in Evaluation and Effectiveness.
- Role of Higher Technical Institutions, Professional Societies, CPD Service Providers
- Summary

### **Introduction**

Continuing Professional Development of an engineer implies the acquisition of various technical, managerial, social and entrepreneurial skills as he progresses in his career. Technological obsolescence is very fast and in certain fields this is unnervingly swift - Web Technologies, Networking, Computers, Electronics and Telecom

- Today's professional has to keep his / her knowledge updated by acquiring certification in newer technologies.
- He or she has to periodically participate in professional conferences to keep him or her abreast of the current technological progress occurring elsewhere.

- He or she has to improve his / her communication skills to be able to negotiate with his or her clients and associates.
- He or she has to improve his / her understanding of managerial, legal and societal responsibilities.
- Presently leading corporate organizations and government agencies have strong HRD divisions which take care of these responsibilities. However, such opportunities are not uniform and need to be continuously monitored.

### **Fast Changing Global Environment**

Apart from technological changes, globalization has led to increased competition: today's engineering professional has to compete with the very best and produce commodities more efficiently at a lower cost. He has to be innovative and constantly alert. We need to have a high quality professional engineers who will be the leaders of Indian Industry of the future. These engineers will require to undergo high quality CPD programs to keep their knowledge and skills upgraded. New technologies will require CPD programs for dissemination and skills for acceptance.

### **Types of CPD Activities**

- (a) Formal education full time / part time
- (b) Special in-home continuing education/ training programs
- (c) Special University / CPD provider's programs (say by IGNOU):
  - Special project/ product oriented training programs
  - Research and development programme (CAD/ CAM application software)
  - Business / management programme
- (d) Presentation of technical papers in conferences.
- (e) Participation in group discussions/ meetings
- (f) Academic and professional consultancy activities (preparation of manuals, books, software, courseware etc.)
- (g) Full-fledged certification program and short- term certification programs.
- (h) Web-based e-University programme

### **Impact of Information and Computer Technologies**

Information and Computer Technologies offer very effective multi- media based technologies for continuous education. IITs, IIMs and NITs should embark upon high quality Continuing Education (CE) and CPD programs using high- bandwidth network to a large number of aspirants. Local centres with tutors can provide better reach. Digital libraries should be established for access to quality textbooks, journals and other publications. Facilities to access these libraries through software agents should be available.

A strong education community consisting of institutions, students, facilitators and industry should evolve. In the US, corporations like ORACLE, Microsoft, SUN and Cisco have contributed significantly in which CE has a very important share.

Continuing Education/ Continuing Professional Development will become a very important industry with the emergence of certification. However, it may not attract the very best talent as the research component in this form of education is minimal. However, the impact of IT is likely to bring innovations.

Innovative teacher scholars are likely to become digital publishers and educators. This may result in high quality educational material. The dominant criticism of non formal education in engineering is the lack of laboratory experience. This may be overcome through Virtual Laboratories.

#### **Novel Continuing Education Methodologies:**

Continuing education technologies have brought together students, faculty, facilitators, support staff and administrators. These include:

- (a) Conventional educational tools which will continue include: printed notes, audio conferencing, videotapes for voice instructional video tools like slides, video recordings and video conferencing.
- (b) New distance education tools which have become available through computer network and web technologies have revolutionized teaching - learning processes.

#### **High Quality Content Development - Authoring Tools**

1. Development of good computer (multimedia) technology based packages can be a key element in the development of net based distance education through pedagogical improvement on the lecture- tutorial - laboratory paradigm.
2. The courseware can be designed keeping in mind the level of participants. Multimedia removes monotony and brings in more realistic understanding of difficult concepts and technologies.
3. The multimedia based courseware can be accessed through the Internet. It also serves the dual purpose by enhancing the learning experience and also opens avenues for learning at home or at remote locations.
4. Objectives of a computer-based user-friendly courseware should be such as the:
  - students should be able to use it at their own pace and level of understanding
  - system should be intelligent and interactive for problem solving and not an electronic page-turner;
  - mimic tutoring through useful hints.

5. Continuing education providers have to concentrate on very attractive courseware with the help of staff who should be conversant with state of the art technologies Java and Java script, shock wave movies with plug-ins, web-page-database interactions, frames, layers, image maps and real -time streaming audio and video.
6. There are several service providers for
  - Course management and delivery (McGraw- Hill Learning Architecture White Pine Software)
  - Authoring Tools - Macromedia Inc.,
  - Assessment Tools - Intellimetric Knowledge Software
7. Very effective Distance Education Environment can be utilized for regular CE/ CPD programs. High bandwidth fibre optic network will provide mind-boggling opportunities for education, which will emerge driven by the infrastructure for entertainment and data communications.
8. Alternate technologies like TV and DSL for access to the internet will provide the the new opportunities with advances in data compression technologies; and two way video streaming may become possible over modest / high bandwidths. The audio/video stream and chart window can be used as follows:

#### **Audio/ Video Stream**

- Class Notes
  - Chat window
  - Hand written notes
9. It is thus obvious that the new technologies for content delivery are emerging along with the new techniques for content development. Particularly, these are widely in use in IT related areas and other Computer Assisted Training and Computer Aided Instruction programs for in house training.

#### **Virtual Laboratory**

Computer and Electronic Technology have been used to control equipment. The development of a devise driver and interfacing this to the computer with suitable electronic card is necessary. The signal from the equipment is interfaced with the computer for processing data. Use of "LABVIEW" is very widespread now. Once such technology is available for control, web technology can be utilized to access the equipment through the network. A large number of such laboratories are available. However, for the extensive applications, higher bandwidths would be desirable.

#### **Difficulties in Accessing the Effectiveness and Evaluation of Participants**

- It is desirable that the performance of participants is evaluated continuously. This will require sophisticated assessment tools.



- Computer-Aided- Instruction is suitable for efficient self learning also. How the knowledge thus acquired be evaluated is an important question that needs to be tackled.
- Continuing education/ CPD programme may have to be standardised in modules extending over a finite instruction period. This can be delivered as a full-time or part-time programme.
- As CE/ CPD programmes evolve, these may lead to certification. Thus, certification may mean enhanced skills. A set of such certifications may mean an additional diploma and higher skills
- It may be necessary by the Registration/ Certification authority to recognize programmes as eligible for assessment of an engineer for PE status and subsequent renewal.
- Will it be necessary to accreditate these programme?
- How can the participation and performance in CPD programme be assessed objectively?

### **Suggestions/ Conclusions**

- Advanced Technical Institutions should have CE/ CPD divisions for the benefit of engineers employed in the industry.
- Distance education models may be encouraged for CE/ CPD
- Innovative content development is necessary with help from software assistants.
- Effective models for evaluation of the performance of participants may be necessary.
- CPD programs may be organized in standard modules.
- Award of 'Certification' after the completion of the program could be useful.
- CPD courses should be evaluated for usefulness.
- New competent CPD providers may be established to conduct CPD Programmes.

[Prof C. V. Ramakrishnan, Professor, Department of Applied Mechanics, IIT Delhi. Formerly, he was the Dean of the Undergraduate Studies, Head of the Department of Applied Mechanics and the Computer Services Centre, IIT Delhi. He is a visiting Professor, the University College of Swansea, U.K and CEMES, Sophia Antipolis, France. He has guided 21 PhDs and approx. 100 M. Tech students. He is the Author of 90 National and International Publications. He has also in his credit many original technical papers. ]

**Mr. John Triplet**

I wish to thank Engineering Council of India and all of you for the opportunity given to me to speak at this session. I am an engineer from U.S.A. In the U.S.A., you have to be registered as a "Professional Engineer" (PE) for signing drawings in a lead project, where you are legally responsible for the assignment. PE's endorsement implies that professionally this project is right. His verification of signature shows that he has engineered this project properly. In the USA, you should have a Bachelors Degree in Engineering; and you take the examination while working under other professional engineers and in five years' time you get the professionals status after passing it. That is the system in U.S.A. I left the United States 14 years ago and since then I am working overseas. In the USA, a PE has to renew registration after every five years. But here in India, I do not need to be registered as a PE. I have my Bachelors Degree in Engineering and it is sufficient for practicing here as a PE. When I came here as a PE from the U.S.A, I continued to work as PE. Right now you are working to bring in place a legal working mechanism for the registration of PEs- which will be equivalent to what is recognized by the Engineers Mobility Forum (EMF). This is an important development and I thank ECI for initiating the process.

I am privileged to work with the Delhi Metro Corporation for the last 4 years. I am working here with some of the best engineers and managers that I have worked with in my career. Though they are of world-class, you need the credentials for registration of engineers as the PEs in India. This is something to say that I know what I am doing and that I have got the backing of the Engineering Council of India and the Govt. of India.

I encourage you and I ask you please do everything you can to make registration credentials possible in India and go all out on making your engineers a world-class registered Professional Engineers to be a part of the world recognized community of professionals.

**Questions & Answers****Question- 1.**

**Participant.** How to manage the training of trainers? My understanding is that by the time trainer gets trained, the technology changes. Can the institution like IIT or professional societies provide the training to the trainer so as to provide updated knowledge? I think that is the only solution.

**Answer-1.**

**Prof. Ramakrishnan:** There was a time when knowledge was in the universities. Now the new technologies like electronics, IT and others are there with the industry. These technologies are changing constantly. As you can see, they are the ones who should be involved in the continuing education programme. It is rightly pointed out that you need expert teachers for this who can teach the teachers. Now who is going to do that-as a lot of commercial interests are involved? The commercial service providers and professional societies will have to come into the picture because this is a new domain.

**Chairman:** I think the question which distinguished delegate has asked is very important in today's environment with technology changing at a rapid rate. In order to achieve the objective of training of trainers, perhaps the institutions have got to go in a big way. We are talking of 3D virtual laboratory, online training-aids and research and development facilities; and, perhaps, the IITs can take it on. At the gross route level, the people are not aware of the developing practices and, therefore, they are not in a position to keep pace with it.

**Question- 2.**

**Participant.** This is regarding implementation of CPD; there has to be a linkage between industry and universities. What kind of a role do you expect for the industry?

**Answer -2.**

**Prof. Ramakrishnan:** I think this is an issue which is to be addressed squarely. The industry has a very important role because they need to train their people frequently. I do not think that universities or IIT's are in a position to really provide CPD. To be honest, in IIT's most of the teachers are not really interested in such programmes because there is no challenge involved in this. People are very much interested in developing software, computer designs, and things like that but they do not want to give training to the professional engineers. So this has to be done by some other agencies and professional societies. Once CPD becomes important and mandatory, I think, a lot of commercial people will come into the picture, sooner or later.

**Question- 3.**

**Participant.** Don't you think that the online training facility including 3D virtual laboratory, audio-visual training aids, classrooms, etc., as was demonstrated in the presentation by Prof. Ramakrishnan, will be very expensive.

**Answer-3.**

**Prof. Ramakrishnan:** I think the cost is something which will come down once there are sufficient numbers of takers. It is a question of decision and then moving ahead. About five years ago, mobile phone was something which was considered to be very expensive, but it is quite different now. The same thing will happen and all these electronics-based including wireless technologies will become cheap.

**Question- 4.**

**Participant.** "Talking of Certification" is much easier in the case of software or languages, but it is difficult in the case of hardware like mechanical engineering, civil engineering, etc. Are there any state-of-the-art tools? The corporate may not be willing to part with it. What solution do you suggest?

**Answer-4.**

**Prof. Ramakrishnan:** Well what you are talking about is propriety knowledge v/s open information that is available / known. To quote a case, for example, once all instrumentation and control services were provided by the firms to the dealers. Now with the availability of special software, which almost every one can use, virtually everybody is being trained. Similarly, professional society like the Institution of Chemical Engineers can organise CPD programmes and people can go for it. These CPD programmes can be awarded credit points and given certification. Once you recognised a programme, automatically people will pay their own money and then they will go for it to enhance their prestige and skills; this is now what is going to happen.

**Question- 5.**

**Participant.** Is it feasible to develop and maintain the global standards in CPD for the PEs?

**Answer-5.**

**John Triplet.** It is my dream that engineers become an international community and when a P.E. goes from India to US, he/she is recognized having passed the professional exams. The PE standards have to be high for recognition at the global level. If you establish these standards and go to the States or go any where in the world, you will be recognized as a Professional Engineer.

**Participant.** I do not agree with Mr. Triplet. I do not think it would be easy to have a universally acceptable professional engineer. I do not want to go into the whole process of registration of the professional engineers. We know how difficult it is to become a PE. It is not so simple even in the USA; the professional engineering practice in one State is not valid in the other State there. Therefore, it is difficult to have a universal P.E. But, as Dr. Mashelker said earlier, we should have world-class engineers in India.

**John Triplet.** The point I think is very relevant. You may be in a position to be able to come as close as possible professionally and may be far excellent in performance, but in order to get recognized at the international level, you should have certain prefixes/ suffixes to your profession and that is a must. How do you achieve it and how you are likely to be recognized in the community of international forums, when technology is changing every day, is a different issue. I agree that it is not possible to have a uniform international level of P.E.

**Question- 6.**

**Participant.** It was said by Mr. Triplet that when he left America 14 yrs ago then he was a PE. But in order to retain the P.E. status every five years or three years (I do not know how many years), he has to re-register by reapplying and indicating evidence that he has been following CPD programme and has accumulated certain hours of CPD; but he could not do that. My question is why Mr. Triplett has not been able to pursue his CPD activities when he was out of the States or what prevented him from honouring this requirement and is he still retaining his PE status?

**Answer-6.**

**John Triplett.** 14 years ago, I registered as PE. I am very busy with projects or concentrating on the work at hand. The experience in my work and assignments itself amount to continuing professional development and I have not been able to apply for re-registration. But I do not want to say that I am not qualified. My qualifications have been checked by the Govt. of Delhi/ Metro

**Participant.** NCB has more than 300 world-class engineers. I think our main objectives are to produce world class engineers to service Indian Projects and it should be our first priority.

**Chairman.** I think you made a point; nobody will deny that; we have got to have that kind of professional acumen and it has got to be a marriage between project management professionals and the technical knowledge proficiency; and we should be able to carry any task here in India. But the point at issue is that you have to develop and upgrade your technology to be able to come upto that level of skills and high quality standards.

**Question- 7.**

**Participant.** Talking about the degree engineers, are the basic engineering degrees of the Indian universities / engineering institutes world-class?

**Answer-7.**

**Prof. Ramakrishnan:** All India Council of Technical Education is the statutory body established for this particular purpose; and it recognizes the engineering programmes. The National Board of Accreditation has been set up which is an arm of the All India Council of Technical Education. If these two bodies do their job systematically and parallel, there should be no difficulty. All those engineering institutes which do not come up to the mark will get 'C' Grade Accreditation; and it will automatically reduce their intake of students. However, an engineering degree is not enough for the registration of a P.E.

First of all we should regulate ourselves before we can ask for recognition from outside. So the first task is that we put in place all the controls which are mandatory and which do exist in other countries. There is a major difference between other countries and our country. In our country, the starting point for the engineering profession itself is an engineering degree. In some countries, it is not like this; most of the engineers start as technicians; acquire other skills; become a diploma level persons and then move over to a higher level of proficiency. All these things could be achieved via different routes.

We are in a very comfortable position as against what happens in other countries. Our IIT degrees and the one given by other national institutes are, no doubt, world-class and are even recognized by the countries like USA, UK, etc. Others are also moving in that direction.

**Participant.** From my point of view, Professional Engineer's registration is not compulsory for everybody; even at the international level, it is a voluntary process. Professional Engineers (PE) registration is for the persons who want to become accountable and take responsibility for projects that they are handling. If you do not register as a PE, you have not to worry; you can work under some other PE / professional engineering organization or with organizations in the consortium of the experts. It is very much possible. The registration is voluntary in all countries. It does not mean that all engineers in the United States are having Professional Engineer's status. Secondly, knowledge is plentiful with institutions but the things to synchronize are: the technical standards, legal standards, ethics code, national standards, as they are bound with each other.

**Lt. Gen. Utpal Bhattacharyya.** I think we had a very good discussion and eminent speakers have participated in the deliberations on the vision of the continuous professional development, its techniques and methodologies, which can be incorporated to improve the certification system and the training of the trainers.

We had an overview of what is the system followed in the United States of America. We have got to place in position world-class standards for the accreditation and development of P.E. in our country. Similar is the practice with the pilots and medical practitioners'. And we do hope to have a mechanism of registration of professional engineers of world-standards in place in India in due course, which also includes a world-class approach for the continuous professional development (CPD) of PEs'.

[Mr. John Triplet is the Deputy Project Director, Phase-I of the Delhi Metro Project since May 2001. He is an Electrical Engineer from the United States of America and the Senior Professional Associate, Parsons Brinkerhoff, New York. He has more than 28 years' of service in the Railways Operation and Maintenance Engineering.]

[Lt. Gen. Utpal Bhattacharyya is the Director General Works, Engineer-in-Chief Branch, Army Headquarters. He looks after all the works pertaining to the Indian Army. He has been awarded Ati Vashisht Seva Medal by the President of India for his distinguished service of exception order to the Nation.]

**3. TECHNICAL SESSION-II: CPD ACTIVITIES AND EVALUATION MECHANISM**

**Chairman:** Mr. H. L. Bajaj, Former Chairman, Central Electricity Authority

**Co-Chairman:** Mr. M. L. Ravi, President, Computer Society of India

**Key note speakers:** Mr. S. S. Chakraborty, President, Consulting Engineering Services (I) Pvt Ltd

Mr. Mahendra Raj, Past President, Consulting Engineering Association of India

MR. H. L. Bajaj

At the outset, I would like to thank ECI for giving us an opportunity to assemble here for a day long seminar on the important subject of continuing professional development. (CPD) has been in existence in one form or the other. The idea is essentially related to the changing technologies in the world. It is important that each one of us either by himself or herself creates some kind of opportunities to learn because the technologies are changing very fast. We must find some ways of updating our knowledge and acquiring the newer technologies that are coming around all the time and, therefore, such like courses and seminars do encourage this kind of process of continuing professional development. For this, I think each one of us needs to thank the organizers for conducting such a programme. Our first speaker is Mr. S. S. Chakraborty and he will be followed by Mr. Mahendra Raj. I am very sure most of you are familiar with these eminent persons.

[Mr. H. L. Bajaj is the former Chairman of Central Electricity Authority, Govt. of India. He was on the Board of NICLO Corporation, former Chairman of the Electro Technical Division Council of the Bureau of Indian Standards. He has been responsible for designing of the various super-thermal power projects in the country. He is the President of various National and International Organizations. He has won the Best Corporate manager Awards. ]

**Mr. S. S. Chakraborty**

It is a great opportunity to speak on the continuing professional development. CPD is an important component of engineering profession and for which we have been working almost for more than a decade, led by Mr. Mahendra Raj. We have come to a stage now, particularly in the economy of globalization, where our engineers will have to perform efficiently and effectively to compete in the world market. We must have a forum; and we must increase knowledge-base, which doubles in 5 to 10 years of time. The chips are becoming so powerful. I was told that the entire knowledge industry could be captured by the year 2015 at the back of a stamp paper. The knowledge is expanding so fast and we cannot be silent spectators. And in this openness, I believe very firmly that the professional development has to be done on a continuing basis in all its forms. It is not only in the acquisition of a new Engineering Degree or the acquisition of a new knowledge but also in reflecting in all the walks of life. It should be the quality of life itself. The continuing professional development should be a part of our life.

Now, this session is particularly oriented about the CPD activities and their evaluation. To my mind, it is a very difficult task to do in an objective manner. It is extremely difficult to measure something where the characteristics essentially pertain to the quality of CPD. It is where I think, most of the problems come up. I will make an attempt to lay down the contours on how to do an evaluation of the CPD; and I think, we should be able to arrive at a measure for this.

The continuing professional development is an essential integral part of our human resource initiative. It reflects the organization's capability to nurture talent and drive benefits. It is openness to new ideas / innovations. It enhances the creativity and it should be self sustaining. I feel the Engineering Council of India, which represents of so many professional associations of engineers & technologists in India, has a very vital role to play. I am afraid that not all the associations are fully geared up to address their basic problems of how to develop the professional base of their members, or how to enforce them, or how to motivate them. If each one of them assign attributes to the specialization that they represent, then by itself, it can create such a huge base of data that it could be very easy for the ECI to give it a level of a bench mark.

We should focus and re-focus on quality standards. Changing quality standards is also a continuous process. It is particularly important that in developing economy like India, we will have to train a large number of our professionals in a different manner, depending upon the nature of the project and the field of specialisation. In the same manner, the industry-academia interaction has got to be at the institute's level. It is a very important aspect for the CPD movement in India. Commitment towards ethics-based service is also an essential part of CPD and hence extremely important.

In the CPD measurement, the variables are so large that we will have to convert these into a sort of compound indexing and annotative in their evolution. Engineering theory, standards and practices are applied for managing the work. There is a need to award certificates for the specialized subjects like hydro-graphic survey, computer training and other such subjects, which are not taught at Degree level. Then there is the question of the acceptable level of CPD, acquiring additional educational qualification in the form of certification and postgraduate qualification, which will be an added advantage. In addition, there are a large number of accredited courses going on; these have become very much common in the U.S. A. The various short-term courses are also an essential part of the continuous professional development programme. The attendance at the interactive knowledge-based conferences or seminars should not be considered by the organization as wasteful expenditure or time; it is an essential process in which you could gradually upgrade your knowledge-base.

Further, the knowledge dissemination is rarely done. Here, most of the enterprises do not disseminate the knowledge even within the organizations and it is confined only to the limited files. So whatever knowledge we are gathering, it should be disseminated. This also should be taken into consideration when it comes to the question of our evaluation.

The presentation of various technical papers in the seminars, submission of the designs, research papers published and the innovative methods adopted including any patent taken all contribute to the CPD. We must customize the CPD programmes to the individual needs because every



problem is very specific and it has got to be addressed in an individual manner for reinforcing the weak points. The CPD must be recorded in a form of a work diary and these should be documented and submitted for evaluation.

In conclusion, I must say that the evaluation process of a continuous professional development will not be an easy task for a country like India. I do not think that we have come to a conclusion as to how we will address this very difficult problem. I feel that unless we do this continuous professional development with the help of the Government, professional societies and the Engineering Council of India, it will not be very effective in the global economy.

[Mr. S. S. Chakraborty is the Managing Director of Consulting Engineering Services (India) Private Limited, New Delhi. He is the Vice- President of International Association of Bridge and Structural Engineering (IABSE), Zurich, and Member to the General Assembly of FIB, Geneva. He is recipient of the Silver Plaque from the Federation of Indian Export Organisations (FIEO) in recognition of his organisational capabilities. He was conferred Shelter Award for outstanding achievement by Shelter Promotion Council of India. He is well recognized in the field of Engineering, Project Financing, Physical Infrastructure in the areas such as, Expressway, Water Resources Development, Power and Energy, Environment & Integrated Urban Development. As provider of services, he has led several multi-disciplinary teams for a wide variety of projects across the world with innovative financing.]

#### **Mr. Mahendra Raj**

We have been talking about the registration of professional engineers for quite some time; but in India some how or the other; it has defied the fraternity of engineers. Hopefully, soon we will have the Engineer's Bill and the registration process will be in position.

CPD is a very important aspect of the registration and the post-registration of professional engineers. For every engineer, this is a very important activity because in this world of competition, you cannot survive unless you go through this continuous professional development by yourself or by any other means.

In my presentation, I will start with definition of continuing professional development which I have picked up from the internet from the Institute of Civil Engineers, UK, which Mr. Chakraborty is representing here, then I will say why CPD is necessary, what constitutes CPD and how to evaluate CPD programme.

The Institute of Civil Engineers, UK, defines CPD as "the systematic maintenance, improvement and broadening of knowledge and skills, and the development of personnel qualities necessary for the execution of professional and technical duties with speed, economy and efficiently throughout the professional working life". This is the basic definition of continuing professional development.

Why is CPD necessary for becoming a qualified professional engineer? I hope everybody knows the answer to this question. Becoming a qualified engineer is not an end in itself, it is merely a

beginning. Engineering knowledge is constantly growing at an exponential rate. At any moment of time, growth in knowledge of one unit of time equals that in the previous 5 units, some say 10 units. The knowledge base of every professional is also expanding with the passage of time.

There is continuous infusion of new technologies, new materials, new processes, and innovations. Growth and development of technology affects all aspects of our lives, continuously. In order to derive the maximum benefits from developments in technology and growth of knowledge, codes and standards in every field of specialization are revised frequently. It is essential for a professional to stay abreast of all the latest developments in his / her field of specialization and the new codes being evolved.

It is essential, because the professional decisions have direct impact on health, happiness and safety of society. More so, it is essential because the clients are far more knowledgeable and far more demanding today than ever before. I hope everybody agrees with it. Beside, it is essential because globalization of professions is unavoidable and global competition is very intense. It is very difficult for an individual to keep his knowledge and expertise updated without external assistance because of the time constraint. This is the role which continuous professional development programmes have to play. CPD programme have to be so devised as will keep the professional updated with the latest developments in his or her field of specialization and their applications.

Continuing professional development gives the professional confidence to enter new markets, win over new clients and adopt new methods of working in the free market with required effectiveness and efficiency. It also qualifies him or her to retain the status of a professional engineer.

What constitutes CPD? Any programme which brings the professional abreast of the latest developments in his or her field of specialization can be called a continuous professional development programme.

The success of a CPD programme can be accessed by the professional himself / herself. If he feels that the programme, which he / she has attended, has updated his / her knowledge, skills, judgment in the area of his / her specialization and has enabled him / her to be more productive by fully understanding and applying advances in technology for meeting challenges in his or her career apart from better serving the community.

**Broadly, CPD programmes can be classified in the following main categories.**

- a) Formal Education and Training : The formal education and training activities includes obtaining post graduate degree, or attending post graduate courses, or undertaking training in a new field say, for example, computer applications, etc.,

- b) Informal Learning Activities : It covers participation in lecture series on technology specific topics such as, for a designer it includes designing a multistory building, suspension structure, repairing, rehabilitation and retrofitting of structures, participation in lecture series, workshops, practical training, undertaking a major project, attending conferences, meetings, presentation of papers, technical case histories, formal teaching through the visiting faculty technical programmes, writing research papers, etc,. All these are a part of the CPD
- c) Performing in-service activities : It covers participation in the specific activities of a professional body such as ECI or other professional associations including of whatever association an engineer belongs to, working on technical task forces, or committees ,etc,. These are also very important activities for ones professional development. All these also constitute CPD.

How to evaluate them? This is not an easy task. However, ECI has developed techniques for the evaluation of CPD. This is given in the ECI's System and Procedures. The CPD is an essential and very beneficial activity for every professional to undertake for his or her success as well as survival in the profession, which will depend on how best he or she pursues this activity.

In a country in which the status of professional engineer has legal validity and is awarded by a statutory body, it is invariably stipulated that in order to retain the professional engineers status he or she has to pursue certain minimum level of CPD activities every year; and it is mandatory by law.

Whenever a professional engineer applies for renewal of his or her status, he / she has to give full details of the CPD programmes pursued by him / her during the intervening period in a standard performa. These programmes are allocated marks and weights and an assessment is made whether stipulated criteria has been met with or not.

The system of allocation of marks and weights is different in different countries. In some countries, instead of allocation of marks and weights, a count of hours spend on the CPD activities is kept- which is multiplied by the weights that have been assigned to these activities and the CPD is thus evaluated.

In our country, when the Engineer's Bill becomes the Engineers Act, ECI will start registration of the professional engineers; for this, it will follow the system and procedures that it has developed for the evaluation of CPD programmes pursued by a professional Engineer.

In India, a professional engineer will be required to renew his or her registration every five years. During these five years, he or she will be required to accumulate around 250 credit hours of the CPD programmes. The system of evaluation of credit hours is also covered in these system and procedures.

Let me give an example of one or two other countries to show you what happens in these countries.

In Australia, a professional engineer has to undertake about 150 hours of the CPD during three years; it works out to around 50 hours every year of the CPD. Every year a performa is filled up for listing all the CPD activities attended by a professional engineer including the details such as, what, where and how he / she did the CPD and how many credit points were accumulated. In Canada, there is another system which is being followed.

Every country has a system of monitoring the CPD that all the professional engineers have to go through. Similar systems are also there in Hong Kong, Japan, Singapore and U.K. But their periods of validity and re-registration vary. However, in some countries, by and large, the professional engineer is given a chance to make up the CPD hours, if these are not found adequate.

[Mr. Mahendra Raj is the member of high-power committee set up by the Ministry of Urban Development and Poverty Alleviation of the Government of India to draft a comprehensive legislation to Regulate and Control the Activities of Builders and Developers. He is the former president of Indian Association of Structural Engineers and CEAI. He has many 'first' to his credit. These include: the first skyscraper in Bombay, first Large Span Folded Plate Structure and the first Large Span Industrial Structure for the Hindon River. In recognition of his contribution, he received the "Architectural Engineering Design Award" from the Institution of Engineers (India) in 1989-90, the Gourav Award in 1995, Life Time Achievement Award in 2001 from the Indian Concrete Institute and Scroll of Honour from the Institute of Engineers (India).]

#### **Mr. M L Ravi**

We have many success stories of professionals in our country. And as professionals first and foremost, we need to learn the art of presentation and communication, which is a major component of the professional skills. We may have the expertise, we may have the experience but if we don't possess skills of both oral and written communication and presentation, we will not be able to do well in our profession.

We need to know as professional engineers what inherent strengths and weakness we have. In order to cover our weakness, we try to pull down people who have strength in those areas. And in order to have a good winning situation, there is an urgent need for all of us now to pool in our strengths. We simply cannot become self-centred, as there is a community at large which is watching us as professionals.

We need to set standards; we need to set specifications; and we need to work for achieving our goals and objectives. And towards this end, every professional engineer needs to have affiliation with various bodies. A request, therefore, is made by the various professional institutions to the professionals to become a member of these bodies. ECI is a body set up by several of these professional bodies coming together on a common platform. It has developed rules, system and procedures for registration of professional engineers, their CPD and on ethics. For engineers, certification is required; but it is not a proof of your competence. It is your ability to learn to adapt to changes which are happening around you and that is what needs to be seen, criticality.

Let me just share, information is not technology, information is a peace of structured data and a technology becomes a medium or vehicle to transmit this information to all of us around. So, information is not a technology nor is computer a science; computer is a skill. These skills and many other skills, professional engineers will be required to acquire. A professional engineer needs to use his / her imagination to meet new challenges and seek opportunities. And this is for what he / she needs CPD.

[Mr. M. L. Ravi is the President Computer Society of India and Managing Director, Innovative Consulting Group, Bangalore. He has 23 years of experience in the field of Computers and Information Technology. Presently, the company is executing consulting in the areas of rural development, e-based corporate governance and career counseling.]

### Questions and Answers

#### Question- 1.

**Participant.** What is the percentage of people who are following the sort of credit hours that you mentioned? I find from the data presented about the credit hours that it is not going to be easy to evaluate these. For example, if somebody goes for a Ph.D. programme, he gets 100 marks; he spends 4 years to 5 years to get it as compared to the other activities, which may be far easier.

#### Answer 1.

**Mr. S. S. Chakraborty:** When an individual undertakes PhD, it is not the only CPD activity that he/she does, along with it, he / she will be pursuing other activities also like delivering lectures, attending seminars, or conferences, writing and publishing technical papers, lecturing, working on projects, guiding research students, etc,. All these would also be added to the credit points.

My information is that engineers, as you heard from our friend from America, in order to be professionals, have to work very hard. On the other day, we had the President of FIDIC with us in one of the conferences; he is an Australian; and he was not joking when speaking at that conference he said that it would add to his CPD programme. You see every professional is conscious of the CPD and about the credit points that it gives.

#### Question-2

**Participant.** A delegate while stating that he only hoped that the CPD does not become a distraction from the normal duties, raised a question whether it was necessary to go for a specific CPD and weather the credit-point-basis of assessment of CPD was being done?

#### Answer-2.

**Mr. Mahendra Raj.** It's a challenging task and that is why I am saying the "CPD Challenge". We do not have the formal CPD programme with credit points so far; but that does not mean that our engineers should not / are not pursuing CPD activities. Look at the people who are at the top;

they have come up by pursuing CPD activities for updating themselves. An engineer must keep himself updated otherwise he / she will be eliminated even before the globalization comes to stay fully.

Engineers have to deal with technologies and these advance quite fast and in some sectors like electronics and computers, it happens faster. Practicing engineers have to learn that the CPD is a necessity for keeping oneself inter alia updated with the constant changes in technologies. The CPD, therefore, cannot be a distraction from the normal duties.

### Question-3

**Participant.** I would like to know from the data that is available with ECI, how many engineers in India would like to have the certification, or what is the plan of ECI in this regard, how many certificates they will be able to give per year out of how many? Why I am asking this question is because it is going to be a very gigantic task.

**Mr. Mahendra Raj:** The system and procedures of registration of P.E. were discussed in the last ECI conference. You see in every country there are a very large numbers of engineering graduates. India has much larger number of graduates than what is it in America. Every graduate engineer does not become PE. You know there are some people, particularly those who aspire to reach the top and are very keen to reach there, while some others are quite happy to stay at the middle levels because they do not want to get themselves stressed which comes with the responsibility. There may be 10% to 20% who may aspire to become PE. So the number of PE's is not going to be very large. Every engineer in India may not like to become PE.

I think, the answer to the question will also depend on the Engineers Act. If the Act says that only those engineers can sign drawings, or certify designs, take the other direct responsibilities, etc, who are registered PEs'. So, he / she will have to become a PE. In case the Act makes PEs certification mandatory for every engineer to have it, then in that case, the number will be quite large.

Coming to the data that ECI has, I would like to say that the ECI is seized of the matter and it will be possible to start registration of PEs' after the Engineers Bill is passed by the Parliament and with it when it becomes the Law. The draft of a Bill has been submitted to the Ministry of HRD which is considering it. Meanwhile, a resource and data-base centre is being developed. Yes, the task of registering PEs will be, no doubt, gigantic one.

## 4. TECHNICAL SESSION-III: ROLE OF PROFESSIONAL ASSOCIATIONS

**Chairman:** **Mr. Yogendra Prasad**, National President, Indian Institute of Plant Engineers

**Co-Chairman:** **Mr. D. P. Mishra**, Past President, Indian Institute of Chemical Engineers

**Keynote Speakers:** **Mr. Jawahar Kaul**, Past President, CEAI  
**Mr. Sushil Jain**, Senior Consultant  
**Mr. Yogendra Prasad**

I am happy to be here with all of you for deliberating on a very important subject of this session i.e. "Role of the Professional Associations in the CPD". In our country today, we don't have dearth of money; we don't have dearth of consultants but implementation is the biggest problem. If you look at the budget which is presented by the Government every year, we find that at the end of the year even 15% of the money is not being spent on education. Now every year, the Government tells us that we have to develop the infrastructure. Recently, Rs. 1,74,000 Crore have been provided for infrastructure. Lot of money is being provided for the power and irrigation sectors, but if you see at the end, either our economists are not doing the survey properly, or the correct facts are not coming out.

The standing situation of a net power deficit despite having planned new power projects is the constant pain in our necks. One of the main reasons for this rather a dismal position is that we seem to be not implementing projects as planned. Today, if you consider the per capita consumption of power, it is the poorest in India; even the small country like Bhutan is better than us in this regard. The main reason is that there is no power; today, we are having a lot of programmes; though, we have electrified around 80% of our villages, these villages are getting hardly 4 hours of power supply. Even big capital cities and other large towns are getting around 12 hours of power supply. How do you expect that the people will develop themselves including in creating employment. Here, it points out one important fact of life and this is that our professional engineers and managers are not implementing properly the projects that are planned in addition to the other reasons emanating from the systems under which we are working. So, the issue today is : how to implement development projects and how to get efficient implementers for these projects.

I want the professional engineers to develop expertises in the various fields. They should help the society by forming NGOs and implementing the development projects. Today, we are not properly trained. Around 1, 50, 000 MW of the Hydro Power potential is available to us. We must tap this potential and for this we should formulate projects and implement these.; if we implement these projects, power will be available to us throughout the year for drinking, irrigation, industry, domestic purposes, etc,

I implemented the rehabilitation package of a power project honestly! I did not face any hostility; and no police case was filed against me. I completed the project in 3 years. It is now providing 1000 MWs of power for irrigation, drinking water, etc, to Madhya Pradesh.

It is not that that people do not want progress; people want progress; people want help; it should be possible to provide these to the people provided we implement projects honestly; work professionally; and continue with our professional development. You may take it as my request to our professional bodies and engineers. This way, we are going to help this country; and it will be the great service to this nation; and that is the only way we can reduce the terrorism, robbery and all types of criminal cases.

If you can provide good roads, electricity, water, our 99% problems will be solved. People will get self employment. Today they are not in a position to have their own industry; farmers are not in a position to send their agriculture products to another place. It is the responsibility of the professionals to provide the real service to the society.

The theme of this Session is the Role of Professional Associations in CPD. In my opinion, this role is very important for realising the national objectives and providing desired service to the society. The Professional Associations will have a major responsibility for updating objectively the skills through CPD of its members and the individual professional engineers.

[Mr. Yogendra Prasad is currently the National President of Indian Institute of Plant Engineers. He the immediate Past Chairman and Managing Director, National Hydroelectric Power Corporation and former President of the Central Board of Irrigation and Power.]

#### **Mr. Jawahar Kaul**

In this age of the Information Technology, where innovations are seen every moment, professionals not only should have distinct ability and knowledge but also of the new developments in respect of their field / subjects of specialisation. The education and training of an engineer is intended to provide him / her individual kit for performing intellectual role and tools for using it in the Industry. This kit, normally, facilitates solutions of diverse technical problems and it has its prime focus on service to the society and improvement of the working environment.

Very early in the professional career, an engineer begins to come face to face with a number of problems for which his tool kit is inadequate. This invariably, therefore, has to be updated throughout his / her career with managerial and technical tools, both general and specific, in areas such as administration, finance, industrial relations, communication, professional knowledge, ethics and political science. This can be achieved and acquired through undertaking, at the regular intervals a formal education and training activities. This includes formal face to face education, distant education, short courses, on the job training, through informal learning activities-which can be through journals, manuals, conferences, meetings and mentoring by peer presentations and publications, etc,. All these can be provided in different degrees by the professional societies and associations to its members.

The involvement with the associations provides an excellent opportunity for an individual member to grow and to contribute effectively and efficiently. Professional contacts can provide opportunities for getting information on the various subjects pertaining to the engineering



profession, technologies, economics, markets as well as on the various other engineering disciplines. It is now common for the professional engineering associations to take the responsibility for promoting and supporting such programmes as will improve significantly and continuously the competence of their members.

In India, we have still to regulate the practice of engineering in accordance with the Act relating to engineering profession. Incidentally, this Act is being formulated and will come on the statute in due course and the ECI is pursuing it with the Government. All matters relating to the PEs including ensuring their proficiency and competence, establish and maintain standards of professional ethics and promote public awareness about the role of professional associations will be some of the important sections of the Act.

In India, there are several professional bodies and associations who provide platform to develop and help professionals in updating technology and other allied aspects. To quote an example, Indian Road Congress (IRC), provide a big professional platform where civil engineers from all over India interact and become aware of the latest developments in the field of highway infrastructure and the bridge technology. This is on the similar lines as of medical and legal professions.

Professional associations will have a major role to play in the whole process; and they will also be expected to constitute the "National Committees" in each specified discipline. Each National Committee will be responsible for facilitating continuous development of the PEs as per the specified policy and procedures, processing applications for registration and re-registration of professional engineers and evaluating their development as per the specified norms and standards. It will also make recommendations regarding renewal of registration of the PEs.

Each National Committee shall maintain a local database of all their members who have obtained registration as professional engineers. The committee will also keep a track of its member's professional development and credit will be awarded accordingly. They will also develop a code of ethics under a general guidance of ECI for their members.

Some of the elements of the code for the professional engineers can be as follows:

- A Professional Engineer shall perform his / her duties in the interest of public, employers, other members of his / her profession and also shall act at all times with fairness and loyalty to the Association / Society / Institution of which he / she is a member, employees, clients, subordinates and the other professionals.
- A Professional Engineer shall have proper regard for the safety, health and welfare of the public in the performance of his / her professional duties.
- A Professional Engineer shall not be associated with enterprises working against the public interests, or which are sponsored by persons of questionable integrity, or which will not confirm to the basic principles of the code.

- A Professional Engineer shall sign or seal only those plans, specifications' reports prepared by him under his own direct professional supervision.
- A Professional Engineer shall not under take any assignment which may create a conflict of interest with client or employer without the knowledge of his / her client or employer
- A Professional Engineer shall conduct himself / herself towards the other Professional Engineers in good faith.
- A Professional Engineer shall undertake only such work as he / she is competent to perform by virtue of his / her training and experience.
- A Professional Engineer shall advice his / her Association / Society / Institution of any practice by another Professional Engineer, which he believes is to the contrary to the code of ethics.

The National Committees shall include the membership committee for evaluating membership applications and make recommendations to the Council to assist in the ongoing review of the associations membership requirements. Its Education and Training Committees can establish, formulate and disseminate the associations' policy and publish association's journals which will provide the latest updated information on the various upgradation programmes of the professional practices. Its Career Guidance Committee should develop career guidance programmes for the members. In addition to various other such activities, adhoc committees can be established to carry out short-term specific assignments.

The immediate aim is to help the members in their day-to-day working apart from realising long-term objective of improving their skills. Benefits to the members include protection, giving expert advice and support on all the aspects of professional working both in India and overseas, free expert legal representation, 24 hours legal helpline and advice for the members and their families, access to the national network of experience, regular communication and invitation to attend important meetings, access to the education facilities ,etc.,

I have been studying very closely what the professional bodies in the other countries are come up with for the service to their societies. I found that the professional associations like the American Society of Civil Engineering and the Society of Civil Engineering in U.K, are doing extensive research and helping their members in the above stated specific areas apart from creating general awareness in them about the latest developments in their field of specialisation and in the other areas which have the potential to affect them, or advance their career.

In the recent years, our association-CEAI- held many lectures and conferences which came up with many innovative ideas. The Association has contributed to the development of its members in a very big way by disseminating information to them. It has also, at the same time, conducted conferences, seminars, symposia where the latest information and data were exchanged. Finally, I would say that the engineering community should continue with its efforts to have the Engineering Bill placed before the Parliament for making it the Law for the Indian engineers. It is then that the development of engineering profession in India will move on to the world-class

scale and the trade in engineering services will begin for the benefit of the economy and engineers.

We can see the voluminous work that the engineering profession can do by way of trade in services. There is a huge market abroad, particularly in the western countries to be tapped. Like the IT boom, the Indian engineers are also going to witness the boom on the same pattern and at a similar scale.

It is for realising this boom, the professional associations will have to contribute; for this the associations will have to ensure updating of their members with the various developments in technologies, markets, legal matters especially international, various aspects of consultancy, dispute resolving mechanisms, the internationally accepted codes of ethics, morality and business practices.

ECI which has come to be a Confederation of the Professional Engineering Societies and Associations; it has got to perform a far greater role in the present era of WTO. With the Engineering Bill becoming a Law after the Parliament passes it, it will be the main task of ECI to promote the engineering profession through disseminating the knowledge, working out the new innovative solutions to various problems which engineers are facing and resolve the various issues in a manner which ensures the welfare of the people and sustainability of the environment.

[Mr. Jawahar Kaul is the Past President of Consulting Engineers Association of India. He is a member of the Governing Council of the Consultancy Development Centre. He is the co-founder senior Director of SPAN Consultants Private Limited and SPAN Travers Morgan International Limited. He is an eminent Construction Engineer and Project Management Specialist. ]

#### **Mr. Sushil Jain**

I will be speaking on "CPD -Role of Professional Associations" with particular reference to the changed world scenario, action required, role and status of professional associations in India

The Changed World Scenario : The world is fast changing. Professional Associations have to keep pace with the changing world scenario. General Agreement on Tariff and Trade (GATT), which developed after the Second World War, was replaced by World Trade Organization (WTO) in 1995 of which India is a signatory.

Countries have realized that the economic activity is very important for the prosperity and progress of the people of India. Opening of trade and services across borders is important. Under the "Engineers Mobility Forum (EMF) Accord" (and for the supervisory level, the Dublin Accord), countries have come together for providing mutual recognitions.

The Indian companies have grown in size and activities; and they are increasingly going global and participating in the international competitive bidding for contracts; thus, they are creating a demand for the mobility of Indian engineers at the international level.

Action Required : It has become necessary to establish an accreditation body (Engineering Council of India) that will be playing that role which meets all acceptable criteria i.e. recognition of standards by apex accreditation bodies of the various countries. This accreditation body will also accredit the other institution and bodies for issuing license to the professional engineers.

We must License the Indian engineers on priority for:

- enhancing their image in the society by focusing on their quality and accountability,
- enabling the recognition of their expertise and mobility at the international level and
- enabling them to work on the internationally funded and other large projects globally.

Role of Professional Associations : Professional associations have a very important role to play. They have to provide a simple but effective service to their members against a background of increasingly complex compliance and regulatory standards. These associations-under the guidance of Engineering Council of India-have the responsibility to:

1. Set the standards and procedures.
2. Support and foster professional ethics/ behaviour
3. Projecting the profession and its practitioners
4. Legislative development
5. Regulation and enforcement
6. Provide world-class opportunities for the CPD of engineers
7. Provide the online options
8. Enhance the image of engineers in the society
9. Enable recognition of expertise of the Indian Engineers and their mobility at the international level
10. Represent the members at various platforms
11. Work with the other professional organizations

Status of Professional Association in India and Role of Engineers: The good news is that in India, professional associations and bodies are already well established and doing an excellent work for their members. Many of the above responsibilities are already being carried out. The additional work is to integrate with the rest of the world and licensing of Indian engineers. The engineers can:

- be the role models and set the standards,
- create strong awareness on importance of ethics & CPD and
- work proactively with the professional associations

License is not necessary for all engineers. Only those engineers who wish to work on global projects and those who have to bear the overall responsibility of signing the drawing or official documents or applications for necessary permissions, etc., will require to be licensed.

But, the CPO programs are good for all engineers for keeping them abreast with the latest and to keep pace with the changing requirements and technology.

Importance of Ethics and Values: One of the essential conditions for the professional engineer's license is examination on the engineering ethics and values. Engineers, who apply for the license, will have to study and then pass the examination on ethics and values.

But, all engineers will not be applying for the license. However, they should be learning the professional ethics and values through the CPD programs to remain world-class and at par with their international brethren.

It is quite strange that when we talk about professional engineers or licensing engineers, we do not give importance to learning of ethics and values and make it mandatory. I would like to mention a few things about core values. I think we all have core values but some times we compromise with them, or we don't evoke them. And these are very simple; and if you really follow the core values, I think, you are the best human being and best engineer.

The fact is that serious and systematic learning of ethics and values are necessary right from the school level and for all. The education system needs to be redefined to include systematic teaching of human values-as a subject-in all the schools, colleges, and training institutions.

**[ Mr. Sushil Jain is the Senior Consultant.]**

**Mr. D.P. Mishra**

Today, if we see, the basic needs of the country are Roti, Kapra Aur Makan. Take the case of water, recently we had a water resources management seminar held by the Indian Institute of Chemical Engineers; and when we looked around the country during the deliberations in the seminar, we observed that the GOD gives us 2400 billion cubic meters of water per year and we are so inefficient that we only catch 600 billion cubic meters per year of water out of this and release 1800 million cubic meters of water to the sea; this being so because we are not able to catch it. We go down deep with the soil as much as 200 meters in Gujarat to get water. In Rajasthan, we carry water from Jodhpur to the villages to feed the rural population. The people pay Rs7. for a bucket of water. We would need another 600 billion cubic meters of water by the year 2005.

Today, there is a fear in the U.S.A and Europe that the numbers of engineers there are gradually on the decline. The new generation of people in U.S.A and Europe are not taking engineering as a subject; and, therefore, it is causing some worry in these countries because they do not know how this situation can be met as there is going to be difficulty in resource engineering and how and where from it will come. As Indian, we can speak English and we can make available this resource to them and meet many of their other related requirements. In terms of educating engineers in India about this scenario apart from what has been already said regarding the CPD by my previous learned colleagues, the professional associations have a big role to play; and if they play this role aptly and timely, it will bring a substantial benefit not to the country but also to the Indian engineers.

During the last 5 years, the technological changes that have taken place are unique. Today, you do not see drawing boards in any of the offices; these have been replaced by the 3D CAD facility. This facility is the qualifying requirement for many overseas jobs. Using this has many advantages. You can minimize error to the extent of less than 1%. It is now the responsibility of the professional associations to educate their members and others concerned about the new concepts, designs and technologies which are available globally and train them to work with these.

I am the chairman of the technology committee of the Indian Chemical Manufacturers Association. In the chemical industry, many changes have taken place, especially in the carbon trading. These things were not known to the industry, and now we have brought the knowledge home by way of organizing seminars, conferences, workshops, technical meetings and refresher courses. Hopefully, by the end of the year, at least 12 to 15 units will get advantage of the carbon trading scenario of the world.

While concluding, I would say that it is necessary for the professional associations to be involved in the accreditation of the engineering degrees. The associations can take pride in the development of their engineers for the international placement and this can best be done by them if they are also involved fully and effectively in the accreditation process in India as is the case in many advanced countries.

It is nice that the ECI will be looking into this aspect; it will also consider involving fully the professional associations in it for them to play their role right from the day the process commences; and it will also be necessary that the associations should play their role from the day an engineer begins his / her education and till his / her professional development is completed. And that is how the branding will be done.

[Mr. D. P. Mishra is the Deputy Managing Director of Jacobs H&G Pvt Ltd. He is the former President of Indian Institute of Chemical Engineers.]

## Questions and Answers

### Question-1.

**Participant.** As you said, projects are not being done properly, who are responsible for it, why no action is taken against them and what are the solutions?

### Answer-1.

**Yogendra Prasad:** I have raised these issues through papers and T.V. channels myself. What is happening is that approvals for projects are not coming on time. Even if the approvals are given on time, the land is not available, The State governments are not helping in providing the land and controlling the law and order situation. These are the problems. So, we have to have an effective political will for solving these problems. Unless the state governments have political will, things are not going to move.

**Question-2.**

**Participant.** I don't think that the political will in the country is going to come very soon. Without power, food, water and roads, how majority of the people can go on living (except the people in urban areas)?

**Answer-2.**

**Mr. Yogendra Prasad:** That is why I said that so many things are required to be done. Professionals should form NGOs for approaching the governments. They should implement projects in a better way and that is the only solution. If engineers continue to be afraid of living in villages for working on sites, the problem will remain. It is the professional who should try to implement projects efficiently so that it can be a benchmark for others to follow.

**Other Speaker:** I am from the private sector; I would like to tell you that in the private sector projects are implemented not only on time but also before time. In other sectors, the amount of efforts that is required for the preparation of feasibility studies and the real estimates is not being made because somebody dictates that it should be done in 12 months, when actually it may warrant far more time.

In the private sector, for example, we have cases of Reliance projects costing from Rs. 5000 crore to Rs. 6000 crore. These projects were done before time. Jamnagar Refinery, which is one of the world's largest refineries, was done in the record time. It happened because of the factors such as, intensity of efforts made, commitment of the owner and engineers, etc., all these factors reinforced each other into a logical and optimum work and activity-wise construction schedule, phasing of expenditure and the like, otherwise it would not have happened.

**Question-3.**

**Participant.** We are discussing the Role of Professional Societies in the CPD of Engineers. This topic has been very well covered by the eminent speakers. But, what type of preparedness we have to do so that we can legislate and regulate our engineers?

**Question-4.**

**Participant.** In the present scenario, we are conducting simple seminars, some elections and people are coming and going away. In future, suppose the Engineers' Bill is passed by the Parliament, what type of strategy is to be followed by the professional societies so that engineers will have the required technological skills, CPD credit points through seminars, workshops and the other activities?

**Answer-3 & 4.**

**Yogendra Prasad:** The questions that you have raised are very relevant. The point is how the professional societies and associations are going to help the engineers after the Engineers' Bill will



become an Act. It is a subject by itself, which can be deliberated in a full fledged seminar. I think this session has a limited scope for this.



## 5. Concluding Session: Action Plan

**Chairman:** Mr. A. C. Wadhawan, Past President, Indian Institute of Metals

**Key Note Speaker:** Prof. Mahesh Tandon, President, Indian Concrete Institute  
Prof. Mahesh Tandon

In the present day world, as a structure engineer, I must tell you, what changes are taking place. People are now talking about not very difficult mathematical theory which we were taught when we were trying to design structures. Now is the question as to whether you know which software to be used and which button to press?

The expertise of structural engineering is slowly but surely changing; and I think it is going to result in a very big disaster unless we are able to stop this trend. These are all the perceptions, which should not detract us from minimizing the importance of understanding what is happening now. Coming back to the challenges of continuous professional development, I want to propose the action plan for the CPD on the following lines:

- The action plan for CPD must create incentives for change; people don't change just like that. The CPD provides the key to unlock the real potential. You really don't know what you are capable of doing and what your potential is for it till you exert yourself and for that you have to change yourself. Some people do not want to change because they are sticking so tightly to whatever they have at the moment. They are blinded completely about the future. Others say that it is the lethargy and so on.
- The action plan for CPD must have the attention of the majority of the professional fraternity for its success. A single person cannot form the technical database or the managerial accumenhip of an organization. ECI must, therefore, reach out to all its constituent organizations, who, in turn, must reach out to all its members. I mean we must plan on a massive scale.
- The action plan for CPD must look relevant. What were the persons who visited Tokyo every year for their continuous professional development, which essentially focused on the study of the Japanese techniques for rice cultivation, doing there? Because it was found later that Japan does not grow any rice; it imports its entire requirement. I am not sure what they were doing there. So, the CPD that we are looking for should be something which must look realistic and relevant.
- The action plan for CPD must send the message that this HRD is the new buzzword. I think, the main function of this HRD is or should be the planning and implementation of professional development which is the job of HRD personal manager. I meet a lot of these guys especially from the multinational companies and how they work, I have noted. They seem to sleep only 4 hours in a day, whole day they are solving problems, problems and problems. I think that HRD is not about hiring and firing of people. It is not even about the staff confidential reports, which

seem to take around 99% of their time. They should be thinking about the issue of professional development first; and thinking about the other business of hiring and firing, confidential reports and the annual increments as a subsidiary function later. The action plan for CPD must be about creating better and professionally competent engineers and human beings.

- The action plan for CPD must lay emphasis on the significance of ethics and honesty in ones professional life. In think any continuous professional development programme-which does not include this aspect-is really falling far short of its objective. So according to me, this should be an almost parallel kind of activity of the action plan for CPD.
- Finally, I think, the action plan for CPD, which is given in the handout of ECI, suggests about constituting the Board for Professional Development of Engineers(BDPE) by the ECI. The main functions of the BDPE are to lay down development policy, establish standard for continuous professional development, monitor such developments (through CPD Committees), and to maintain and improve the competency level of PE's.
- Further, PE's are to be encouraged to record and report their involvement both to the professional society to which they belong and to the BDPE.
- BDPE will give recognition to approved CPD programmes, which can be an international conference or national conference, seminar, workshop, attending courses, etc, ; these courses will be evaluated by the BDPE and it will also provide guidance and support to its members for conducting the CPD programmes.

There are 18 engineering disciplines listed on the first page of the handout of ECI. Each of these disciplines varies in knowledge and skills; and accordingly each discipline will have essentially a different scope of its CPD; and there will be only a few similarities. Therefore, there will have to be an apex body, something like a forum which will develop and guide these CPDs in consultation and participation of its member professional bodies. I think that's one of the jobs of ECI; it is not merely forming a board of professional development of engineers; but it is implementation that is what it is also required to do. It will also decide and assign the credit point ratings for each CPD programme, as is done in the USA, Canada and in many other countries.

There must be some an apex body to which this whole thing is brought forward to and which has a national perspective; and, therefore, it will be able to access on a national level the development needs of the professional engineers who are from these 18 different disciplines; bring some priorities between these various disciplines and diverse organizations which are going to conduct the continuous professional development programmes.

Last point: BDPE is to do is the appraisal of CPD programmes as well as of its assigned credit point ratings. What I mean is that it has to continuously update the assigned credit point ratings and also continue the appraisal of the programmes.

So, this is broadly what I had in my mind to tell you. Unless we formulate a kind of a charter, it is not going to work the way it should work. And this has to be done in a democratic and transparent manner. The constituent members of ECI are the most knowledgeable people in their fields of specialisation; and they have to get together and decide how this continuous professional development programmes are to go ahead.

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#### **Mr. A. C. Wadhawan**

The two specific areas that were covered in this session as well as in the previous sessions are much closed to my heart. I have been dealing with the subjects of code of conduct and code of ethics, particularly for engineers and the professional bodies. We all talk of ethics; and just before this session, we talked of ethics in a big way. The code of conduct and code of ethics in the world started in 1988; it was in that year that for the first time a survey was done to find out as to how many organizations, how many professional bodies and how many companies follow a code of ethics; and you will be surprised to know that at that point of time in the U.K., there were not even 10% which were having the code of ethics.

By the year 1992 because of the consorted efforts, 25% of Fortune 500 companies had the code of ethics. Today, as many of you are aware, there are organizations which would not like to do business with those organizations that don't have code of conduct and code of ethics. It is something which is accepted world-over as a must thing for an organization. If an organization has a code of conduct and code of ethics, obviously the people working in that organization also need to follow that.

In our country, we are very poor in this area. Now, there is a genuine concern that code of conduct and code of ethics can become an assets and not a liability. We got, as a matter of fact, a survey done of 17 companies in the country on their adopting of a code of ethics and code of conduct and we found that though they all propagated it, when actually it came to implementing it, a very few of them were able to do so.

In promoting professionalism, the engineering associations have a big role to play. Most of us are members of these associations; and they have periodical meetings; and if they take the lead in propagating that there should be a quality in work; there should be dedication to the profession; there are no reasons why we cannot uplift ourselves to a position of doing better quality of work.

I think somebody mentioned the word of innovation; we Indians probably are most innovative when we face a challenge. If CPD is made as a challenge, there is no reason why we cannot innovate.

We have done well in some of the major scientific works done in the U.S.A and elsewhere. It is the environment which has to be right; the challenges have to be there; and there should be the motivation for you to do a thing.

We have been saying so far that our population is very large. I think, perhaps, it is an asset and not our liability-if tapped properly. The task ahead is how to educate our engineers; how to make them quality conscious; how to improve their skills and knowledge. I think that is an important area. We cannot have a quantum jump; it needs a step-by-step jump. Our boys in IT have done it.

[Mr. A. C. Wadhawan is the former CM.D, Hindustan Zinc Ltd., Past President of the Indian Institute of Metals, former Chairman of SCOPE and PESB. He has been associated with a number of important national and international scientific, technological, industrial and relative professional bodies. He was the Vice Chairman of the International Lead-Zinc Association, Asia Pacific Region in 1995-1996, a Member of the Advisory Panel of the International Lead-Zinc Study Group, London,. He is a fellow of the Indian National Academy of Engineering and a Member the International Association of Energic Economy, U.S.A. ]

## Questions and Answers

### Question-1.

**Participant.** After passing their degree, most of the engineers opt for IT. What do you think of this trend?

### Answer-1.

**Prof. Tandon:** I think with all due respects to the people in the IT industry, people opt for IT because that is the only place where there is a shortage and the salaries are three times more than that in the civil engineering profession to which I belong. It is most disheartening, when you talk to the students who have got into IITs and they got their last choice namely civil engineering, they don't know what the future goals are for them. This I am talking about the students who go to the IITs; What about students from the other engineering colleges. I think that this type of situation has to stop.

I wish the Statutory Council of Engineers is formed quickly and the Engineers Bill is passed. We should also approach AICTE, which is responsible for the present state of affairs of the engineering education, I know, they have a body of experts on their roles which goes around and sees whether the engineering institutions should be given accreditation or not. I believe even in



the IITs, there are hardly a few who want to go for the hard hat in engineering because it demands really a hard work.

**Question-2.**

**Participant.** I want to know if there are some globally recognized international models like ISO 9000, ISO 14000 available for accreditation or certification of engineers that we are going to follow directly, or do we need to develop our own local models depending upon economical status of India ?

**Answer-2.**

**Mr. A. C. Wadhawan:** I think it is a very good question, indeed. I think that we have to follow certain norms which are followed world-wide. We do not have to reinvent the wheel. Not only that, there is a something called WTO and there is a question of mobility of engineers from one place to another. The other place that we move to must recognize that certain standards are followed, so there are certain things which have to be common. There are many models across the world for accreditation of professional engineers but actually what has been said is very relevant, we should not just blindly follow. We have to formulate our own models for meeting the requirements related to WTO and our needs-something which is relevant to our society.