ENGINEERING COUNCIL OF INDIA

UNIVERSE

7th National Convention

Industry - Specific Engineering Education for Better Employability of Engineers - Contours of Reform

January 28, 2012

ITM Universe Campus, Dhanora Tank Road,
Village Paldi, Halol Highway, Taluka Waghodia,
Vadodara, Gujarat - 391510

Proceedings

Principal Sponsor

Reliance Industries Limited

Jointly Organized by

Engineering Council of India

&

ITM Universe, Vadodara

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Glimpses of the Event

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Compiled and Edited by
P.N.Shali

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		Dr. Anil Kane, President Emeritus, World Wind Energy Association and Corporate Advisor, Suzlon Energy Ltd.
		Prof. P. Prabhakaran, Ex-Vice Dean, Tech. & Engineering, MS University, Vadodara
		Shri Y. S. Trivedi, Senior Vice-President, Hazira Manufacturing Unit, L&T, Hazira
		Shri P. N. Shali, Director, Engineering Council of India & Former Adviser and Consultant (SP-NE), Planning Commission, Government of India
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Introduction

Higher technical education, particularly engineering education, has always occupied a place of prominence in our economic development. According to the XIth Plan Working Group set up by the Planning Commission on Technical Education, the key challenging issues include inter alia: assuring quality of technical education, ensuring its relevance to global, local market and industry needs, and improving employability. The McKinsey Global Institute on the emerging global labour market, according to a study that it has conducted, has stated that though India produces a large number of engineering graduates every year, multinationals find that just 25 per cent of them are employable. Our engineering education, therefore, is not relevant to the present needs of the Indian industry; and if nothing is done now, engineering education will not be relevant in future as well. We need industry-specific engineering education for making engineers employable.

The Engineering Council of India took up this issue. It organized six national conventions, starting with the 1st national convention which was held in August, 2006 at Kolkta. This was followed by the 2nd national convention in May, 2007 at Baroda, 3rd national convention in February, 2008 at Hyderabad, 4th national convention in July 2009 at Visakhapatnm, 5th national convention in September, 2009 at New Delhi- sponsored by the Planning Commission, and the 6th national convention in September, 2011 at Kolkata-sponsored by Tata Steel. A national workshop held in March 2009 at Madurai and the 6th national conferences held at New Delhi in November 2009 were on the related themes. The concern about the quality of engineering education was widely shared at these conventions, workshop and the conference by the delegates from both the industry and academia. An almost unanimous view emerged from these in-depth deliberations that the engineering education needs a systematic overhaul for enabling India to produce world-class engineers of multi-skills, apart from sound knowledge of engineering sciences. We need industry / sector-specific engineering education.

The transformation of our economy and society in the 21st century would depend, in significant part, inter alia, on the quality of engineering education. The present regulatory system of higher technical education is flawed. The barriers to entry are too high. The system of authorizing entry is cumbersome. The system, as a whole, is over-regulated but under-governed. The system of affiliated colleges for undergraduate education, which may have been appropriate 50 years ago, is no longer adequate or appropriate. It needs restructuring, and reformed. India is not an attractive destination for higher technical education for international students. It is time for us to make a conscious attempt to create appropriate policy framework for attracting foreign students to India for higher technical education. This would enrich our academic milieu and enhance quality. It would also be a significant source of finance.

The supply constraint of higher technical education is an impediment today. It must ease for the better quality higher technical education. When students have relatively few choices, institutions have greater power over them. An expansion of higher technical education that provides students with choices and creates competition between institutions is going to be vital in enhancing inter alia accountability. Such competition between institutions within India is, of course, essential. However, the significance of competition from outside India must not be

underestimated. For this purpose, we need appropriate policy for the entry of foreign institutions into India and the promotion of Indian institutions abroad. Such policies must ensure that there is an incentive for good institutions and a disincentive for sub-standard institutions to come to India.

The objective of the 7th national convention was to consider in-depth various aspects of the reform of engineering education and try to get a consensus on the contours of change. Specifically, it discussed whether we need to move out from the present engineering domain–specific engineering education to multidisciplinary engineering education; and it also considered: what could be the possible multidisciplinary engineering curricula of the new possible engineering branches that will meet the needs of the industry. The convention also looked at duration of the course, industry training, after the course mandatory internship with the industry, treatment to the diploma stream in the reform process, and modalities of bringing in the engineer technicians in the process of formal engineering education. Besides, it also looked at creating an effective and efficient interactive mechanism between the industry and academia for keeping engineering education system and process dynamic so that it meets ever-changing demands of the market from time-to time, etc.

Recommendations

1. Presently, engineering profession in India has no legal status unlike other professions such as Lawyers, Doctors, Architects, Chartered Accountants, etc, in the absence of Engineers Act not being there on our statute; and, hence, accountability of engineers cannot be ensured as such. India needs, therefore, to bring on its statute Engineering Act and set up a Statutory Council for Engineers by virtue of this Act.

2. Engineering education should not be looked from the old functional paradigm, but it should be looked from the "user driven "rather than a ' discipline perspective "and reformed accordingly so that it meets the current and future needs of the industry and R&D.

3. Multidisciplinary engineering education will only meet the ever changing needs of the economy. We need to move out of the present engineering discipline–wise education to multidisciplinary engineering education with more practical aspects built in the curriculum.

4. Engineering education should be based on the consensus of academics, the industry and practising engineers. There is a need for establishing a standing working mechanism between the academia, the industry and eminent practising engineers for getting this consensus.

5. We need to integrate engineering disciplines for making it user driven. In the curriculum we should also add general aspects of the subjects such as law, economics and statistics, project management, finance, communication, production management, English language and soft skills.

6. The engineering curriculum needs to be updated on a regular basis.

7. While during-the-course industrial training can continue to be visits only during the first two years of the course, it should be made projects-based during the third and fourth years of the course either undertaken individually or in the format of a group of students working on a project. The training should also be assessed.

8. After the course, it should be made mandatory for a student to go for a paid internship of six months to one year with an industrial unit before engineering degree is granted. A provisional engineering degree can be granted after the course is completed.

9. The industry should be compensated for any expenditure that it may incur on this internship. This is a policy matter. This compensation can be provided to the industry via the tax route, or, it can be met from out of the budget of CSR.

10. Faculty shortage is a serious problem; and it is one of the main causes of producing unemployable engineers. This needs to be tackled. One of the options for this could be permitting practising engineers and engineer consultants to teach in engineering institutes. This needs a policy intervention and change of mind set of our academicians.

11. The current admin-regulatory mechanism has not delivered what it was suppose to deliver. It needs a through overhaul.

12. There is a wider view that the education sector should not remain in the hands of the government. It should be made self regulatory.

13. A standing institutional mechanism needs to be established for training the faculty. Special methodologies also need to be developed to

teach the teachers. The training programmes should be regularly monitored for their efficacy and objectivity. Practising engineers should also be involved in the teaching programmes of the faculty.

14. We should revert back to having two years common subjects in all the branches of engineering, and the branch should be assigned in the third year, as was the practice in the past. It had worked very well then. The students could gain some basic knowledge of the subjects of the other branches which helped them during their working life.

15. As a matter of reform of engineering education, we can consider introducing a few sector-specific multidisciplinary engineering degrees such as BE (Construction Industry), BE (General Engineering), BE (Hydrocarbons) and a combined five-years degree in Engineering & Management.

16. Industry-Academia partnership is a must at all levels such as for revision of teaching methodology, syllabi, exchange of faculty, technology transfer etc.

17. There is a need for legal recognition of PE certification granted as per the system and procedures of the Engineer Mobility Forum.

18. The diploma engineering education also needs to be reformed for making it appropriate for the industry.

19. The vocational engineering education system at the workers level needs to be upgraded and made as an option in the 10+2 education- in the eleventh and twelfth year, instead of following the present pattern, it should cover a syllabus on vocational courses, particularly for the students of rural India . It will help in a greater measure to create large number of jobs in the industry for rural youth. Both the central and state governments should consider this as a matter of policy. This course can be delivered through ITIs. English language should be a compulsory subject of this course.

Executive Summary

The Indian education system has time and again been criticized for the skills that it inculcates in the students and the skills that the industry looks for in them. Only about 25 % of engineering graduates, who come out of engineering colleges every year, are employable, and the rest of 75 % are not found employable by the industry, and they hunt for low level of employment. What needs to be done, therefore, to revamp engineering education system so that it becomes more relevant and responsive to the emerging needs of the industry is being asked in every fora concerning engineers. Engineering Council of India (ECI) took up this burning issue for discussion, and it organized, before this 7th convention, six conventions on the reform of engineering education for better employability of engineers since 2006 at the different locations of the country.

The definition of engineering includes application of scientific and mathematical principles to practical ends such as the design, manufacture and operation of efficient and economical structures, machines, processes and systems. Engineering is also seen as a creative field that makes a positive impact on people's day-to-day lives by designing and constructing things that people use.

Globalization means rapid advancement in technology(ies) and doing business. Liberalization of our economy has opened up cut-thought competition. Export avenues are open; it calls for quality products that we produce, which would have to be of international standards. The industry is importing and installing latest technologies and equipments; and it is adopting modern tools and practices. On the other hand, engineering institutes continue to function with decade's old curriculum adopted by universities, thereby imparting technical knowledge which has remained of partial relevance to the industry. There is no formal institutional linkage between the industry and institutions providing engineering education in the country. This should have been there, as it is the case in developed countries.

Rapid obsolescence of curricula and course contents, due to infrequent revision and much delayed response to technological advances and consequent market demands have resulted in deterioration of our engineering education. Resource constraint, low efficiency of utilization of existing resources, lack of mechanism for sharing physical and human resources of sister institutions, etc., have led to large scale obsolescence of physical resources, deterioration of quality of teaching / learning processes and lowering of competence of teachers.

Multiple control institutional mechanisms and controlling regulations have adversely affected innovative initiatives for admission of the students, recruitment of the faculty, curricula revision & up gradation, and financial management of the institutions. Failure to attract and retain high quality faculty due to archaic recruitment and promotion procedures, absence of incentives for quality performance, lack of staff development policies and low internal efficiency of most of the institutions have led to deterioration of quality of the faculty. The inferior infrastructure and faculty in most of the engineering colleges in the private sector have compounded the problem.

The industry demands multidisciplinary and multi-skilled engineers today; engineers who have sound theoretical knowledge of the discipline of engineering for which they have specialized, a basic knowledge of the other branches of engineering, some basic knowledge of economics, statistics, written and oral communication, finance, project management, contracts, disputes and their resolution, company

law, etc. English language should be a compulsory subject in the engineering curricula and in the curricula of diploma engineers and engineer technicians.

We should give emphasis on the creativity and innovation while deciding about the curricula. They should have presentation skills, and organizing and leadership qualities.

The employable engineers can be produced if we take the following measures: ensure participation of the industry in curriculum development, improve teaching-learning process, upgrade laboratory infrastructure and facilities, give increased weightage to laboratory experiments, place highly motivated and qualified faculty with industrial exposure in position, give increased weightage to industrial training, create internal quality assurance cell and external quality audit, and ensure no political and bureaucratic interference in education, except for the formulation and implementation of right policies. Engineers are recognized by their creativity. If you look around, every thing that you see is a creation of engineers. How to be creative is not taught in our engineering colleges; while as it should have been a compulsory subject in engineering curriculum.

There is a general perception that conventional branch - wise engineering education is not producing engineers required by the industry and other sectors of our economy. The engineering education should be, therefore, user driven and not in discipline perspective, as at present. Perhaps, we should also look for changes in the basic disciplines of engineering branches. It should be redesigned, process wise or function wise, keeping in view the actual functions, which are required to be performed in the application areas. This needs basic conceptual change. This may be the appropriate path for reforming engineering education system for making it user driven or industry- specific.

Engineering institutions should invite experts as visiting faculty regularly. The faculty should visit periodically industrial units for understanding their present as well as future needs. In order to bridge the present gap in skills of engineers, platforms should be developed that would bring together institutions providing engineering education and the industry for evolving modalities for collaboration.

A pragmatic approach for healthy balance between wholeness of knowledge and specialization that caters to current technological demands along with character building needs to be taken. The grading system of faculty should be well laid as per the international standards. All engineering institutes should join hands for sharing their faculty and facilities. The syllabus, teaching methodology, grading systems, etc., as far as possible, should be uniform at all institutes.

The government must play the key role in facilitating the reform process of engineering education system so that it is made relevant to the industry and R&D; while leaving the actual work for it to the stakeholders. There should be less regulation and more freedom to the stake holders in this task. The government should intervene through instruments of policy as and when it deems it necessary.

The execution of pre defined and accepted reforms need to be smooth. For becoming more competitive and bettering our innovative thinking in the global economy, joint research programs by the industry and academia should be encouraged by the government through appropriate incentives.

The present faculty shortage can be met by allowing practising engineers and engineer consultants to teach. The prevailing academic practice does not give scope to practicing engineers and engineer consultants to teach. This mindset of academia must change, as the

practicing engineers would not replace them, but these will play only supplementary role; and it would go a long way in meeting the faculty shortage. This needs a policy intervention and change of mind set of our academic establishments. We should make faculty jobs more attractive as a matter of policy; we should also know how to retain faculty in their positions.

We should institutionalize the industry –academia interactive mechanism at the national level as a matter of policy. The industry and institutions should come forward and play a role in creating this mechanism. It must also be made a mandatory requirement of our regulatory policy governing our engineering education. It would develop a lot of synergy between the theoretical and practical aspects of the subjects that are taught. It will also help the faculty to get assignments from the industry on industrial problems on a regular basis. The students will also gain from such type of projects if they are involved in them. This is a regular feature of engineering education system in the developed countries.

During-the-course industrial training should not be confined only to visits to industrial units, but it should be made a project-based training. This training should also be assessed; and passing it should be made mandatory for the students. After the engineering course is over, there should be a mandatory paid internship of six to one year in an industrial unit. This should also be assessed; and passing it should also be made compulsory. The industry should come forward and support this. The expenditure that the industry may incur on this training and on during –the-course training should be compensated via tax route or through the budget of CSR.

The present predicament that we have is that the teachers teach the subjects that are imposed by the university. It is not the consideration whether these subjects are relevant to the industry or not. Most of the time is lost in covering just the syllabus, leaving no time to the students to do some thinking elsewhere of their own. What we need today is imparting multi-skills to the students. This would be possible when we move beyond the syllabus. But the syllabus is such as would not give the students enough time to go beyond it. Perhaps, we need to integrate skill development with the formal education system. The freedom to decide what they want to do in life should be with our youth. Today, what they should do in life is imposed on them by their parents and peers. This must go.

Globalization of higher technical education is need of the hour because it reflects global out look. It will take care of various factors such as interconnected systems on ecological, cultural, economical, political and social sciences, humanities, etc. This will not only help in reducing competent engineers going out of our country, but also it would rather attract to our shores the students from other countries. The demand is for new and constantly developing skills to retain global competitiveness. For this, the globalization of higher technical education will become more valuable to the Individuals, to the institutes, as well as to the nation

Doctor becomes a practicing Doctor after s / he receives seven years of medical education- MBBS & then, MD or MS and registration by the MCI. The practice of architects and charter accountants is regulated; even nurses need registration. Engineers become practicing engineers only after four years of education because they do not need registration for practicing their profession in India. Engineering profession should also be regulated like the other professions mentioned above are regulated.

Opening Session

Dr. Uddesh Kohli

This is the second time that we are having this convention in Vadodra. The first was held on May, 2007 as the 2nd convention on the same theme at the MS University campus. Considering that only 25 % of engineering graduates who come out of engineering colleges every year are employable and the rest of 75 % are not found employable by the industry, ECI has chosen this issue for a discussion and organized six conventions on the theme relating to reform of engineering education for better employability of engineers in the country since 2006 when the first convention was organized at Kolkata. These conventions were attended by the academia, the industry, consulting engineers and the students. The subject was discussed in–depth and the recommendations that emerged from these conventions were compiled and sent to the concerned departments of the government of India, state governments, engineering institutes and the industry. The 7th convention is being organized today jointly with the ITMU, Vadodra. It has been sponsored by the Reliance Industries. At the end of the day, recommendations emerging from the convention will be formulated and sent to the concerned quarters. After this convention, ECI will organize a round table conference on this theme at New Delhi at which the recommendations that emerged from all the seven conventions will be put up for consideration and final conclusions emerging from that round table conference will be submitted to the government for consideration.

Theme Address: Prof K. Baba Pai

The definition of engineering includes application of scientific and mathematical principles to practical ends such as the design, manufacture and operation of efficient and economical structures, machines, processes and systems. Engineering is also seen as a creative field that makes a positive impact on people's day-to-day lives by allowing for the designing, building, and constructing of things which people use. There is a large demand for engineers both from software and hard core industries. Though our engineering institutes turn out fresh engineering graduates in large numbers, only 25 - 40 % of these engineers are selected by reputed companies and rest of the graduates either are unemployed or they hunt for low level of employments. It seems something is missing in the present education system; and there is a need for some brain-storming for tackling this problem of unemployment of pass out graduate engineers. This tells us that there is some think wrong with our present engineering education system; and this system needs to be turned around by upgrading it. This can be achieved when aspiration is accompanied by energy, enthusiasm, confidence, commitment, openness and daring.

Majority of the students don't know why they are studying in a particular stream. They go to the class for the heck of it. If the exams are standardized incorporating academic research papers and genuine projects, majority of the Indian students (75%) will not make the grade. The current examination pattern is ridiculous.

Dr. Uddesh Kohli, Chairman, Engineering Council of India (ECI), Chairman Emeritus, Construction Industry Development Council (CIDC) & Chairman, Construction Industry Arbitration Council, Former Chairman, Power Finance Corporation, Former Chairman, Consultancy Development Centre, Former Adviser, Planning Commission.

Prof K. Baba Pai, Campus Director, Institute of Technology & Management, ITM Universe Campus, Vadodara, Ex-Dean, Tech. & Engg., MS University, Vadodara.

Cram three or four previous question papers and the student will be a distinction holder. Students are not hard working. They are always on the lookout for shortcuts. Seldom it is found that students doing homework on their own.

What should be our approach for reforming the engineering education system? The answer is that the academic curriculum should be modified with a purpose - creating engineering excellence and confidence in problem-solving for preparing students for the industry. Further, the education of the students should be such as would enable them to design and build high-tech products, structures, systems, and processes. Working globally should be the dream of every engineer; and our education and training should be such as would realize this dream. A sense of pride should be created within students for engineering profession. The global exposure and prosperity that will come from this profession should be hammered in them. A better understanding of project management, collaboration, and teamwork as required by the industry should be developed in engineers. They should be exposed to real-world engineering by project- based training in the industry. The fundamental engineering skills of students should be strengthed to make them better problem-solvers. The global branding of Indian engineers as a well-trained, experienced, and productive workforce should be developed.

IITs and IIMs are our global brands. We should make other institutions also global brands. This should be our concern, and, therefore, a cause for action. For this, the action rests with the institutions. They need to upgrade their infrastructure, put in place the quality faculty, and also upgrade their delivery mechanism, apart from the curricula. These institutions will also have to be given the kind of freedom that is enjoyed by the IITs. The action for this rests with our regulatory agencies. Besides, for globally branding Indian engineering institutions, apart from what actions are required to be taken by them, as stated above, they should match their curriculum with that of the IITs. The type of activities, which should be a part of the curriculum, should include industrial training, attending technical conferences /seminars / conventions and making a contribution in them, undertaking projects including on some specific industrial problem (s) sponsored by the industry, research assignments from R&D establishments, visits to factories, exposure to technical journals, and trade magazines, etc.

The quality auditing system should be introduced. A datum for measuring the quality and excellence should be established. The accreditation inputs should include quality of teaching, level of research, faculty expertise, evaluation of the faculty, standard of infrastructure, resources available with the institution. If it is a self financing institution, the money spent on research and the faculty for attracting the best talent, and interaction between institution and companies should also be a part of the quality auditing system.

The new subjects on soft skills should be introduced in the curricula. It is suggested that we should introduce integrated engineering and management course and national level evaluation system – similar to CA, MBBS, ete, courses. There should be recognition of engineers after 3-7 years of experience as Professional / Chartered Engineers through a national level evaluation process.

Engineering profession should also be regulated like the other professions are. For this, Engineers Act should be brought on the statute and the Council of Engineers set up.

Address by the Guest of Honour : Dr. P.K. Jain

Engineering education is a most powerful tool for increasing industrial competitiveness in the

Shri P. K. Jain, the Site President, Vadodara Manufacturing Division, Reliance Industries Ltd, Vadodara, Gujarat.

global economy. Therefore, we cannot neglect it as such. Even during the time of global recession in 2008-09, Indian economy continued it growth during this period. The industry should play a pro active role in attracting talented young men and women to engineering, research and development fields. India should not only aim at becoming scientifically advance country, but also it should aim at becoming a global leader of innovations. The industry should support the cause of reforming the engineering education system in the country for producing employable engineers.

The software industry has shown the mental capability and knowledge of the Indian software engineers. The quantitative growth in terms of students admitted during the past decade- and- a – half annually has taken place primarily due to the liberal government policies. This booming growth of the output of engineers, which is expected to reach a level of 14 lakh engineers annually in 2015 from the present level of about 8.5 lakh engineers annually, has posed the problem in maintaining the quality of our technical workforce. About 87 % of the graduate engineers come from the private sector self financing engineering colleges (SFI). Most of these colleges do not have quality infrastructure, quality faculty, and linkage with the industry. In order to up grade engineering education system in India, we should go far research oriented engineering education. We should produce more PhDs; we should make faculty jobs more attractive as a matter of policy; we should know how to retain faculty in their positions; we should go far research partnership with the industry on tackling industrial problems; and we should give emphasis on the creativity and innovation while deciding about the curricula. There is a need for paradigm shift in the higher technical education in the country for making it relevant to the needs of the day.

The industry demands multidisciplinary and multi-skilled engineers today. Our engineering education system is not producing these engineers. In other words, the industry needs today engineers who have sound theoretical knowledge of the discipline of engineering for which they are specializing, a basic knowledge of other major related branches of engineering, some basic knowledge of economics, statistics, written and oral communication, finance, project management, contracts, disputes and their resolution, company law, etc. They also should have presentation skills, and organizing and leadership qualities. Skill gap in graduate engineers would have to be bridged through reform of engineering education for making them employable.

Industrial training during-the-course needs to be overhauled. This training should also be assessed and the students should pass it. After the engineering course is over, there should be a mandatory internship of six-to-one year in an industrial unit. This should be a paid internship. This should also be assessed; and passing it should also be made compulsory. The industry should come forward and support this. The expenditure that the industry will incur on this training and on during –the-course training should be compensated via tax route or through the budge of CSR.

Practising engineers and eminent engineer consultants should also be allowed to teach the students. The faculty should change its mindset which at present does not consider these engineers fit enough to teach the students. This needs a policy intervention at the national level.

The industry - academia partnership needs to be created. These steps if taken, it will develop a lot of synergy between the theoretical and practical aspects of the subjects that are taught. The industry should give assignments to the faculty

on industrial problems on a regular basis. In turn the faculty should involve the students on these studies. This is a regular feature of engineering education system in the developed countries.

Address by the Guest of Honour : Shri Ramashankar Singh

Doctor becomes a practicing Doctor after s/he receives seven years of medical education- MBBS & then, MD or MS and registration by the MCI. The practice of architects and charter accountants is regulated; even nurses need registration. While as engineers become practicing engineers only after four years of education. Engineers do not need registration in India for practicing their profession. Hence, it is not necessary for them to go for M.tech after basic engineering. Engineering profession should also be regulated like these professions are regulated. AICTE was set up to regulate the quality of engineering education. If it would have been able to stick to that mandate of the Parliament, we would not have been discussing this subject in this convention today. So, we need to have a look at what has gone wrong with that mandate.

We have all praise for IITs, NITs Indian Institute of Science. Make a system where the best students opt not to go to these institutions, you will see what happens then to these institutions. They are best - students driven institutions. Though the laboratory practice is included in the engineering curriculum, in most of the cases we find generally no proper equipment, not even rudimentary one in these labs, what to talk of most modern equipment. If the equipment is there, it is found lying in the crates, unused. This is the problem.

We need to expose the students to the industry in a proper way- and what that proper way entails is that they should be given project-based industrial training during-the-course; and after the course, they should have internship of minimum one year with an industrial unit. Both these trainings should be assessed; and it should be made mandatory to pass these trainings. In order not to put further pressure on parents of this internship, it should be made paid internship; and the expenditure that the industry may incur on this training, it should be compensated via tax route or from out of the budget of CSR. The industry should enable it. Then the industry should interact with the institutions regularly and discuss with them as to what kind of engineers they need; in turn the institutions should revise their curriculum based on the inputs that they get from the industry. By this way it will be possible to revise the curriculum objectively on a regular basis.

The engineering students have, by and large, poor communication skills – even in their mother tongue. The English language should be taught as a part of the engineering curriculum; and they should also be trained in the other forms of communication. Doing what is learned should be paramount in a student. There is no practice of writing long essays in our engineering institutions. The subjects are taught; and that is it. We should reform our delivery system and bring in the concept of writing long essays on some topics from the course. By writing long essays, the students will acquire research and presentation skills. This is the normal practice in the UK. US and the other developed countries. These long essays are normally presented in the class in these countries. The theme of the convention is apt and timely.

Address by the Chief Guest : Prof. K. G. Narayan Khedkar

The theme of this convention is very relevant today. Several committees have deliberated on

Shri Ramashankar Singh, Chairman, ITM Universe Group and Chancellor, ITM University Gwalior

Prof. K. G. Narayan Khedkar, Ex-Director, VJTI, Mumbai and Visiting Professor IIT, Bombay

how to improve our higher technical education system. Several unaided engineering colleges are now providing education to the students. We must remember whenever and wherever the supply of any product becomes large, the quality of that product diminishes, because large supply means mass production of that product; and mass production leads to deterioration of quality of that product.

Engineers are recognized by their creativity. If you look around, every thing that you see is a creation of engineers. How to be creative is not taught to our students of engineering; while as it should have been a compulsory subject in the engineering curriculum.

The system of education today is teacher / teaching centric; and it also examination centric. There is absolutely no emphasis on learning at all. The system of education should be shifted to student centric, knowledge centric, learning centric, and innovation centric. Then only one can see the difference; and that is a difficult task because most of the engineering institutions are not autonomous as they are affiliated to a university, where we have to fallow the rules and regulation set by the university. This is the constraint and within this constraint we have to work and achieve our goals. At least what we should do within this constraint is to encourage the students to ask as many questions as they may have to ask. We should not discourage them from asking questions- as is the case, by and large, presently. If we are able to do this, we will encourage creativity in the students. For this to happen, the faculty and the students need to change their attitude and mind set.

Engineering education has three purposes; one is giving the knowledge to the students; the second is giving know-how to the students, and the third is building character of the students. The industry often complaints that the relevant knowledge is not given to the students by the universities / institutes. This is a problem being addressed in every fora. The industry expects engineering graduates to have a relevant knowledge and training so that when they come out of their colleges, they should be able to take up their jobs in the industry. This is not happening; and these engineering graduates have to go through one-to-two years of training in the industry before they are assigned their jobs there.

The teachers teach the subjects that are imposed by the university. It is not the consideration whether these subjects are relevant to the industry or not. Most of the time is lost in covering just the syllabus, leaving no time to the students to do some thing else of their own. This is the problem with the present engineering education system. What we need today is imparting multi-skills to the students. This would be possible when we move beyond syllabus. But the syllabus is such as would not give the students enough time to go beyond it. So we must look into this problem, while considering reform of the present engineering education system. We have to give freedom to our youth to decide what they want to do. The freedom to decide should be with them only. Today mostly it is imposed on them by their parents and peers.

Vote of Thanks : Shri H. J. Thaker

Shri H. J. Thaker delivered a vote of thanks.

Shri H. J. Thaker, Chairman, Indian Institute of Metals, Baroda Chapter, Vadodara and Profit Center Head (Fabrication Unit) M / s. Patel Alloy Steels Pvt. Ltd., Ahmedabad.

Technical Session-I

Session Chairman's Opening Remarks : Prof. S. M. Joshi

The different parts of engineering and technology have integrated into a seamless whole. No signal engineering discipline can handle technologies today; and no single specialization can deal with the engineering problems today. It is well recognized fact of our lives that we need multidisciplinary and multi-skilled engineers today. Engineering council of India has taken an initiative and has organized six conventions previous to this one on the theme: "Reform of Engineering Education for Better Employability of Engineers". This is the seventh convention on the same theme that is being organized today.

I am sure that at the end of the day some though provoking recommendations will emerge from this convention. I will add that while considering the various aspects of engineering education, the role of its regulatory bodies should also be considered. I think these bodies represented by the UGC and the AICTE also needs to be reformed. There is a merit in integrating these regulatory agencies into a seamless whole. With this being done, it would go a long way in improving our higher technical education in the country.

Keynote Presentations : Shri Yogesh B. Pandya

Employability refers to a person's capability of gaining initial employment, maintaining it and seeking new employment. Employability depends on assets in terms of the knowledge, skills and attitudes that an individual possess, the way s/he presents them to employers, and the way s/he uses those assets. Despite the increase in number of colleges, the competition for acquiring fresh talent every year is so heated up that it gives an impression that the resources are really scarce. Based on technical skills, English fluency, teamwork and presentation skills, only one in four engineering graduate in India is readily employable (a study by the New York Times). The present generation of engineers is challenged to find solutions to energy, environment, food and agriculture, water, terrorism, infrastructure and health related issues. These problems require multidisciplinary knowledge, system thinking and an understanding of social issues.

The industry needs focusing on quality over quantity, industry exposure, focus on research, entrepreneurial mindset, problem solving and analytical approach to its problems. The curriculum up gradation in line with technological advancements is, therefore, a must thing to do in order to bridge the gap between what is taught in the colleges and what the industry requires. In other words, we should adapt the curriculum that is in pace with the Industry requirement, build up relationship with the industry and career advisors, collaborate to develop "learning models, joint academic – industry degree models, research - based teaching material and methodology, and give focus on fundamentals of a subject.

We should also develop alumni networking and relationship bandwidth, and mutually enabling processes for capability building of the faculty. We should pay adequate focus on personality development and encourage greater industry interaction. The way forward is recognizing the needs of the industry. We should also build sector specific skills for improving productivity, and forge strong linkages between employers and institutions of higher technical education. We should improve the governance of academic institutes. We should build the industry –

Prof. S. M. Joshi, Ex-Pro-Vice Chancellor, MS University, Vadodara

Shri Yogesh B. Pandya, Head HR and Admin, L&T Heavy Engineering Division, L&T, Hazira

academia linkage, centers of excellence, and attract top talents to the faculty pool.

Prof. P. Prabhakaran

The core engineering jobs for which graduate engineers are required include production - specific managers and information technology jobs like software development managers. Both these jobs require persons for management / design and development / marketing / sales / project implementation, etc. On the other hand, for jobs requiring diploma engineers include production supervisors. Production operators are required for machine maintenance / skilled operations, etc. These jobs can be handled by persons holding trade certificates. All are important jobs and require knowledge and skills. These jobs can be classified as the first tier, the second tier and the third tier of engineering services.

The self financed institutions (SFI), which are mostly private - owned, need to ensure employability of engineers, diploma engineers and engineer technicians that they produce in large numbers. They need to strengthen teaching – learning process. They need to upgrade their infrastructure. The government institutionsare relatively better placed in giving quality education, and the quality improvement programme (QIP) is in place in these institutions. The SFIs also need to take up QIPs.

The unresolved issues in the case of SFI, which are 5 to 10 year old, and are in the business of the degree level engineering education, are unbalanced hierarchy of the faculty, in experienced teachers, non-availability of middle level teachers, retention of teachers, training the trainer and absence of a comprehensive plan for improvement. It is mandatory to have the faculty development plan, faculty induction programme based on innovative teaching and research methodology, knowledge up gradation programme, which includes short term courses, seminar, workshop, conference (both attending and conducting), self appraisal and assessment, and motivational rewards to teacher who innovates and ignites mind. Presently, the input to engineering courses is not assessed for aptitude. It needs to be assessed in the CAT itself. Innovations are needed for moulding, industry - specific engineering graduates. The industry – institute interaction mechanism needs to be institutionalized for effective industrial exposure.

Shri Deepak V. Acharya

The basic requirement of industry shall be understood by the academicians through survey and mutual interaction. The multidisciplinary engineering education is required from the first year till the completion of final year encompassing the general knowledge of interdisciplinary branches in an appropriate mix from each discipline (branch) for better employability of engineers. In order to mould the students to become future engineers, managers, scientists, researchers, innovators & entrepreneurs for meeting the global industrial requirements, basic knowledge and skills required in them include basic knowledge of all the major branches, management sciences, exposure to industrial interface by participation in workshop, seminars, conferences, exhibitions, and industrial visits. They should also have communication and presentation skills, English language skill for written and oral communication, skill of interpersonal relations, workplace etiquette, soft skills, emotional intelligence, ethics and values.

The selection of students for engineering course should be through written test, aptitude test and psychometric test and then group discussion and personal interview. Then there has to be

Prof. P. Prabhakaran, Ex-Vice Dean, Tech. & Engg., MS University, Vadodara
Shri Deepak V. Acharya, President, Inoxcva India Ltd., Halol

assessment of personal behaviour, concern for safety, and concern for environment. They should have knowledge of SAP / ERP system, software related to technical module, finance management –overview, fixed cost, variable cost, overhead, cost analysis of products, etc. They should also have knowledge of sales and marketing of industrial products. They should also be exposed to carrying out research and development activities, industrial engineering, recent developments in IT sector, knowledge of product design and development, knowledge of cryogenic / thermal engineering, basic knowledge of statutory requirements as per plant / product requirement and the laws as applicable. They should have self motivation through positive thinking, and self awareness about the goal in life. They should have or develop innovative thinking and leadership qualities. They should also have an overview of global business scenario. The general knowledge of mechatronics, electrical equipments, machinery, metals and materials, electronics, project engineering, project management, construction and fabrication, knowledge of Jigs, fixtures, tools and dies, robotics and automobiles, etc, would be handy.

They should be exposed to applying their engineering knowledge acquired in an engineering college while doing the course through a contact programme with any unit of small scale industry unit by undertaking manufacturing of small items, as a part time activity with economical gain; and they should utilize the knowledge and experience thus gained from the above activity for their project work. The students should also participate in the programmes organized by the professional institutes regularly.

Prof. J. L. Juneja

Ever-changing technology has necessitated industries to adopt latest technology, modern industrial practices for production of quality products, and for reducing cost of production. Globalization of trade and industry due to the liberalization of economy has created cut throat competition. Export avenues are open, but it calls for production of quality products of international standards. Consequently, the industry is importing and installing latest technologies and equipments; and it is adopting modern tools and practices. On the other hand, engineering institutes continue to function with decades old curriculum adopted by universities, thereby imparting tech-knowledge which is not relevant to the industry.

Thus, engineers who come out of these institutes are not equipped with relevant knowledge and skills, and the industry finds it difficult to employ them. This is the main reason of poor employability of engineers who pass out from these institutes. In order to tackle this problem, establishing the industry-institute linkage has been emphasized and discussed at all the forums for the last 30 years. But this linkage has not come up yet. Of late, it is well recognized by the industry that the industry - institute partnership is much more in their interest. The institutions are also keen to have this mechanism with the industry for producing engineers which the industry needs. With this linkage, the institutions can also ensure employability of their students. As such, the land is now fertile for creating the industry-institute linkage for better employability of engineering students.

If we look at industrially advanced countries - the US, France, Germany, etc., - we find a quite encouraging scenario of the industry-institute partnership in these countries. The industry in these countries depends much on the institutions for their R & D activities, which may include sponsoring R&D projects for technological up gradation, apart from projects on their industrial problems. In India the Industry and Institutions

Prof. J. L. Juneja, Principal, Ahmedabad Institute of Technology, Ahmedabad.

can work together at least for ensuring that the quality of out put from the institutions meets the demand of the industry. This would ensure right workforce for the industry; and it would also ensure better employability of engineers who pass out from our institutions.

Today, there is an exponential growth of the student enrolment. The privately funded engineering institutes vary in quality - ranging from "world class" to "third class" engineering Institutions- under the same umbrella. This exponential growth of engineering institutions has also resulted in faculty: student imbalance. While students are increasing, there is acute shortage of faculty, particularly highly qualified and experienced faculty. In most private colleges, we see extremes of either 60 plus or 20 plus faculty in terms of their age profiles. This is a very serious constraint for quality out put from these institutions.

For the academic excellence, a joint effort of both academia and industry is essential. Recognizing lack of employability of engineering graduates, the industry should proactively nurture the talent in colleges, visualizing institutions as the nurseries of their future talent pool. The Industrial inputs in teaching learning process and experience sharing can be very effective in this process. Thus the role of industry is to be perceived as that of the mentoring, facilitating and nurturing; and academics must accept that role in their faculty development process. Developing faculty will have a multiplier effect in enhancing the quality of our students in colleges. The Industry, therefore, should proactively nurture engineering institutions by providing them guidance and support for faculty development and sponsoring projects, and software- as required, guest faculty, etc. This will certainly lead to enhancing the quality of technical education. The identification of Industrial problems and finding ways to solve them is also good motivation for the industry to interact regularly with the academia. This regular interaction with the industry would help engineering institutions in carrying out intellectually challenging R&D for solving industrial problems. At the same time, it will provide to the academia some income and to the students clarity of concepts that they are theoretically learning; while the industry would be benefited by resolving its worrying problems.

In engineering institutes there is costly equipment which is lying idle most of the time. Every industrial unit cannot afford to have such costly equipment which is essentially required to test quality of raw materials and products. The institutes can, therefore, undertake the testing work of raw materials and industrial products at nominal cost benefiting these industrial units; and at the same time, these institutions will generate some income. This process will also teach students how to assess quality of industrial raw material and industrial products.

Industrial visits of students have limitation in learning the industrial practices. The technology adopted and M/C operations are better understood by students by in - plant training. Short duration training of students can be planned during vacations. At the end of the training, students should submit a report on learning out comes. Long - term training can be planned by sand-witch course. This type of training would be more useful if students are trained in that unit in which they are to be employed after the training.

Technical Session-II

Keynote Presentations : Shri Umanath Kumar

The challenges for growth are : infrastructure and quality workforce. According to the Planning Commission estimates, India needs to double its capacity of ports, power, roads and tele-communication during the next five years to sustain its growth. India will need, therefore, a quality workforce in more numbers - engineers, diploma engineers and engineer technicians. India will have to increase no of universities to 1500 by 2016 from the present level of about 350 universities. In take of students will have to be increased to 15 % by 2016 from about 7% today. For having quality workforce, therefore, we need to develop differentiated talent.

Looking at the overall picture, we will need about 5oo million skilled people, and 200 million graduates. We should plan comprehensively to have this rather large workforce by the year 2022. We must look at the other ground realities that are there. About 60% of our labour is employed in agriculture, which contributes only 1% to our overall growth. We will have to check the present primary school drop out rate of about 56%. If the right to education in implemented right away, only 50 million children will reach class 12th in the next 10 years. With the gross enrolment of about 15% in our colleges, only 150 million people will be available to our workforce by the year 2022. About 75 % of our population is in the rural and tribal Ares. With this, we will face a deficit of about 350 million persons in our workforce.

We have before us growing aspirations from the people of rural & triable areas. The people have only a very few employable skills. So we will have to develop these people through suitable vocational programmes. We may have to set up more institutions of the type of ITIs for these people. We can think of creating suitable vocational courses of two years after they pass their 10th class. This can be done by reforming our present school education system of 10 + 2 for the children from these areas. There are many poor people living in the urban areas also who cannot afford to send their children for higher technical education; these children can also be given this choice. This pattern of education can be made an option for children throughout the country. Reportedly, the government is already considering this option. That means, in other words, we will have to think of integrating skill development with the formal education system; and in this we will have to think of developing specific and differentiated talent. Crying need of the hour is, therefore, to focus on the bottom line of the pyramid first – the supply side- for right skilling. If we have a large number of people in the working age (18-58) of right productive skills, our economic growth will be phenomenal. Having a large number of unemployed people in the country is a burden on the economy.

Presently, we are also burdened with skill mismatch and shortage of quality workforce. There is a need, therefore, for paradigm shift of our education policy. We must first find out what we need in graduate engineers, postgraduate engineers and in PhDs, and assess the demand for these professionals during the next decade. Then we must do likewise for diploma engineers and engineer technicians. We must take steps to upgrade infrastructure at the present institutions which do not have it. Then we should look at the curricula that that we teach presently of all the above three categories of professionals. Then we must take appropriate steps to fill up the gap.

In sum : We must look at creating technical workforce of just right education and skills which we need. This will mean multidisciplinary and

Shri Umanath Kumar, Manager, Raychem RPG, Mumbai .

multi-skilled graduate engineers, just right M. Tech engineers and more PhDs. We must create engineering- discipline-specific diploma engineers with English language skill, and just right skilled engineer technicians with English language skill. We must take appropriate steps for upgrading the infrastructure of the existing institutions wherever it is not there, we must take steps to improve quality of the faculty; and crate, if considered necessary, new institutions of just right quality infrastructure and the faculty. We must improve the technology of delivery of engineering education in all the institutions including those of the polytechnics and the ITIs across the country. We must make faculty and research jobs quite attractive for attracting and retaining the right talent.

Prof. S. A. Channiwala

We need to enhance weightage to innovative / live projects and industrial training. Similarly, weightage to laboratory experiments needs to be enhanced. The industry should be involved in the curriculum development. There is an acute shortage of permanent faculty in many of the institutions mostly in the private sector. There is lack of qualified and motivated faculty. Practising engineers from the industry should be invited to teach students. They will not replace the faculty as such, but they will surely supplement the effort. This way we can tackle the present problem of faculty shortage. The Industry-Institutional interactive mechanism needs to be placed in position. The quality of the students at the entry level needs to be ensured.

The laboratories in many engineering colleges do not have equipments and instruments that are required. This issue needs to be tackled. There is a mushrooming of private engineering institutions with low quality infrastructure and faculty. These institutions function as academic business / profit centres. There is no transparency. Strict quality control measures are not reinforced.

The SVNIT introduced a postgraduate course on "Industrial Process Equipment Design"in collaboration with L & T Hazira in 2005-06 with sanctioned intake initially of 10 students. Presently, this stands at 25 students. The curriculum of this postgraduate programme was jointly developed by the faculty of mechanical engineering department of SVNIT and top level management of L & T Hazira. The teaching-learning process is shared by both the SVNIT faculty & L & T personnel. The infrastructure of L&T Hazira is made available to the students. The dissertations of this postgraduate programme are on live projects of L&T Hazira. The students are selected and sponsored by the L & T Hazira. Employability of this programme is 80 to 100%.

In sum: Employable technocrats can be produced if we take the following measures: industry participation in curriculum development, industry participation in teaching-learning process, increased weightage to laboratory experiments, improved industry grade laboratory infrastructure, highly motivated and qualified faculty with industrial exposure, increased weightage to industrial training , internal quality assurance cell and external quality audit, and no political and bureaucratic interference

Shri H. J. Thaker

Rapid obsolescence of curricula and course contents due to infrequent revision and much

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delayed response to technological advances and consequent market demands have resulted in deterioration of our engineering education. Resource constraint, low efficiency of utilization of existing resources, lack of mechanism for sharing physical and human resources of sister institutions, etc., have led to large scale obsolescence of physical resources, deterioration of quality of teaching / learning processes and lowering of competence of teachers in some cases. Multiple control institutional mechanisms and controlling regulations have adversely affected innovative initiatives for admission of the student, faculty recruitment, curricula revision and up gradation, and financial management. Failure to attract and retain high quality faculty due to archaic recruitment and promotion procedures, absence of incentives for quality performance, lack of staff development policies and low internal efficiency of most institutions have led to deterioration of quality of the faculty. Quality of education and quantity of available intake both needs to be attacked simultaneously.

Though, very good efforts in various directions have already been initiated, overall resultant effect can only be achieved by systematic transformation of the technical system as a whole. The need of the hour is to improve quality of technical education system, to enhance existing capacities of the institutions, demand driven, quality conscious, efficient, forward looking, which can, by and large, satisfy the futuristic needs of the industry and society in general. This should be fast and timely, responsive to rapid economic growth and simultaneous technological developments occurring at national and international levels. All these cannot be done by any one body or institution; it certainly requires well defined and joint efforts by all concerned bodies and institutions.

Engineers should be well educated, trained and just ready to start the actual working within short time or almost immediately. This can be possible if institutions impart the right education and training to them. Industrial training is made mandatory for engineering students as it is mandatory for medical students. This should be a part of the syllabus, along with proper coverage in the overall grading system. This practice already exists in IITs and now in NITs. This is one of the basic reasons that engineers who come out from these institutions are accepted by the industry. However, looking to the current industrial needs, and global scenario, these institutions should also modify and further improve their programmes for keeping pace with the time. The whole hearted and committed industrial support, however, is necessary for this. Particularly, this support is needed more by the private institutions; who should also initiate reform of their very functioning. The Industry should accept the students for on – the - job training. There should be suitable performance grading system the students, during this training, which should be a part of the overall grading and evaluation system. Experts from the industry should spare their time regularly for this noble cause and take initiative, provide latest information and guidance on relevant subjects of importance.

Institutions should invite experts as a visiting faculty on relevant subjects regularly. The faculty should visit periodically industrial units for understanding their present needs as well as futuristic needs. The grading system of the faculty should be well laid as per the international standards. Institutes should also join hands for suitably sharing their faculties, facilities, etc., within themselves. The syllabus, teaching methodology, grading systems, etc., should be uniform, as far as possible, at all institutes. A pragmatic approach needs to be taken, for healthy balance between wholeness of knowledge and specialization that caters to

current technological demands, along with character building.

The government must play the key role to understand, systematize and control the entire activity through appropriate policy intervention. The execution of the pre defined and accepted reforms need to be smooth. To improve innovation and competitiveness in the global economy, joint research programmes by the academia and the industry should be encouraged as a matter of policy by the government through appropriate incentives.

In order to meet India's long-term business demand and the skills required in engineers thereof, platforms should be developed that would bring together institutions providing higher technical education and the industry for evolving modalities for collaboration.

Globalization means rapid advancement in technology and doing business. Globalization of higher technical education, therefore, will reflect global out look. It will take care of various factors such as interconnected systems on ecological, cultural, economical, political and social sciences, humanities, etc. This will not only help in reducing competent engineers going out of our country, but also it would rather attract to our shores the students from other countries.

The demand is for new and constantly developing skills to retain global competitiveness. For this, also the globalization of higher technical education will become more valuable to the individuals, to the institutes, as well as for the nation.

The engineering education system should be re looked in its entirety. It should be matched with the current and future requirements. We should then identify changes that are required to be made in the basic disciplines of engineering branches for making these relevant. For this we need an in-depth study of present engineering system as a whole with open mind and

Shri G. K. Jain, Consultant, Baroda.

Gujarat face-to-face with the real life issues of micro, small and medium enterprises (MSME's) through the Gujarat Technical University (GTU) Innovation Council has gained recognition at the "World Education Summit 2011". The Vice Chancellor, GTU, Mr.Akshai Aggarwal said "The idea of GTU Innovation Council is to rekindle passion for innovation in the young minds, encourage them and make them the agents of change. The initiative need not be limited to the state, but it should be spread throughout India.

We should bring on the statute the Engineers Act and set up a Statutory Council for regulating the engineering profession without further delay. With the regulation, engineers will be made accountable for their action, apart from making them to practice their profession ethically.

Prof. R. D. Gupta

The quality of engineering graduates will depend on the quality of intake, the quality of faculty, the quality of course contents, the quality of Infrastructure and the quality of delivery of the course contents. The external inputs include e-education, open course ware (OCW) and the industry exposure. What is ailing higher technical education? It is inferior primary and secondary education, large intake of students, inadequate faculty and absence of quality faculty, poor retention, education without focus on objectives, and very ineffective industry – institutional interaction.

What is needed as a response on the part of education planners and Institutions? It is open access repository of academic knowledge, in campus and off campus training by the industry (2-4 weeks) and enhanced number of M.techs and Ph.Ds. In the X11 Plan, more qualified workforce, mostly through distance education, predominantly by IITs and NITs is targeted to be produced.

We need to reform our engineering education and we need to do so using locally available resources. Existing situation dictates us to groom and use faculty optimally, make use of guest faculty, take all steps to make Industry - Institute Interaction more effective. Let all practical examiners to be appointed from the Industry.

The goal of teaching is student's learning. Sometime reforms forget the goals, gauging their success by changes in forms of teaching. Any complex system such as 'teaching' requires relentless focus on student learning and a commitment to evaluate changes with respect to these goals. We must focus on 'teaching' rather than teachers. It is believed that long - term improvement in teaching will depend more on the development of effective methods of teaching than on the identification and recruitment of talented individuals into the profession.

Many national boards have instituted a voluntary certification process to help raise the standard of teachers. Many of these programmes have not deliver. The curriculum should be prepared by the academicians and the experts from the industry. We must impart soft skills to the engineering students.

Prof. R. D. Gupta, Director Engineering, ITM University, Gwalior.

Concluding Session and Panel Discussion

Session Chairman's Opening Remarks : Prof. R. D. Gupta

We had a very thought provoking presentations in the day on the theme of the convention from distinguished keynote speakers both from the industry and academia. Most important part of the proceedings of this convention is the recommendations - which we will put together after this panel session. A panel of distinguished persons both from the industry and the academia has assembled here. I may call upon these panelists to make their presentations on the theme of the convention for about five minutes; and after that, I will open the session to the floor for discussion.

Panel Presentations :

Prof. S. M. Joshi

Engineering specific job opportunities and employability of engineers are the issues which are related to the national development. Realizing that India needs a large trained and quality workforce for sustaining its high growth during the next decade, the government has decided to increase intake to the universities from the present 10 % to 17 % by 2023. We also need to reform our engineering education system so that it becomes relevant to the industry. It is important that the industry and engineering institutions should work together for this. We should institutionalize the industry –academia interactive mechanism at the national level as a matter of policy. The industry and institutions should come forward and play a role in creating this mechanism.

Dr. Anil Kane

What the industry wants in engineers, it must be provided. So, it must be found as to what the industry wants from engineers. For this, among other things, the industry must interact with the academia on a regular basis. So we need to have the industry –academia interactive mechanism in position at the national level. It must be made a mandatory requirement of our regulatory policy governing our engineering education. We should also consider whether we should have specialization during the first four years of the course or after that. Safety has become very important today because of advancement of technologies across the board. We do not teach safety in the curriculum of engineering today. So, safety must be added as a subject in the engineering curriculum.

We need to train people on how to use and maintain high tech equipment like high duty cranes, earth moving machine, dumpers, excavators, turbines, etc. We need trained operators to handle this equipment. We must teach this in the ITIs. There can also be a certificate course on this. We must also reform the curriculum of diploma engineers for meeting the demand of supervisors from the industry. English language must be taught to graduate engineers, diploma engineers and engineer technicians.

Shri Y. S. Trivedi

I am of the view that during the first 10 years of service in any industry, domain knowledge in engineers is very important. If they go for management course soon after their engineering course, they are not doing the right thing. First requirement for an engineer is to build his or her professional career in the domain in which s / he is qualified. After 10 years, when s / he is elevated to a higher position of responsibility, s / he will need

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Dr. Anil Kane, President Emeritus, World Wind Energy Association and Corporate Advisor, Suzlon Energy Ltd.
Shri Y. S. Trivedi, Senior Vice-President, Hazira Manufacturing Unit, L&T, Hazira.

knowledge of management subjects and other skills. This is the stage when s / he should acquire knowledge of management science, economics and other skills. When s / he moves up further in her / his career s / he should go for acquiring multi –skills including knowledge of human side of engineering.

Prof. P. Prabhakaran

We need to strengthen the postgraduate education. We should have more PhDs .We should encourage talented students to go far postgraduate education and do PhD. By this motivation, we will develop researchers for the industry and R&D laboratories.

The industry should come forward and promote engineering education. The industry should be encouraged to set up engineering colleges. The industry - academia institutional mechanism should be created at the national level. The projects must flow to the institutions, and the faculty, with the involvement of the final year students, should handle these projects. Thus we must integrate engineering education with the industry , then only we will have the right education.

Shri P.N. Shali

Nearly 8 lakh engineering graduates come out from colleges every year in our country.At any given time, a large number of them remain unemployed. According to FICCI, this is because of a critical shortage of skills in engineers that the Indian industry needs. According to a survey report by McKinsey global Institute, multinationals find only 25% of Indian engineers employable. According to the Knowledge Commission "Most graduates (Read Engineers) do not possess the skills needed to compete in the economy, and industries have been facing a consistent skills deficit". This is a cause of concern.

Engineers who come out of engineering colleges are discipline-specific engineers and not multidisciplinary engineers which industry needs. They do not have sufficient knowledge to start working straight away on their jobs in an industrial unit. They need retraining which means expenditure that the industry will have to bear. We have working engineers who often get stuck in the domain-specific jobs. They do not move out to acquire multi-skills required today for meeting the changing needs of the engineering profession.

The problem is there because engineering education evolved over the years from a general phase to one of highly domain - specific specializations and continues to be very much grounded in these specialisations. While as there has been a paradigm - shift in the complexities, size, technologies of projects and in the way these are implemented today, necessitating application of wider knowledge of engineering specialisations and other skills.

More so, the rate at which new technologies, new products and new processes are coming up is extremely rapid. There is no subject that can make you understand technology in its entirety; it needs interdisciplinary knowledge and skills to understand and comprehend. Engineers having knowledge and specialization merely in one branch of engineering cannot handle these technologies. For this, we need multidisciplinary and multi-skilled engineers. Further, too much theory is taught, little emphasis is given on practical training .There is, therefore, no correlation in the present engineering education system between theory and practice. Hence, engineering education system does not prepare

Prof. P. Prabhakaran, Ex-Vice Dean, Tech. & Engineering, MS University, Vadodara.

Shri P. N. Shali, Director, Engineering Council of India & Former Adviser and Consultant (SP-NE), Planning Commission, Government of India.

engineers for the role of project engineers and managers today. The current engineering curriculum is outdated. But any change that we may want in the conventional practices cannot be done through legislation. It can be better and quicker done through credible consensus building process. That is why we are here today.

We need engineers today who have skills to deal with matters such as: business and commerce people and resources, environment, health and safety, legal aspects, project, logistics and procurement engineering, application of IT and communication technology, and the finer elements of contracts and claims, apart from the changing world of technology itself. Besides, all engineering activities have economic implications. Engineers need to be able to analyze the economic aspects of engineering applications. This empowers engineers to make well-reasoned decisions-in analyzing personal decisions as well as business, technology and informed conclusions about public policy based on a comprehensive analysis of costs and benefits of alternatives.

The desirable characteristics of the 21st century engineer from the viewpoint of industry perspective are:- fundamental technical domain knowledge complemented by knowledge from neighbouring technical disciplines, solid methodical knowledge, system-building and problem-solving skills, understanding of the entire value-chain, management know-how and business process skills, inter-cultural understanding and cultural empathy (identification and understanding of another's situation, feelings and motives), and capacity and willingness to engage in life-long learning supported by cosmopolitan attitude and global mindset. Besides, engineers need to have the skills such as: project management and decision-making, marketing and financial know-how, foreign language proficiency, knowledge about the social and ecological implications of technology, interpersonal and communication skills and above all leadership qualities.

So, we need to reform engineering education and change it from the present engineering branch-specific degrees to industry-specific degrees. Make it more practical and multidisciplinary with additions of subjects from social sciences-economics, statistics and management. We, therefore, need to bring up a new curricula and mode of delivery. But we should do it with caution and as per the consensus of all stakeholders. A general degree in engineering, as in the USA, France and in some other countries, would be very suitable to Indian industry with appropriate subjects from the main branches of engineering and subjects from the other than engineering disciplines included in the curricula. This course could be of five years duration with six months of a mandatory paid internship with an industrial unit. Consensus details can be worked out.

New branches could be introduced such as : B.E. (Construction), B.E. (Infrastructure), B.E. (Manufacturing), MBBE - a combined degree in management and engineering of five years including six months of paid internship, B E (Transport Engineering) - roads, railways, ports, etc. B E (Public Health & Environmental Engineering). Some more variants could be thought of in consultation with the stakeholders. For seeking admission to the PG courses; there should be a mandatory requirement of one-two years of practical experience. The contents and duration of the PG courses also need re-orientation and reform so as to make them research-oriented and industry– specific. Subject credits are a matter of in-depth discussions after we have narrowed down suggested alternatives.

A working and dynamic Industry-academia interaction mechanism is needed in India. It is well established abroad to the extent that professors become, with their position in the

academy, automatically the top most industrial consultants. Therefore, seamless transition in the engineering education has become important. The present regulatory mechanism for the higher technical education in the country needs to be reformed and made seamless and more effective and efficient. Engineers Act needs to be enacted without further delay.

Intervention from the Floor :

Shri Ramashankar Singh

We should not have grades or percentage in our education system-from the school level to higher technical and non technical education. Instead, we should have just two grades -pass or fail. We will give a big relief to our students; and with this, education will move out from its present cramming phase to more innovative phase. If a student has passed the common admission test for engineering education with aptitude having been assessed for it, s/ he should be admitted in any college-IITs,NITs or any other quality college. There are enough seats in the system. All will be admitted. Then why go for percentage marks or grade for placement. We must, therefore, abolish these percentages and grades from the system. The cramming is because of this classification in our education system. When we abolish this classification from our education system, the practice of cramming will also go; and the students will get a much needed relief. With this, we will get our boys and girls truly interested in education in general and higher technical education in particular. So judging the merit of a student from the percent marks that s/he has obtained in a college or in a common admission test - for whatever stream of profession it is taken- is not right. It must be replaced with just pass or fail. This should be done with conscious of all the stake holders.

TECHNICAL PRESENTATIONS

7th National Convention on

Industry Specific Engineering Education for Better Employability of Engineers – Contours of Reform

at Vadodara

Convention theme address

K. Babu Rao, Ph.D
Professor emeritus & Director
ITM Universe, Vadodara

0

'We are merely roadside mechanics'

We want to upgrade the level of engineering and technical education. Our society acts like suction pumps which pulls out fresh engineering graduates straight into jobs'

Kiran Karnik, President, National Association of Software and Services Companies, does not mince words.

This gives the inspiration for some drastic change in education system

1

Engineers create that which has never been
Albert Einstein




Sir Visvesvaraya Sir J.C. Bose Dr Homi Bhabha Dr. Abdul Kalam

Our tribute to the eminent scientists and engineers of India

Engineering is seen as a creative field that makes a positive impact on people's day-to-day lives by allowing for the designing, building, and constructing of things

2

Present Status:

- There is heavy demand for Engineers both from Software and Hard core industries
- Our Engineering institutes act like suction pumps which pulls out fresh engineering graduates straight into jobs
- However, Only 50 to 60 % of graduated Engineers are getting selected by above reputed Companies and rest of graduates either unemployed or hunt for low level employments; though they are having good % of marks and coming out from same good institutions
- It seems something is missing in present education system and need for some brain-storming

There is need to upgrade the level of engineering and technical education
Which can be achieved – when aspiration is accompanied by

energy, enthusiasm, confidence, commitment, openness and daring

3

Definition of Engineering

The application of scientific and mathematical principles to practical ends such as the design, manufacture and operation of efficient and economical structures, machines, processes and systems

4

Points to ponder

- Majority of the students don't know why they are studying in a particular stream. They go to class for the heck of it
- If the exams are standardized incorporating academic research papers and genuine projects, majority of the Indian students (75%) will not make the grade
- The current examination pattern is ridiculous. Cram three or four previous question papers and the student will be a distinction holder
- Students are not hardworking and are always in the lookout for shortcuts. Seldom is found students doing homeworks on their own

5

Approach:
The Academic Curriculum Should be modified with a purpose

Creating engineering excellence & confidence in problem-solving and to better prepare students for industry and a fast globalizing world

Designing and building products, structures, systems, and processes should be the dream of every engineer

The Objective should be

- Creating a sense of pride within students for engineering careers and the prosperity & global exposure that will come from these careers
- Developing better understanding of project management, collaboration, and teamwork skills required by industry
- Providing exposure to real-world industry and engineering projects
- Strengthening fundamental engineering skills of students to make them better problem-solvers
- Global branding of Indian engineers as a well-trained, experienced, and productive workforce

Curriculum Development should be such that

Global branding is 'No longer for IIT's and IIM's only'

It is the aim of the Development program to globally brand Indian engineering schools as producing very good engineers and technicians

Advantage: Readymade Engineers for Industry

'Engineered in India' should become a brand

Type of Activities as part of Curriculum

- Trainings
- Seminars
- Competitions / Project sponsorships from industries
- Research assignments from R&D and Industries
- Site / Factory visits
- Exposure to Journals / Trade magazines distribution
- White papers / Articles
- Standards / Codes exposure
- Western culture exposure
- Job offers / Placement for competition winners
- Branding of participating schools initially by various Industries

The total weightage should be around 200 hours per year per student for a total of 600 hours over 3 years

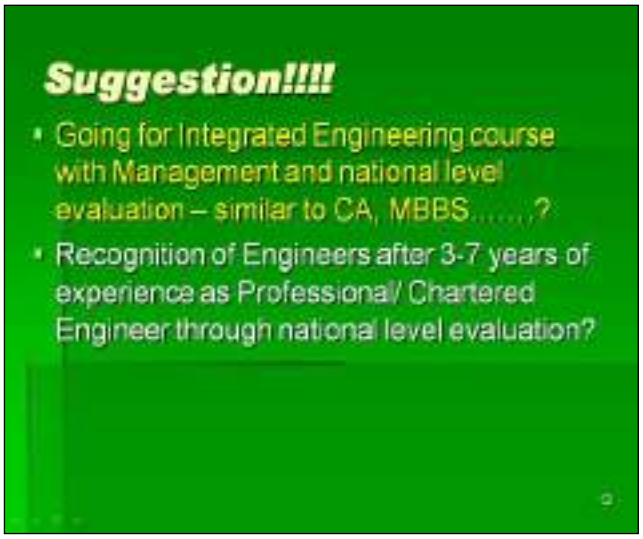
PRESCRIPTION

- Introduce a quality auditing system
- Establish a datum for measuring the quality and excellence
- The accreditation inputs:
- Quality of teaching
- Level of research
- Faculty expertise
- Evaluation of teachers
- Standard of infrastructure
- Resources available at the institution
- Increase share of spent on research
- Increase share of spent on faculty to lure best talent
- Increase interaction between institution and companies
- Introduce new subjects on soft skill in the curricula

PRESCRIPTION

- Manpower handling
- Positive thinking
- Managerial in profession
- Safety & health
- Finance for non-finance
- Power of observation & creativity
- Leadership
- Proficiency in English language, communication & presentation skill
- Stretch students to fullest possible


The skills requirements for an engineer is fast-changing in today's globalizing world
21st Century engineer


Suggestion!!!!
Going for Integrated Engineering course with Management and national level evaluation – similar to CA, MBBS……?
Recognition of Engineers after 3-7 years of experience as Professional/ Chartered Engineer through national level evaluation?

Employability of Engineers
Industry View

Presented by
Mr. Y. B. Pandya
Head- HR & Administration
L&T-MHI Turbine Generators Pvt. Ltd.

MHI 28th January 2012

Content

- Basic Premise
- Definition of Employability
- Facts
- Challenges
- Sector Scan
- Industry Need
- Employability Skill Sets
- Identifying & Bridging the Gap
- Way Forward

MHI Y B Pandya 2/11

Basic Premise

MHI Y B Pandya 3/11

Basic Premise

Individual	Institution	Industry
Inquisitiveness	Knowledge, skill	Opportunity in Area of interest
Creativity	Up to date curriculum	Facilitate Learning
Accepting challenging roles	Industry exposure	Evaluation of learning
Analytical & Problem solving skills	Emphasis on research	Address hindrances

MHI Y B Pandya 4/11

Employability

- **Employability** refers to a person's capability of gaining initial employment, maintaining employment and obtaining new employment.
- Employability depends on
  - assets in terms of the knowledge, skills and attitudes, individual possess
  - the way they use and deploy those assets
  - the way they present them to employers

MHI Y B Pandya 5/11

Facts

- India produces almost twice the number of engineers produced by the US and a little less than twice of all that Europe produces
- Engineering colleges in our country have been growing at 20% every year
- Quality of education is getting a boost

Source – Interview by Aamir Peerzi, Chairman Wipro Ltd in Economic Times

MHI Y B Pandya 6/11

Facts (Contd...)

- Despite the increase in number of colleges, the competition for acquiring fresh talent every year is so heated that it gives an impression that resources are really scarce
- Based on technical skills, English fluency, teamwork and presentation skills only one in four engineering graduate in India is readily employable (Study by The New York Times)

Challenges

- There continue to be exciting new subfields of engineering, like nanotechnology, biotechnology, information technology and logistics.
- The present generation of engineers is challenged to find solutions to energy, environment, food & agriculture, water, terrorism, infrastructure and health related issues.
- These problems require multidisciplinary knowledge, system thinking and an understanding of social issues.

Sector Scan

Construction sector

Manufacturing Sector

IT sector

Power Sector

Industry Needs

- Quality Focus: focusing on quality over quantity
- Industry Exposure
- Focus on research
- Entrepreneurial mindset
- Problem Solving & Analytical approach
- Curriculum upgradations in line with technological advancements

Employability Skill Set

Employability Matrix

Specific Skills	Core Skills	Personal	Communication Skills
Computer excellence	Self confidence	Ethics	Listening skills
Ability to adapt to changing technology	Analytical thinking	Professionalism	Speaking skills
Technical skills	Creative thinking		Written communication
Mathematical skills	Interpersonal skills		
	Leadership skills		

Employability Model

Bridging The GAP

- Adapt curriculum in pace with Industry change
- Build up relationship with industry and career advisors
- Collaborate to develop "Learning Models"
- Develop joint Academic – Industry Degree Models
- Development of research based teaching material and methodology
- Focus on fundamentals of a subject

Bridging The GAP (Contd...)

- Alumni networking and developing relationship bandwidth
- Mutually enabling processes for capability building of the faculty, students and the companies
- Adequate focus on personality development
- Greater industry interaction

U-IL (University Industry Linkage)

- Foundation for Innovation and Technology Transfer (FITT) – the industry interface unit of Indian Institute of Technology, New Delhi (IITD) has been in active operation, in the Institute since the year 2000. Since then about 15 companies have been incubated within the campus
- In view to facilitate greater University – Industry Linkage, FITT and FICCI have signed a Memorandum of Understanding (MOU) in November 2006

Setbacks of U-IL (University Industry Linkage)

- The number of projects are low, often adhoc
- Projects are confined to a handful of research universities and technical institutes
- Their collaborations tend to be mostly with foreign firms

Way Forward

- Recognizing the sectorial needs and build sector specific skills
- Drive skill development that improves productivity, business growth and employability
- Forge strong linkages between employers and higher education institutions

Way Forward (Contd...)

- Share winning business cases to benchmark skill investment and the effective use of manpower.
- Improve governance of academic institutes and industry linkages
- Build Centers of Excellence
- Attract Top Talents to the Faculty Pool

Questions/Doubts...

Role of SFI in Moulding Industry Specific Engineering Personnel

Prof. P. Prabhakaran
Ex-Vice Dean, Tech. & Engg.
M S University, Vadodara

Human Resource for Industry- Specific Engineering Jobs

Degree holders

Doctorates /Post graduates/Graduates

Diploma holders

Trade Certificate holders

Degree Holders

- **Core Engineering Jobs**

Production Specific – Managers

- **Information Technology Jobs**

Software Development Specific - Managers

Both Jobs need personnel for

Management / Design & Development/ Marketing / Sales / Project implementation etc.

Diploma Holders

- **Core Engineering Jobs**

Production Specific – Supervisors

Need personnel for

Shop floor maintenance /supervise/ manage etc.

Trade Certificate Holders

- **Core Engineering Jobs**

Production Specific – Operators

Need personnel for

Machine maintenance /skilled operations etc.

Educational Institutions for Trade Certificate Courses

- Industrial Training Institute (ITI)
under Directorate of Employment & Training, GoG since 71

- **ITI in Gujarat : 316 (Source: DET Web site)**
(Govt. : 185, Granted ITI training Centre: 131)
about 53000 students are trained per year

 # Vocational training services
(under Centre of Excellence, GoI & GoG – 37 ITI are upgraded)

 # Anchor Institute for Mentorship
(GoG initiative)

Educational Institutions for Trade Certificate Courses

- **Skill Upgradation Programmes**

Production & manufacturing
Fabrication,
Electrical & electronics
Chemical
Automobile
Textile
Information Technology
etc. etc.

Educational Institutions for Engineering Diploma Courses

- In Gujarat: 90 Polyetchnics
  (Govt: 30 & SFI: 60)
  (All affiliated to GTU)
- Infrastructure up gradation through
  # World Bank Assistance to Govt Polytechnics (A GoI & GoG initiative)
  # AICTE assistance through MODROBS

Educational Institutions for Engineering Degree Courses

State Owned:
IIT, NIT, Central & State University Institutions
Affiliated Colleges, Open University etc.
Private Owned:
SFI / Co-operative

Type:- Central and State level
University Faculty & Departments
Deemed to be University
Autonomous Colleges
Affiliated College

Educational Institutions for Engineering Degree Courses

- In Gujarat: 100 (GTU affiliated)
  (Govt: 18 & SFI: 82)
  (Source: GTU Web site 2011-12)
  IIT, NIT, Private University
- 39 Institutions offer P G Courses
  (Govt: 11 & SFI: 28)

Scenario of Engineering Education

Strong 3 tier system of technical education
Planned (?) growth in technical institutions
* Degree level :
from 100 % Govt. till 1980s to 80 % SFI today
* Diploma level :
from 100 % Govt. till 1980s to 67 % SFI today
* Certificate level :
almost totally government owned

Why then the need for worrying about 'Industry Specific Engineering Personnel'?

- 'Quantity' seems to be in place.
  #300 fold increase in output in 65 years
  # 70-80% of the total output to industry for employment is from SFI in 2011
- 'Quality' is suspect?
  # Quality Assurance System is in place such as NBA / NAAC
  # SFI needs to ensure their "employability" since the bulk supply comes from this sector

Strengthening of Teaching – Learning Process

- Infrastructure Up-gradation
- Quality Human Resource
  (What is being done and what needs to be done ??)

Trade Certificate Courses:
Diploma Courses:
Degree Courses:
* Bachelor of Engineering
* Master of Engineering
* Doctorate in Engineering

Scenario of Degree Level Engg. Education

Graduates per Million Population of India
- 1 per million per year in 1947
- 213 per million per year in 2006
- 250 per million per year in 2011

UG Programme offered in Engineering:
- 8 + in 1947
- 45 +in 2012

Institutions offering UG programmes: (in Gujarat)
- 3 +in 1947 (all govt. institutions)
- 100 + in 2012 (80 % SFI)

Quality Issues

1. Infrastructure Development
Govt. institutions – meagre
SFI – as per AICTE norms

2. Human Resource
Govt. institutions – relatively better placed, QIP in place
SFI – many unresolved issues

Quality Issues related to SFI

 # Many SFI are new – 5 to 10 year old
 # Unbalanced faculty hierarchy
- * inexperienced teachers
- * non-availability of middle level teachers
- * retention of teachers

 # Training the trainer
- * absence of a comprehensive plan

Expectation
The above may be a passing phenomena

Strengthening Academic Output – Teaching Learning Process

Faculty:
 # Faculty development plan(mandatory)
- * faculty induction programme: Innovative teaching, research methodology
- * knowledge up gradation programme: Short term courses, seminar, workshop, conference (both attending & conducting)
- * self appraisal report & assessment

 # Motivational rewards
- * 'teacher who innovates & ignites mind'

Strengthening Academic Output – Teaching Learning Process

Student:
#Intake quality in terms of Exam Results
- * **Govt. institutions:** relative better
- * **SFI:** relatively inferior

(Note: So far Exceptions are few)

#Intake quality in terms of Aptitude
- * **Govt. Inst.:** no means to assess
- * **SFI:** no means to assess

(Note: Is it necessary to assess ?)

#

Strengthening Academic Output – Teaching Learning Process

Innovations needed in moulding industry specific engineering graduates
(Both at School & Engineering College levels)

Engineering college level:
- # Teaching methodology – interactive type
- # Examination scheme – continuous assessment
- # Teaching scheme – shift from compulsory to choice based system (CBCS)
- # Personality development initiatives – communication skills, group discussions, mock interviews

Strengthening Academic Output – Teaching Learning Process

industry – institute interaction for effective industrial exposure –

* periodic industrial visits,
* mentorship from industrial experts,
* programme-wise expert lectures from industry experts,
* industry related minor projects

Strengthening Academic Output – Teaching Learning Process

School Level

revamp the present system
nurture innovative & creative mind through science projects
mentorship from Engg. Institutions
encourage open house exhibition at engg institutions for school children

"Unfit raw material leads to poor quality finished product"

"Ignite the young fertile mind"

Who is an industry specific engineer ??

One who possesses a right

* attitude
* aptitude
* confidence level
* communication skill
* knowledge
* analytical mind
* common sense
* willingness to share
* cool and level headed

What an SFI should do to deliver industry specific engineers ?

*Systematically address issues related to teaching – learning process

*At the end of 5th year

"NBA Accreditation for all programes"

*At the end of 10th year

"Academic Autonomy" from UGC"

If not

"Deemed University Status"

Who is an industry specific engineer ?

"The one who can effectively enter in to the shoes tailor made for any specified job through a short in house training programme"

A request to industry experts

What industry should not expect is state of the art exposure to very latest development in industry by trainee in an educational institution

Let us not be hypocrats :Experts were once up on a time "a trainee"

Quote for the Day

"Excellent buildings / gardens et al. great proud feeling about the institution,

but

excellent human resource moulds industry specific engineers"

INOXCVA

Experience • Expertise • Excellence

INDUSTRY - SPECIFIC ENGINEERING EDUCATION FOR BETTER EMPLOYABILITY OF ENGINEERS CONTOURS OF REFORM

Dr. Deepak V. Acharya
President, Inoxcva India Ltd.
Halol

INOXCVA

CORPORATE AND PLANT OFFICES - INDIA

INOX INDIA

INOXCVA

PLANT AND OFFICES - ABROAD

INOXCVA, Texas, USA

INOXCVA, Amerport Baytown, USA

JAT-CVA, Hebei Province, China

Brazil

CVA Inc. Red Deer, Canada

INOX INDIA

INOXCVA

SPECIFIC ENGINEERING EDUCATION TO MULTIDISCIPLINARY EDUCATION

- Industry basic requirement shall be understood by Academicians through survey and mutual interaction.
- Multidisciplinary Engineering Education required from the first year till completion of final year encompass the General knowledge of inter-disciplinary branches for better employability of Engineers.
- To mould the students to become future Engineers, Managers, Scientists, Researchers, Innovators & Entrepreneurs meeting the Global Industrial requirements.

INOX INDIA

INOXCVA

MULTIDISCIPLINARY APPROACH

1. Basic skill required
2. Knowledge of management system (multi disciplinary approach for reform)
3. Industrial interface
4. Participation in workshop, seminar, conference, exhibition and industrial visit for exposure
5. Process engineering
6. Entrepreneurship education

INOX INDIA

INOXCVA

BASIC SKILL REQUIRED

- Communication & Presentation skill.
- Requirement of English language for written & oral communication
- Interpersonal Relations skill
- Workplace Etiquette.
- Soft skill
- Emotional Intelligence.
- Ethics & Value
- Written Test, Aptitude test & Psychometric test
- Group Discussion & personal interview

INOX INDIA

INOXCVA

KNOWLEDGE OF MANAGEMENT SYSTEM

(Multi Disciplinary Approach for Reform-1)

- Safety, Health & Environment System(Behavior based safety Approach)
- OHSAS 18001 & other related system for Safety implementation
- ISO 9000 Standard (Quality System)
- 5's & Kaizen Management & Lean Manufacturing.
- JIT, TPM, TQM, SIX SIGMA, SMED (covered under the Kaizen Umbrella)

INOX INDIA

INOXCVA

KNOWLEDGE OF MANAGEMENT SYSTEM

(Multi Disciplinary Approach for Reform-2)

- SAP /ERP System
- Software related to Technical module
- Finance Management –Overview Fixed cost, Variable Cost, Overhead, Cost analysis of product , etc.
- Knowledge of Sales & Marketing

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INOXCVA

KNOWLEDGE OF MANAGEMENT SYSTEM

(Multi Disciplinary Approach for Reform-3)

- Research & Development activities/ Industrial Engineering, Recent development in IT sector.
- Knowledge of Product Design Development.
- Knowledge of Cryogenic/Thermal Engineering.
- Basic knowledge of statutory requirement as per Plant / Product requirement and law of Land.
- Development of self motivation technique through positive thinking/Self Awareness about the Goal in life.
- Development of leadership quality & Innovative thinking.
- Awareness about Global Business Scenario-Overview.

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KNOWLEDGE OF MANAGEMENT SYSTEM

(Multi Disciplinary Approach for Reform-4)

- General knowledge of Mechatronics (i.e. Electronic panels , Electronic Equipments, PNID,CNC M/cs Drawings of Electronic circuits etc.)
- General knowledge of Electrical Equipments/ Machinery , Electrical Circuits etc.
- General knowledge of project engineering
- General knowledge of construction & fabrication (Including Civil Construction & Drawing)
- knowledge of Jigs, Fixtures, Tools & Die, Robotics & Automobiles etc.

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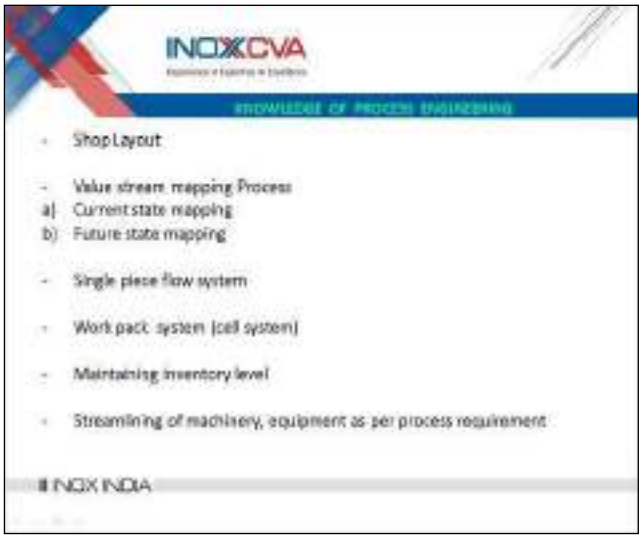
INDUSTRIAL INTERFACE

- Opportunity for application of Engineering knowledge through contact of small industry
- Undertaking manufacturing of small items (job work) as a part time activities with Economical gain
- Utilize the knowledge and experience gain from the above activities for project work

INOX INDIA


INOXCVA
- Participation of students in the programme organised by the professional Institutions, like; IIW, GEO, CII etc.
- Attending Industrial Exhibition for learning purpose
- Project report on the basis of actual learning from Workshop, Seminar, Conference, Exhibition etc.
- Industrial visit -opportunity for learning and Exposure.
INOX INDIA


INOXCVA
- Shop Layout
- Value stream mapping Process
a) Current state mapping
b) Future state mapping
- Single piece flow system
- Work pack system (cell system)
- Maintaining inventory level
- Streamlining of machinery, equipment as per process requirement
INOX INDIA


INOXCVA
- Entrepreneurship platform for converting ideas into Business through:
a) Creativity
b) Innovation
c) Leadership attribute
- Education to built entrepreneur ship
- Knowledge of world class manufacturing
INOX INDIA

Industry – Institute Interaction for better employability of engg. Students: Opportunities and challenges.

Prof. J. L. Juneja
Principal, Ahmedabad Institute of Technology
Ahmedabad

Ever-changing technology has necessitated industries to adopt latest technology and modern industrial practices for production of quality products and for reduced cost of production. Globalization of trade and industry coupled up with liberalization of economy has opened up cut-thought competition. Export avenues are open but it calls for quality of products as per international standards.

- As a result, industries have imported latest technologies and equipment and are adopting modern tools and practices. On the other hand, institutions are functioning with decade old curriculum adopted by universities, there by imparting tech-knowledge which has remained of partial relevance to industries. Thus the pass-outs of institutes are not equipped with skills and knowledge as per expectation of industries. This leads to poor employability of pass-outs of engineering institutions.
- Industries therefore constantly complain about the improper quality of pass outs of engg. Institutions. At the same time they are under compulsion to employ them to man their industries with technical manpower. Never-the-less such a ill-equipped manpower needs training by concerned industry for a period ½ yr to 1 yr before he/she starts giving expected result.

- In order to over come this situation and as a solution to this grave problem ,industry- institute – interaction has been discussed at all forums for the last 30 years. But because of hesitation of real interaction on part of industries, this could not take off to desirable level of late, it is well recognized even by industries, that industry - institute partnership is much more in their interest. Institutions had been eager enough long back for III to give quality output to industries for better employability of their students. As such now the land is fertile to take off industry institute interaction with a fresh mandate for better employability of the engg. students.

- If we look at industrially advanced countries like USA, France, Germany etc. there is quite encouraging scenario with respect to industry institute partnership. The industries in advanced countries depend much on institutions for their R & D activities and technological up gradation of their industrial products by giving sponsored projects to institutions. Institutes in turn develop technology and transfer it to industry for modernization & up gradation of its products. We in India at least can work together (Industry and Institute) to ensure the quality of our pass-out students is as per need & demand of industries. This shall ensure increased employability of aspirant students as well as rightly trained manpower to industries. Industry - Institutes partnership can further be beneficial on following accounts.

- To bring academic and Industry closer.
- To meet-with the research requirements of modern age.
- To design and execute projects of industrial and academic significance.
- To regulate joint teaching/research activities.
- Reduction in industrial costs, improvement in quality and competitive dimensions in products because imported formulate can help in making copies but not the originals for global competition.
- Reduction in dependence of foreign know-how.
- For getting high caliber professionals to man industry.

- The present scenario of technical education in the country is such that, there is exponential growth of student enrolments and the institutions in privately funded engineering college vary in quality ranging from "world class" and "third class" engg. Institutions; under the same umbrella. For academic excellence, joint efforts are there fore essential both by academia and industry.
- Exponential growth of technical institutions has resulted in faculty student imbalance. While students are increasing, there is acute shortage of faculty and particularly highly qualified and experienced faculty. In most private colleges we see extremes of either 60 plus or 20 plus faculty in terms of their age profiles. This is a very serious constraint in quality and employability of technical graduates. In most of the cases of institutions even goals are not defined.

- In order to ensure that our students in technical institutions are given quality technical education such that they become better employable & readily acceptable in industries, it is necessary for institutions to adopt:-
- Burning ambition for excellence and achievement.
- Top management sincerely committed to achieve there ambitions.
- Succeed in creating right environment .
- Disciplined execution and razor sharp academic excellence covering latest industrial practices & technologies.
- Academic- industry interaction though is being debated since decades, it is of equally important and relevance in present era and quality of employable pass-out is subject to this interaction being successfully implemented. This single factor has strong & relevance on employability of engg. Pass-outs. A paradigm shift in present time is to realize that academia industry interaction is a win-win proposition. It is an operating necessity in current global competition In a highly globalize world, quality only will survive. It is therefore that:-

- Reorganizing lack of employability of engineering graduates, industry should proactively nurture this talent in colleges, visualizing institutions as the Nursery of their future talent pool.
- Industrial inputs in teaching learning process & experience sharing can be very effective in this peocess. Thus role of industry is to be perceived as mentoring, facilitating and nurturing role and academics must whole heartedly accept that role in their faculty development process. Developing faculty will have multiplier effect in enhancing the quality of our students in colleges.

- As of present considering 20% pass out as employable and 80% need training before employed, leads to a situation where sufficient man power either not available or otherwise is likely to be hindrance in quality of production as well as in global competitiveness of a company. Industries therefore should proactively nurture all technical institutions through support, help and guidance in course of development, faculty development project guidance and support through equipment ,software, guest faculty support and other hand holding to increase the quality of technical education so that almost all those who are studying become employable. This appears to be least cost best proposition.

- The perennial and persistent view of any or most of the industries in Asia pacific region had been that graduates turned out by the institutes lack in requisite skills knowledge, attitudes or values to meet their needs.
- In effect, pre-mature competencies possessed by the new work force are feared to affect productivity. It is because, over time, two different words have been built between institutes and industry. Each has its own activities. Under the circumstances there exits relative difference in perspective of education and industry. Education looks at the general development of students that will give them a wide range of opportunities and choices to prepare them after graduation while industries look for technicians and employees with specific skills who will fit directly in the system,. This being obvious discrepancy in their respective purposes, there is need to create a platform where institute and industry can meet eye to eye, share ideas and regularly interact.

- Close interaction between institute and industry is seen as a platform for show casing best practices, latest technological advancements and their implementation. It is basically considered to improve the quality of technical education adequately to meet the needs of the industry. If close interaction is established. Industries are able to participate in technical education programs with goal of cross fertilizing ideas for systems improvement. Industrial training and other inputs from the industry like teaching learning processes, students awareness on job functions in industry, attitude to adopt industrial environment, proper practical and relevant knowledge, skill and competencies will summarily take sufficient care of industry expectation from new recruits. Mutual benefit is derived from the shared expertise and experiences between the industry and the institute.

This interaction has assumed great significance and has become much more essential than ever before as industries have moved from labor intensive and industrial based to knowledge based in globalized economy, and there fore role of academic institutes has been intensified more than ever. Following are few areas where interaction between industry institute can start with for mutual benefit and better employability of engg. Pass-outs, without further delay

i.(a)Problem solving:-

Based on problems of industries and with an object to solve the same by short term research work ,the same may be given as B. Tech/M. Tech project and its outcome can be shared with relevant industries.

i.(b)The need for assimilating the latest technology and also for evolving new technology for greater productivity, research and development approaches (R & D) may be looked upon in collaboration with institutes. It is because institutes possess vast intellectual resource base and at times with strong research and development cells. They are in a better position to provide intellectual augmentation and innovations that serve industry purposes. further more, institutes possess very costly and sensitive equipment which can be used for R & D.

- The identification of Industrial problems and discovery of the ways to solve them are also good motivation for industries. This way institutes shall have satisfaction of carrying out intellectually challenging R&D for professional income resources. While industry will be grossly benefited by getting solution to its worrying problems.
- In the institutes there are huge number of costly equipment which are most of the times lying idle. Every industry at the same time can not afford to have such costly equipment most of them however are essentially required to test the quality of raw materials and also that of products. Institutes can therefore undertake the testing work of raw materials and industrial goods at nominal cost benefiting industries and at the same time M/C is used optimally for mutual benefit.

2.Industrial Tours & Study Visits.

- Exposing the future work force to actual field work, industrial environment, state of art science and technology adopted in machineries and equipment operations and industrial practices provide ways to relate class room theories with actual industrial experiences at the cognitive level of students. The visits of industry broadens the mutual orientation of students and also give the true picture of the on-going work. Employment prospects amongst students in turn are heightened by familiarity with existing industrial system

3. Industrial Training of Students & Faculty

- Industrial visits of students have its own limitation on part of students in learning the industrial practices . The technology adopted and M/C operations are better understand by students by Implant training:-
- Short duration training of students can be planned during vacation. At the end of training students should submit the report of learning out comes.
- Long term training can be planned by making the course as sand-witch course. This type of training is more effective if students are to be trained and employed in particular industry.

- Apprentice-ship training can be adopted after completion of degree-diploma programme in employing industries where in the financial support is given jointly by industry offering training and the govt. Such training programmes are arranged by regional apprentice-ship training institutes of govt of India.
- Faculty may be sent for implant training during vacations to understand and to get experience of latest techniques and practices which in turn can be transferred to class room teaching.

4. Faculty and Staff Exchange

- There is need felt exchange of staff between industries and institutes. Managers from Industries can come to institutes for teaching on short term - long term duration similarly teachers can be deputed to perform industrial work functions for limited duration. Staff exchange between the industry and the institutes is one of the keys to make I-I-I successful ensuring thereby industries based educational programme is conducted at the institute. The acquisition of actual field experiences by technical teachers aids in skills formation and facilitation of learning process. People from industry also benefit from exchange through their increased access and exposure in applied research, and gain new ideas for product innovations.

5. Curriculum Development and Teaching Learning System

- Collaboration discussion and decision making processes in curriculum development produce mutual agreements and understanding of the real conditions in the work place, the systematic functioning of industries and also meeting industry expectations. To some extent such kind of interactions provide a highly effective mechanism to produce engg. graduates based on employer demands by running academically sound and industry - oriented curricula. Employability of engg. Pass outs stands increased many fold.

6.Scholarships and placements

- The industry can introduce incentives in institutions by way of scholarships, stipends, insurance and even sponsorships as an encouragement to students to embark on study and training programme. This will prove to be effective in drawing the best talent for industry.

7. Evaluation System

- Technical professionals from industries should be involved in evaluation of students in seminars projects and practical exanimations. This shall help in identifying possible technical skill gaps, inadequacies in training and competency matching with kind of work available in industries.
- Thus industry institute interaction is vital in increasing employability of engg. Graduates. It also explores endless possibilities in working synergy and derive a new focus to address socio-economic and technology driven challenges.

Engineering Council of India

7th National Convention

Industry-Specific Engineering Education for Better Employability of Engineers

P. N. Shah
Director

Engineering Council of India

Why We Need to Reform Engineering Education

- Nearly 8 lakh engineering graduates come out from colleges every year in our country
- At any given time, a large number of them remain unemployed
- According to FICCI, this is because of a critical shortage of skills in engineers that the Indian industry needs

Engineering Council of India

Why We Need to Reform Engineering Education

- According to a survey report by McKinsey global Institute, multinationals find only 25% of Indian engineers employable
- According to the Knowledge Commission "Most graduates (Read Engineers)do not possess the skills needed to compete in the economy, and industries have been facing a consistent skills deficit". This is a cause of concern
- Engineers who come out of engineering colleges are discipline-specific engineers and not multidisciplinary engineers which industry needs

Engineering Council of India

Why We Need to Reform Engineering Education

- They do not have sufficient knowledge to start working straight away on their jobs in an industrial unit. They need retraining which means expenditure that the industry will have to bear
- We have working engineers who often get stuck in the domain-specific jobs
- They do not move out to acquire multi-skills required today for meeting the changing needs of the engineering profession

Engineering Council of India

Why We Need to Reform Engineering Education

- The problem is there because engineering education evolved over the years from a general phase to one of highly domain - specific specializations and continues to be very much grounded in these specialisations

While as there has been a paradigm - shift in the complexities, size, technologies of projects and in the way these are implemented today, necessitating application of wider knowledge of engineering specialisations and other skills

Engineering Council of India

Why We Need to Reform Engineering Education

- Mere specialization in one branch of engineering, as is the practice now, does not produce multi disciplinary and multi-skilled engineers needed by the industry today
- too much theory is taught, little emphasis is given on practical training
- There is, therefore, no correlation in the present engineering education system between theory and practice. Hence, today, engineering education system does not prepare engineers for the role of project engineers and managers

Engineering Council of India

Why We Need to Reform Engineering Education

- Technology today has become more interdisciplinary.
- The rate, at which new technologies, new products and new processes are coming up, is extremely rapid
- There is no subject which can make you understand technology in its entirety; it needs interdisciplinary skills and knowledge to understand and comprehend
- The current engineering curricula is outdated

Engineering Council of India

Why We Need to Reform Engineering Education

- But any change that we may want in the conventional practices cannot be done through legislation. It can be better and quicker done through credible consensus building process. That is why we are here today
- A working and dynamic Industry-academia interaction mechanism is needed in India. It is well established abroad to the extent that professors become with their position in the academy automatically the top most industrial consultants.
- Therefore, seamless transition in the engineering education has become important

Engineering Council of India

Why We Need to Reform Engineering Education

- We need Engineers today who have skills to deal with matters such as:

- Business and commerce
- People and resources
- Environment, health and safety
- Legal aspects, project, logistics and procurement engineering

Engineering Council of India

Why We Need to Reform Engineering Education

- Application of IT and communication technology
- The finer elements of contracts and claims, apart from the changing world of technology itself
- Besides, all engineering activities have economic implications.
- Engineers need to be able to analyze the economic aspects of engineering applications.
- This empowers engineers to make well-reasoned decisions-in analyzing personal decisions as well as business, technology and informed conclusions about public policy based on a comprehensive analysis of costs and benefits of alternatives.

Engineering Council of India

The desirable characteristics of the 21st century engineer from the viewpoint of industry perspective are:-

- Fundamental technical domain knowledge complemented by knowledge from neighbouring technical disciplines
- Solid methodical knowledge;
- System-building and problem-solving skills
- Understanding of the entire value-chain
- Management know-how and business process skills

Engineering Council of India

The desirable characteristics of the 21st century engineer from the viewpoint of industry perspective are:

- Inter-cultural understanding and cultural empathy (identification and understanding of another's situation, feelings and motives);
- Capacity and willingness to engage in life-long learning supported by cosmopolitan attitude and global mindset.

Engineering Council of India

The desirable characteristics of the 21st century engineer from the viewpoint of industry perspective are:

- Project management and decision-making skills
- Marketing and financial know-how
- Foreign language proficiency
- Knowledge about the social and ecological implications of technology
- Interpersonal and communication skills
- Leadership qualities

Engineering Council of India

Industry-Specific Engineering Education for Better Employability of Engineers

- So, we need to reform engineering education and change it from the present engineering branch-specific degrees to industry-specific degrees
- Make it more practical and multidisciplinary with additions of subjects from social sciences-economics, statistics and management
- We, therefore, need to bring up a new curricula and mode of delivery . But we should do it with caution and as per the consensus of all stakeholders

Contours of Reform

- a general degree in engineering, as in the USA, France and in some other countries, would be very suitable to Indian industry with appropriate subjects from the main branches of engineering and subjects from the other than engineering disciplines included in the curricula.

Contours of Reform

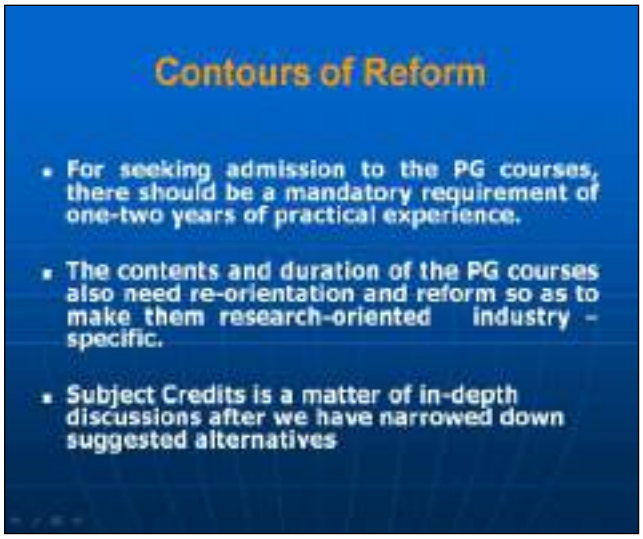
- This course could be of five years duration with six months of a mandatory paid internship with an industrial unit. Consensus details can be worked out

Contours of Reform

- New Branches could be introduced such as :
- B.E. (Construction)
- B.E (Infrastructure)
- B.E (Manufacturing)
- B.E (Engineering)
- MBBE- a combined degree in management and engineering of five years including six months of paid internship
- B E (Transport Engineering) - Roads, railways, ports, etc.
- B E (Public Health & Environmental Engineering)

Contours of Reform

- The other variants of civil engineering suggested by Shri K.K Agrawal
- BE (Structural Engineering)
- BE (Soil Mechanics & Foundation Engineering)
- B E (Transport Engineering)
- B E (Construction Management)
- B E (Public Health & Environmental Engineering)
- B E (Irrigation Engineering)
- B E (Rural Engineering)
- It is opined that these, being specialized degrees, could be considered for M.Tech courses.


Contours of Reform
For seeking admission to the PG courses, there should be a mandatory requirement of one-two years of practical experience.
The contents and duration of the PG courses also need re-orientation and reform so as to make them research-oriented industry – specific.
Subject Credits is a matter of in-depth discussions after we have narrowed down suggested alternatives


Contours of Reform
The present regulatory mechanism for the higher technical education in the country, therefore, needs to be reformed and made seamless and more effective and efficient
Engineers Act Needs to be enacted without further delay

Raychem RPG

Skilling and Growth

2012 & Beyond

Umanath Kumar
Manager, Raychem RPG, Mumbai

CHALLENGES FOR GROWTH

Raychem RPG

- Inadequate Infrastructure
- Quality Workforce
- Incomplete Economic Reforms
- Corruption
- Chronic Large Fiscal Deficits

Joint Economic Committee

SOME FACTS...

Raychem RPG

- The Planning Commission estimates that India almost needs to **double** its ports, roads, power, airports and telecom in the next five years to sustain growth.
- **Number** of universities should go up from 350 today to 1,500 by 2016
- Intake into universities must raise from 7% to 15%
- Differentiated talent development

SOME FACTS...

Raychem RPG

- India's high population density, extreme climate and economic dependence on its natural resource base make environmental sustainability critical in maintaining its development path
- Currently, 60% of the labour force is employed in agriculture, which contributes less than 1% of overall growth

THE COMPELLING FACTS...

Raychem RPG

- India will **need** to skill 500 million candidates by 2022 and produce 200 million graduates (Sri C K Prahlad)
- Primary school **dropout** rate is 56%
- With **Right to Education** plan 50 million children will reach class 12th in next 10 years, if implemented right way
- Gross enrollment to college is 15% - 150 million candidates would be available by 2022
- 75% of this population fall in rural & tribal areas

Deficit of 350 million

THE DUAL CHALLENGE

Raychem RPG

1. Growing aspirations of local people who have few employable skills
2. Skilled manpower from local area

GOLDMAN SACHS

Raychem RPG

- Improve governance
- Raise educational achievement – Pratham, Teach First etc.
- Increase quality and quantity of universities
- Control inflation
- Introduce a credible fiscal policy

Raychem RPG

CRYING NEEDS IS TO FOCUS ON THE BOTTOM OF THE PYRAMID- THE SUPPLY SIDE

Right Skilling

Raychem RPG

BOTTOM OF THE PYRAMID
THE SUPPLY SIDE – RIGHT SKILLING

- Integration of
  - Skill development
  - Formal education system
- Develop specific & differentiated talent

DIFFERENTIATING INDIA

Raychem RPG

- India will have largest working age (18-58 years) population in next 20 years
- If productively skilled the economic growth could be phenomenal
- But if not the over 400million population will be unemployed which may become counter productive
- This will also mean additional burden on Indian economy to support unemployed
- Skill-mismatch and shortage will also lead to higher wage cost

THE KEY SUCCESS FACTOR

Raychem RPG

- Radical & Transformational change at Industry Leadership level

Raychem RPG

SELF MANAGED TEAM :

BUSINESS MODEL AT RPG

Raychem RPG

SMT IS A TEAM OF INTERDEPENDENT MEMBERS WHO ARE ENABLED, EMPOWERED TO PLAN, EXECUTE AND REVIEW THEIR WORK.

THE PEOPLE

Raychem RPG

- 10+2
- From Municipal schools
- Lower economic background

TRAINING - PHASES

Raychem RPG

Refresher Course
(Science + Math)
&
Corporate Grooming

Technical Training
(Electrical + Mechanical + Polymers)

OJT Training
(Different Stages of Operation)

Himachal Pradesh
- Baddi Technical University
- Chitkara University
- Art of Living

Gujarat
- Nirma University
- Xavier's Institute of Technical Education
- Art of Living

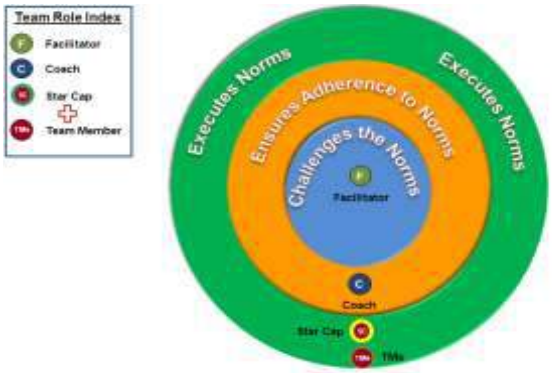
ORIENTATION TRAINING

Raychem RPG

Underwent Rigorous 3 Months Training

OVERVIEW OF TEAM STRUCTURE

Raychem RPG



AT RPG

Raychem RPG

- The paradigm shift at top leadership level
- First unit in Nalagarh for Transformer and energy Meter – need of Diplomas or ITIs
- Create required skills than looking at skill starved job market
- Engage with society around the place
- Establish gainful relationship

THE STARTING POINTS

Raychem RPG

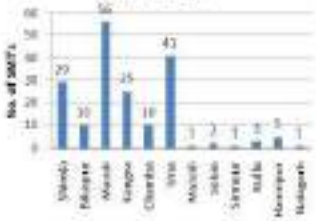
- To generate business awareness in society
  - By engaging municipal schools
  - Village administration
  - Parents of the eligible candidates
- Identify the right candidates, who otherwise cannot go beyond a level – Family Tree
- Develop career path for them
- Enhance employability – continuing education
- Strengthen women empowerment – 30% women in jobs

THE PROFILE OF PEOPLE AT RAYCHEM RPG NALAGARH

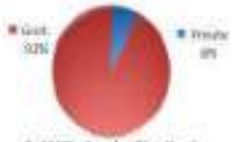
Raychem RPG

184 Self Managed Team Member distributed across Energy Meter, Industrial Product & Transformer Units located at Nalagarh

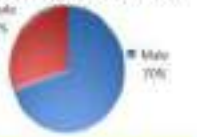
1. Location from where Our 184 SMT's have Emerged



2. Type of School



3. SMT's Gender Distribution



EXTRA ORDINARY RESULTS BY ORDINARY PEOPLE

Raychem RPG

Productivity + Quality

Transformer Job Centre	Industrial Benchmark (250Vs)	SMT Success (8 Hours)
LV Winding	12 Coils	32 Coils
HV Winding	10 Coils	31 Coils
Core Building	4 Cores	9 Cores

Industrial Product

Set New Productivity norm in our surge arrester production from 1500 nos. to 1510 no.s per shift.

TRADITIONAL VS SMT

Raychem RPG

	Traditional Concept	Self Managed Team Concept
Roles	Fixed	Interchangeable
Tasks	Rigid	Flexible
Skills	Specialised	Multiskilled
Control	Individual	Group
Status	Differential	Equal
Supervision	Outside the group	Within the group
Work Effort	Divided	Cohesive
Cost	Cheaper in Short Run	Cheaper in Long Run

TURNAROUND

Raychem RPG

Life Before RPG	Life in RPG
Dependent on family & couldn't Support	Economically Independent
Lacked Education Opportunities	Small Family to bigger family
No Job Security	Ambition to do something in life
Future looked dull	Got the path to meaningful career
Lacked Ambition	Work – Learn – Earn & Support Parents
Economically Deprived	Social Acceptance
	Growth with RPL
	Organization Goal
	Way of Living through values & principles

SUSTAINING TURNAROUND - SYSTEMS

Raychem RPG

SELF MANAGED

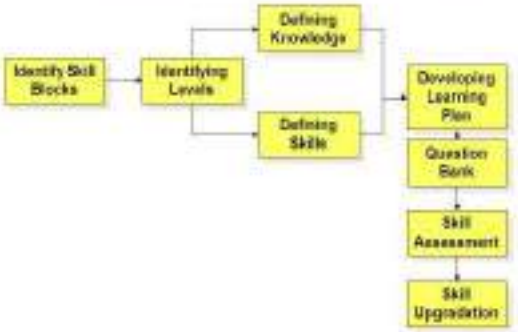
Raychem RPG

Raychem RPG

Skill Based Progression System (SBPS)

Raychem RPG

Skill Based Progression System (SBPS) – Process Steps



EMPOWERMENT

Raychem RPG

1. Defined responsibilities
2. Defined authority commensurate with the responsibilities assigned
3. Set standards of excellence
4. Continuous training to enable them
5. Providing complete business knowledge and information
6. Continuous feedback on performance
7. Recognize for achievements
8. Trust

Empowerment Roadmap - Sample

Raychem RPG

Raychem RPG

The Brighter Future – Higher Employability

- Enrollment into B.Tech program with Baddi Technical University, Himachal Pradesh

THE WINNING APPROACH

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- Industry leaders have to take the first step
- Kill all apprehensions before embarking on the journey
- Prepare for the culture shift
- Enable and empower the various levels in the structure
- Partner with society
- Partner with education institutions

THE HOLISTIC & UNCONVENTIONAL APPROACH

Raychem RPG

- Social awareness of future business scenarios
- Collaborate with society
- Create career progression for the people at the bottom
- Create social mentors
- Prepare teachers at various levels / Village administration

THE HOLISTIC & UNCONVENTIONAL APPROACH

Raychem RPG

- Engage talent who otherwise cannot go ahead in life
- Hand hold them to higher level of career
- Reward the industry with right skills and education

Engineering Education and Institutions in India- A Perspective View

Presented By:
Dr S A Channiwala
Professor,
Mechanical Engineering Department,
Sardar Vallabhbhai National Institute of Technology, SVNIT, Surat

Contents

The Beginnings of Education in India

- Early education in India commenced under the supervision of a guru.
- Initially, education was open to all and seen as one of the methods to achieve Moksha, or enlightenment

The Beginnings of Education in India

- The history of education in the Indian subcontinent began with teaching of traditional elements such as Indian religions, Indian mathematics, Indian logic at early Hindu and Buddhist centres of learning such as Taxshila and Nalanda vidyapitch.

The Beginnings of Engineering Education in India

- The impulse for creation of centres of technical training came from the British rulers of India, and it arose out of the necessity for the training of overseers for construction and maintenance of public buildings, roads, canals, and ports, and for the training of artisans and craftsmen for the use of instruments, and apparatus needed for the army, the navy, and the survey department.

The Beginnings of Engineering Education in India

- The superintending engineers were mostly recruited from Britain from the Cooper's Hill College, and this applied as well to foremen and officers; but this could not be done in the case of lower grades- craftsmen, artisans and sub-overseers who were recruited locally.

The Beginnings of Engineering Education in India

- As they were mostly illiterate, efficiency was low. The necessity to make them more efficient by giving them elementary lessons in reading, writing, arithmetic, geometry, and mechanics, led to the establishment of industrial schools.

The Beginnings of Engineering Education in India

- While it is stated that such schools existed in Calcutta and Bombay as early as 1825, the first authentic account is that of an industrial school established at Guindy, Madras, in 1842, attached to the Gun Carriage Factory there.
- A school for the training of overseers was known to exist in Poona in 1854.

The Beginnings of Engineering Education in India

- Meanwhile in Europe and America, Colleges of Engineering were growing up, which drew to them men having good education, and special proficiency in mathematical subjects.
- This led to discussions in Government circles in India, and similar institutions were sought to be established in the Presidency Towns.

The Beginnings of Engineering Education in India

- The first engineering college was established in the U.P. in 1847 for the training of Civil Engineers at Roorkee.The Roorkee College (or to give it its official name, the Thomason Engineering College) was never affiliated to any university, but has been giving diplomas which are considered to be equivalent to degrees.
- In pursuance of the Government policy, three Engineering Colleges were opened by about 1856 in the three Presidencies.

The Beginnings of Engineering Education in India

- In Bengal, a College called the Calcutta College of Civil Engineering was opened at the Writers' Buildings in November 1856; the name was changed to Bengal Engineering College in 1857, and it, was affiliated to the Calcutta University. It gave a licentiate course in Civil Engineering. In 1865 it was amalgamated with the Presidency College.
- Later, in 1880, it was detached from the Presidency College and shifted to its present quarters at Sibpur, occupy in the premises and buildings belonging to the Bishop's College.

The Beginnings of Engineering Education in India

- Proposals for having an Engineering College at Bombay city having failed for some reasons, the overseers' school at Poona eventually became the Poona College of Engineering and affiliated to the Bombay University in 1858. For a long time, this was the only College of Engineering in the Western Presidency.

The Beginnings of Engineering Education in India

- In the Madras Presidency, the industrial school attached to the Gun Carriage Factory became ultimately the Guindy College of Engineering and affiliated to the Madras University (1858).

The Beginnings of Engineering Education in India

- The educational work in the three Colleges of Sibpur, Poona, and Guindy has been more or less similar. They all had licentiate courses in civil engineering up to 1880, when they organised degree classes in this branch alone.
- After 1880, the demand for mechanical and electrical engineering was felt, but the three Engineering Colleges started only apprenticeship classes in these subjects.

The Beginnings of Engineering Education in India

- The Victoria Jubilee Technical Institute, which was started at Bombay in 1887, had as its objective the training of licentiates in Electrical, Mechanical and Textile Engineering.
- In 1915, the Indian Institute of Science, Bangalore, opened Electrical Engineering classes under Dr. Alfred Hay, and began to give certificates and associateships, the latter being regarded equivalent to a degree.

The Beginnings of Engineering Education in India

- In Bengal, the leaders of the Swadeshi Movement organised in 1907 a National Council of Education which tried to organise a truly National University. Out of the many institutions it started, only the College of Engineering and Technology at Jadavpur had survived. It started granting diplomas in a mechanical engineering course in 1908, and in chemical engineering in 1921.

The Beginnings of Engineering Education in India

- The Calcutta University Commission, debated the pros and cons for the introduction of degree courses in mechanical and electrical engineering. One of the reasons cited, from the recommendations of the Indian Industrial Commission (1915, under the Chairmanship of Sir Thomas (Holland) against the introduction of electrical engineering courses is given in the following quotation from their report[1]: "We have not specifically referred to the training of electrical engineers, because electrical manufactures have not yet been started in India, and there is only scope for the employment of men to do simple repair work, to take charge of the running of electrical machinery, and to manage and control hydroelectric and steam-operated stations.

The Beginnings of Engineering Education in India

- The credit of first starting degree classes in mechanical and electrical engineering and in metallurgy belong to the University of Banaras, thanks to the foresight of its great founder, Pt. Madan Mohan Malaviya (1917).
- About fifteen years later, in 1931-32, the Bengal Engineering College at Sibpur started mechanical engineering courses, electrical engineering courses in 1935-36, and courses in metallurgy in 1939-40. Courses in these subjects were also introduced at Guindy and Poona about the same time.

IITs

- The Indian Institutes of Technology are a group of autonomous engineering and technology-oriented institutes of higher education.
- The IITs are governed by the Institutes of Technology Act, 1961 which has declared them as "institutions of national importance", and lays down their powers, duties and framework for governance.
- They were created to train scientists and engineers, with the aim of developing a skilled workforce to support the economic and social development of India.

IITs

- The Sarkar committee recommended establishment of IITs in various parts of India, affiliated to secondary institutions with the aim of producing not just undergraduates, but researchers and academicians.
- These institutes were expected to maintain high educational standards.

Establishment of IITs [1961 act]

- IIT Kharagpur in Kharagpur (1950; as IIT 1951[2])
- IIT Bombay in Mumbai (1958)
- IIT Madras in Chennai (1959)
- IIT Kanpur in Kanpur (1959)
- IIT Delhi in New Delhi (1961; as IIT 1963)
- IIT Guwahati in Guwahati (1994)
- IIT Roorkee in Roorkee (1847; as IIT 2001)

Original IITs

As a step towards this direction, the first IIT was established in 1951, in Kharagpur (near Kolkata) in the state of West Bengal.

2. IIT Bombay was founded in 1958 at Powai, Mumbai with assistance from UNESCO and the Soviet Union, which provided technical expertise.

3. IIT Madras is located in the city of Chennai in Tamil Nadu. It was established in 1959 with technical assistance from the Government of West Germany.

4. IIT Kanpur was established in 1959 in the city of Kanpur, Uttar Pradesh. During its first 10 years, IIT Kanpur benefited from the Kanpur–Indo-American Programme (KIAP), where a consortium of nine US universities. Under the program, faculty members from these Institutions assisted the Institute in the setting up of the academic programs and development of laboratories.

5. Established as the *College of Engineering* in 1961, located in Hauz Khas was renamed as IIT Delhi.

6. IIT Guwahati was established in 1994 near the city of Guwahati (Assam) on the northen banks of the Brahmaputra River.

7. IIT Roorkee, originally known as the University of Roorkee, was established in 1847 as the first engineering college of the British Empire. Located in Uttarakhand, the college was renamed *The Thomson College of Civil Engineering* in 1854. It became first technical university of India in 1949 and was renamed University of Roorkee which was included in the IIT system in 2001.

Addition of Nine new IITs

In addition to the seven IITs, the Institutes of Technology (Amendment) Act, 2010 seeks to add to the list. Of these, eight are new institutes, in order of establishment.

- IIT Ropar in Rupnagar (2008)
- IIT Bhubaneswar in Bhubaneswar (2008)
- IIT Gandhinagar in Gandhinagar (2008)
- IIT Hyderabad in Hyderabad (2008)
- IIT Patna in Patna (2008)
- IIT Rajasthan in Rajasthan (2008)
- IIT Mandi in Mandi (2009)
- IIT Indore in Indore (2009)

- These IITs are registered as societies and are in various stages of consolidation and development.
- The ninth is Institute of Technology, Banaras Hindu University (IT-BHU), which is currently a faculty under the administration of Banaras Hindu University, Varanasi, which is to be named "Indian Institute of Technology (Banaras Hindu University), Varanasi", which is to be abbreviated IIT-BHU. The bill was approved by the Indian Cabinet in February 25, 2011 and the Lok Sabha passed the bill on March 24, 2011.

List of IITs & Location

Name	Short Name	Established	City/Town	State/UT
Current IITs:				
IIT Kharagpur	IITKGP	1951	Kharagpur	West Bengal
IIT Bombay	IITB	1958	Mumbai	Maharashtra
IIT Madras	IITM	1959	Chennai	Tamil Nadu
IIT Kanpur	IITK	1959	Kanpur	Uttar Pradesh
IIT Delhi	IITD	1961 (1963)	New Delhi	New Delhi
IIT Guwahati	IITG	1994	Guwahati	Assam
IIT Roorkee	IITR	1847 (2001)	Roorkee	Uttrakhand
New IITs:				
IIT Ropar	IITRPR	2008	Rupnagar	Punjab
IIT Bhubaneswar	IITBBS	2008	Bhubaneswar	Orissa
IIT Hyderabad	IITH	2008	Hyderabad	Andhra Pradesh
IIT Gandhinagar	IITGN	2008	Gandhinagar	Gujarat
IIT Patna	IITP	2008	Patna	Bihar
IIT Rajasthan	IITJ	2008	Jodhpur	Rajasthan
IIT Mandi	IITMandi	2009	Mandi	Himachal Pradesh
IIT Indore	IITI	2009	Indore	Madhya Pradesh
IIT (BHU) Varanasi	ITBHU	1916 (2012)	Varanasi	Uttar Pradesh

IITs- Location

Objective behind the birth of RECs

- A large number of industrial projects were contemplated for the 2nd Five-Year Plan period (1956–61). In order to ensure the supply of trained personnel to man these projects, the Planning Commission, in September 1955 appointed an Engineering Personnel Committee (EPC), to undertake an overall assessment of the demand and supply position in respect of engineering personnel-graduates and diploma-holders-during the 2nd Plan period and to recommend the extent to which facilities for technical education should be expanded.

History of RECs

- During the second five year plan (1956–60) in India, a number of industrial projects were contemplated. To ensure enough supply of trained personnel to meet the demand for these projects, the decision was taken to start Regional Engineering Colleges (RECs), at the rate of one per each major state, which can churn out graduates with good engineering merit. Thus, seventeen RECs were established from 1959 onwards in each of the major states.

- The EPC has estimated that by 1960-61, there would be a large gap in the supply position and the shortage will be of the order of 1,800 engineering graduates and 8,000 diploma-holders.
- For fulfilling the recommendations of the EPC, a scheme was formulated for :
- Expansion of the then existing 19, engineering colleges and 50 polytechnics and
- The establishment of 3 new engineering colleges and 23 polytechnics.

RECs

Central Engineering Colleges

Thus, 15 Regional Engineering Colleges were established one in each of the major States. The cities and places in the various States where they were established are as follows :-

1. Andhra Pradesh Warangal 1959
2. Mysore (now Karnataka) Surathkal(Mangalore) 1960
3. Maharashtra Nagpur 1960
4. Madhya Pradesh Bhopal 1960
5. West Bengal Durgapur 1960
6. Bihar (now Jharkhand) Jamshedpur 1960
7. Jammu & Kashmir Srinagar 1960
8. Uttar Pradesh Allahabad 1961
9. Orissa Rourkela 1961
10. Kerala Kozhikode(Calicut) 1961
11. Gujarat Surat 1962
12. Rajasthan Jaipur 1963
13. Punjab (Haryana) Kurukshetra 1963
14. Madras (Tamil Nadu) Tiruchirapalli 1964
15. Assam Silchar 1967

RECs to NITs

- Following the long standing demand for more it's the then MHRD Minister Murali Manoher Joshi decided to upgrade the RECs to National Institute Of Technology(NIT). In 2003 all RECs were upgraded to NITs and central government took control to run these Institutes.
- A parliamentary legislation in 2002 brought them under the direct purview of India's federal government. In 2007, through another legislation, the Indian government declared these schools as Institutes of National Importance at par with the Indian Institutes of Technology.

List of NITs

Name State/UT	Established	Short Name	Upgraded as NIT	Location	
National Institute of Technology, Agartala	1965	NITAGARTALA	2006	Agartala	Tripura
Motilal Nehru National Institute of Technology, Allahabad	1961	MNNIT	2002	Allahabad	UP
Maulana Azad National Institute of Technology, Bhopal	1960	MANIT	2002	Bhopal	MP
National Institute of Technology, Calicut	1961	NITC	2002	Calicut	Kerala (Mahe Region)
National Institute of Technology, Durgapur	1960	NITDGP	2002	Durgapur	West Bengal
National Institute of Technology, Hamirpur	1986	NITH	2002	Hamirpur	Himachal Pradesh
Malaviya National Institute of Technology, Jaipur	1963	MNIT	2002	Jaipur	Rajasthan
Dr. B.R. Ambedkar National Institute of Technology	1987	NIT	2002	Jalandhar	Punjab
National Institute of Technology, Jamshedpur	1960	NITJSR	2002	Jamshedpur	Jharkhand
National Institute of Technology, Kurukshetra	1963	NITKKR	2002	Kurukshetra	Haryana
Visvesvaraya National Institute of Technology, Nagpur	1960	VNIT	2002	Nagpur	Maharashtra
National Institute of Technology, Patna	1886	NITP	2004	Patna	Bihar
National Institute of Technology, Raipur	1956	NITRR	2005	Raipur	Chhattisgarh
National Institute of Technology, Rourkela	1961	NITRKL	2002	Rourkela	Orissa
National Institute of Technology, Silchar	1967	NITS	2002	Silchar	Assam
National Institute of Technology, Srinagar	1960	NITSRI	2005	Srinagar	Jammu & Kashmir
S.V. National Institute of Technology, Surat	1961	SVNIT	2002	Surat	Gujarat
National Institute of Technology, Karnataka	1960	NITK	2002	Surathkal	Karnataka
National Institute of Technology, Tiruchirappalli	1964	NITT	2003	Tiruchirappalli	Tamil Nadu
National Institute of Technology, Warangal	1959	NITW	2002	Warangal	Andhra Pradesh

New NITs

New NIT			Temporary campus/Mentor NIT
National Institute of Technology Goa 2010	NITG	2010	Panaji/NITK Goa Daman & Diu Dadra & Nagar Haveli
National Institute of Technology, Puducherry2010	NITPY	2010	Karaikal/NITT Pondicherry Andaman & Nicobar Islands
National Institute of Technology Delhi 2010	--	2010	-NITH Delhi Chandigarh
National Institute of Technology Uttarakhand2010	NITU	2010	Pauri/NITK/Uttarakhand
National Institute of Technology Mizoram 2010	--	2010	Aizawl/VNIT Mizoram
National Institute of Technology Meghalaya2010	--	2010	Shillong/SVNIT Meghalaya
National Institute of Technology Manipur 2010	--	2010	Langol/NITA Manipur
National Institute of Technology Nagaland2010	NITN	2010	Dimapur/NITN/Nagaland
National Institute of Technology Arunachal Pradesh 2010	NITARUNACHAL	2010	Yupia/NITDGP Arunachal Pradesh
National Institute of Technology Sikkim2010	--	2010	Ravangla/NITC Sikkim

30 NITs

Green- Existing NITs
Red-Upcoming Campuses

Governing Bodies of Technical Education

- MHRD
- Engineering Council of India
- University Grants Commission
- All India Council of Technical Education
- IIT Council
- NIT Council
- Council of Architecture
- State Council of Higher Education
- NAAC – Bangalore – National Assessment and accreditation Council
- National Board of Accreditation

CURRENT STATUS

Principle Levels of Institutions

Level - I	IIT's
Level - 2	NIT's
Level - 3	State Level Engineering Institutions – Govt. & Private
Level - 4	State Level Polytechnics Institutions – Govt. & Private
Level - 5	Industrial Training Institutes – ITI's

Principle Levels of Qualification in Teaching Institutions

Level - I Doctoral Level	Offered by IIT's, NIT's and Other Engineering Colleges
Level - 2 Post Graduate Level	
Level - 3 Under Graduate Level	
Level - 4 Diploma Level	Offered by Polytechnics
Level - 5 Technician Level	Offered by ITI's

DATA

[A] On Students Enrolment In IITs and NITs

Details of B.Tech Intake-IITs

Sl.No	Name of the institute	Total
1	IIT BOMBAY	880
2	IIT DELHI	851
3	IIT GUWAHATI	615
4	IIT KANPUR	827
5	IIT KHARAGPUR	1341
6	IIT MADRAS	838
7	IIT ROORKEE	1155
8	IIT BHUBANESHWAR	120
9	IIT GANDHINAGAR	120
10	IIT HYDERABAD	140
11	IIT PATNA	120
12	IIT RAJASTHAN	160

Details of B.Tech Intake-IITs

Sl.No	Name of the institute	Total
13	IIT ROPAR	120
14	IIT INDORE	120
15	IIT MANDI	120
16	IT-BHU (VARANASI)	1057
17	ISM DHANBAD	1034
	Grand Total	**9618**

Details of B.Tech Intake-NITs

Sl.No	Name of the institute	Total
1	NIT Agartala	757
2	NIT Allahabad	814
3	NIT Bhopal	817
4	NIT Calicut	890
5	NIT Durgapur	800
6	NIT Hamirpur	462
7	NIT Jaipur	740
8	NIT Jalandhar	786
9	NIT Jamshedpur	601
10	NIT Kurukshetra	832
11	NIT Nagpur	676
12	NIT Patna	554
13	NIT Raipur	893
14	NIT Rourkela	810
15	NIT Silchar	490

Details of B.Tech Intake-NITs

Sl.No	Name of the institute	Total
16	NIT Srinagar	632
17	NITK Surathkal	740
18	NIT Surat	693
19	NIT Tiruchirappalli	768
20	NIT Warangal	740
21	NIT Arunachal Pradesh	90
22	NIT Delhi	90
23	NIT Goa	90
24	NIT Manipur	90
25	NIT Meghalaya	90
26	NIT Mizoram	90
27	NIT Nagaland	90
28	NIT Puducherry	90
29	NIT Sikkim	90
30	NIT Uttarakhand	90
	Grand Total	15,395

DATA

[B] State Level Institutions – Degree Levels

Detail of Engg. Institute- State wise

State	No of Institute
Andra pradesh	703
Arunachal predesh	1
Asam	16
Bihar	27
Chanigarth	5
Chatisgarh	51
Daman & Div	0
Delhi	20

Detail of Engg. Institute- State wise

State	No of Institute
Goa	3
Gujarat	98
Hariyana	154
Himachal Pradesh	20
Jammu Kasmir	7
Jarkhand	15
Karnataka	189
Kerala	123

Detail of Engg. Institute- State wise

State	No of Institute
M P	211
Maharasthra	324
Manipur	1
Meghalaya	1
Mizoram	1
Nagaland	1
Orissa	121
Pondichery	13

Detail of Engg. Institute- State wise

State	No of Institute
Panjab	86
Rajasthan	130
Sikkim	2
Tamilnadu	496
Tripura	4
U P	324
Utrakhand	32
West Bengal	94
Grand Total = 3274	

DATA

[C] State Level Institutions - Polytechnics

Diploma Engineering College

Region	No of Polytechnic			
	Gov.	Private	Other	Total
Central	107	153	20	280
Eastern	105	162	10	277
North-West	95	614	69	778

Diploma Engineering College

Region	No of Polytechnic			
	Gov.	Privet	Other	Total
Northern	146	359	17	522
South-Central	117	212	4	333
South-West	153	146	50	349

Diploma Engineering College

Region	No of Polytechnic			
	Gov.	Privet	Other	Total
Southern	42	428	37	507
Western	52	579	39	670
			Grand Total	: 3716

DATA

[D] State Level Institutions - ITIs

Detail of ITIs- State wise

State	No of Institute	Intake
Andra pradesh	61	8068
Arunachal Pradesh	5	384
Assam	28	4364
Bihar	12	2782
Chandigarh	1	240
Chhattisgarh	41	2836
Daman & Diu	1	250
Delhi	71	14291

Detail of ITIs- State wise

State	No of Institute	Intake
Goa	10	1364
Gujarat	478	65148
Haryana	48	5692
Himachal Pradesh	32	2296
Jammu & Kashmir	23	1508
Jharkhand	07	1220
Karnataka	76	8614
Kerala	24	5958

Detail of ITIs- State wise

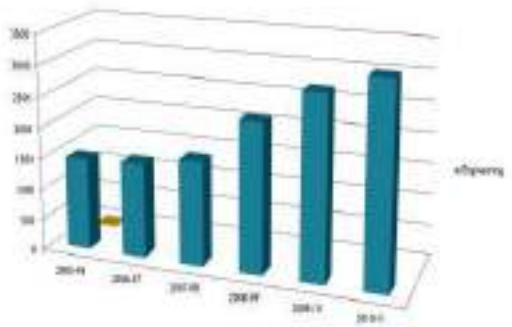
State	No of Institute	Intake
M P	67	3916
Maharasthra	601	95912
Manipur	32	4978
Meghalaya	9	622
Mizoram	02	320
Nagaland	05	387
Orissa	14	2212
Pondichery	03	276

Detail of ITIs- State wise

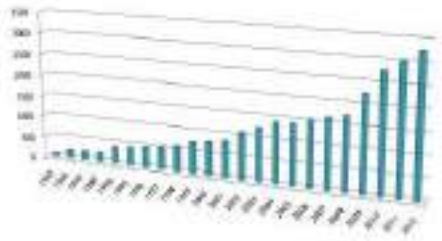
State	No of Institute	Intake
Panjab	75	3952
Rajasthan	94	15506
Sikkim	01	108
Tamilnadu	33	5828
Tripura	07	876
U P	94	14701
Utrakhand	36	2655
West Bengal	26	2152
Grand Total	**3138**	**279416**

Growth patterns- Degree Level Institutions

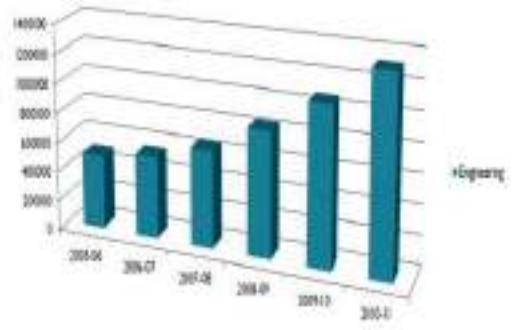
Growth in Technical Institute



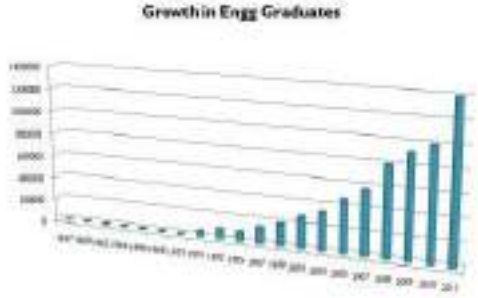
Growth of Degree Institutions 1950-2012



Growth in Seats Technical Institute

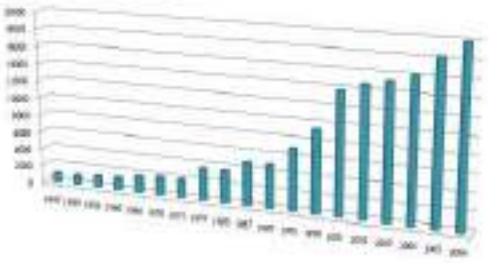


Growth of sanctioned Intake of Graduates 1947-2011

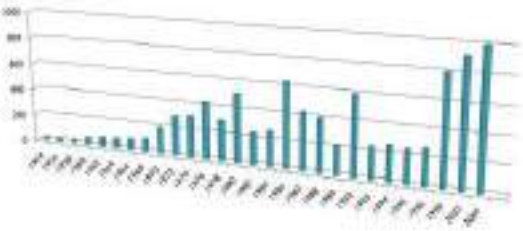


OUTPUT

Masters Output from 1947-2006



Engineering Doctorate Degrees Awarded in India



Employment Status through Campus Interview:

- IIT's : 4682 [2008-09]
- NIT's : 6418 [2008-09]
- Overall: Less then 35% at National Level

Details of Publication/Patent

Name of IIT	No of Publication	No of Patents
IIT, Kharagpur	7,370*	200
IIT, Bombay	10,925 **	200
IIT, Madras	5715 *	125
IIT, Kanpur	6,234 **	100
IIT, Delhi	6,520 *	240
IIT, Guwahati	1596 *	-
IIT, Roorkee	3471 *	12
Total	41831	877

*Upto 2008
** Upto 2011

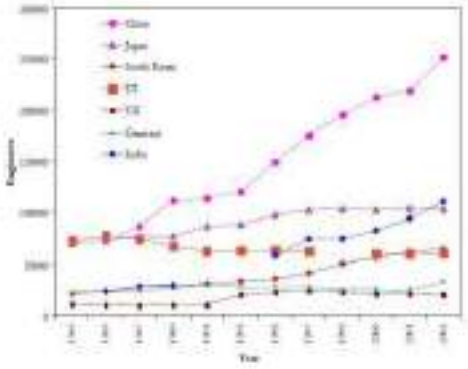
NITs- Publications and Patents

Name	Publication
National Institute of Technology, Agartala	782
Maulana Azad National Institute of Technology, Bhopal	643
National Institute of Technology, Calicut	614
National Institute of Technology, Durgapur	666
National Institute of Technology, Hamirpur	592
Malaviya National Institute of Technology, Jaipur	548
Dr. B.R. Ambedkar National Institute of Technology	
National Institute of Technology, Jamshedpur	NA
National Institute of Technology, Kurukshetra	542
Visvesvaraya National Institute of Technology, Nagpur	546
National Institute of Technology, Patna	687
National Institute of Technology, Raipur	195
National Institute of Technology, Rourkela	703
National Institute of Technology, Silchar	
National Institute of Technology, Srinagar	313
S V National Institute of Technology, Surat	1247
National Institute of Technology Karnataka	576
National Institute of Technology, Tiruchirappalli	603
National Institute of Technology, Warangal	680
	Total 9289

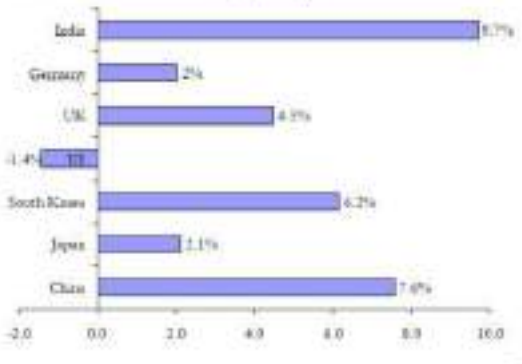
Patents 35

GLOBAL OUTLOOK

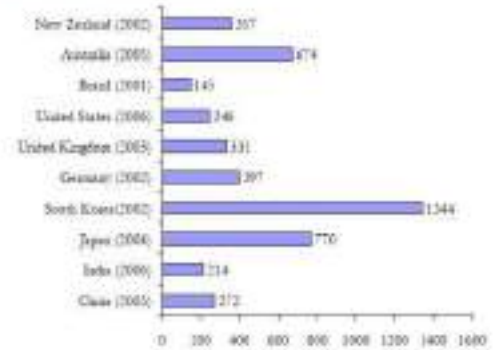
Growth in Graduate Engineers in Different Countries

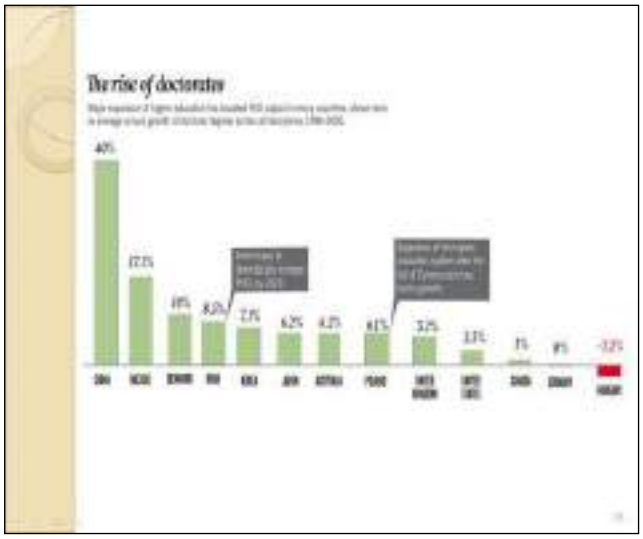


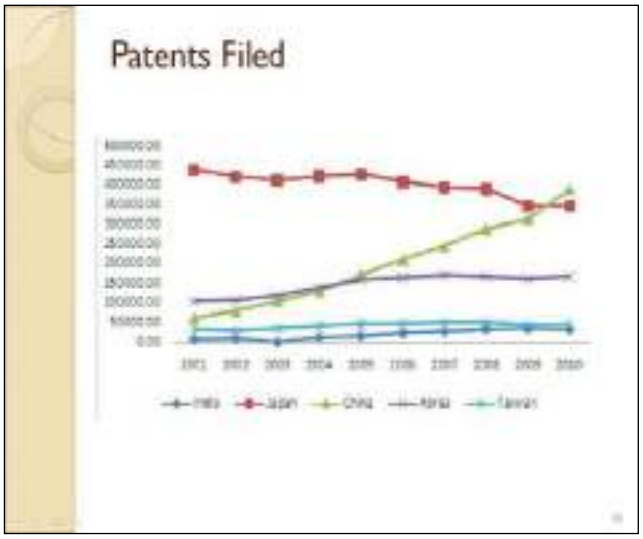
Growth Rate of Graduate Engineers for Different Countries (2004 or the most recent year)

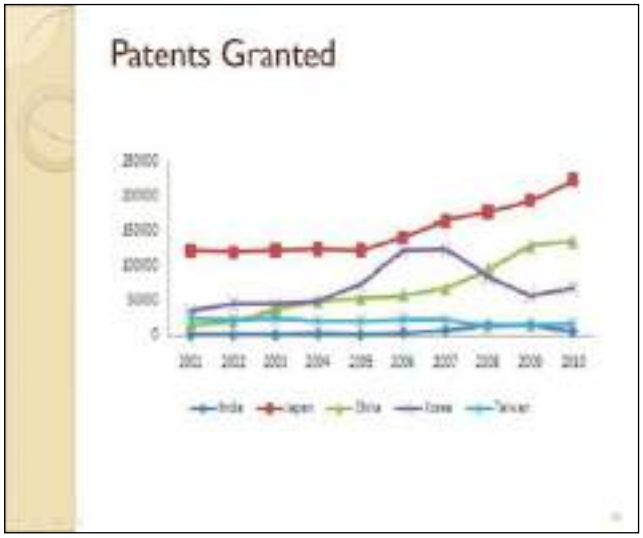


Engineers per Million Population for different countries

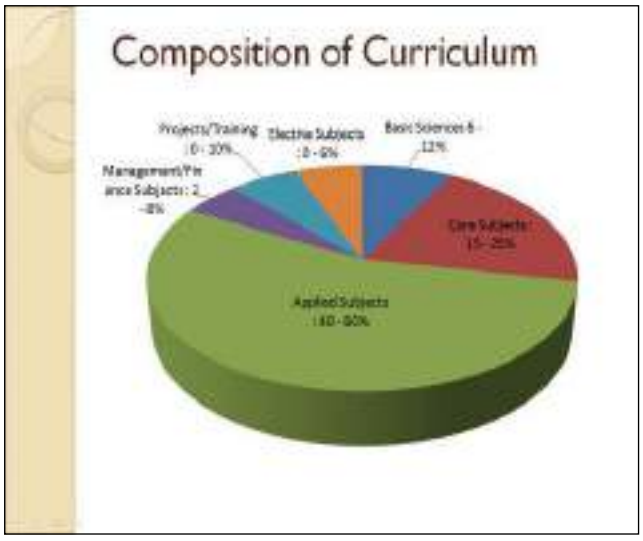








ISSUES



- Weightage to innovative/live projects and industrial training needs to be enhanced (Patent output)
- Weightage to laboratory experiments needs to be enhanced at professional subject level
- Amalsation of Textbook and standard based teaching

- Participation of Industry in Curriculum Development
  - Almost NIL
- Participation of Industrial Personnel in Teaching Learning Process
  - Almost NIL
- Sharing of Industry Infra-Structure
  - Almost NIL
- In general
  - Industry- Institute Bondage is almost NIL.

- Student : Quality at entry level – uniformity needs to be reinforced
- Faculty
  - Acute shortage [40 – 45 % permanent faculty]
  - Lack of qualified and motivated faculty.
- Infrastructure
  - Industry grade equipments / instruments are usually not traceable in the laboratory.
  - Norms not strictly enforced
  - Not upto the mark

- Mushrooming of private engineering institutions
  - Functions as academic business / profit centres.
- Governance at Local, state and central level
  - Sizeably poor
  - Transparency is missing in general
  - Strict quality control measures not re-inforced
  - Political and Burocratic interference.
- Financial Outlay
  - Only 0.5 % of GDP as against 2 % of GDP in china.

THREAT

Impact of Globalization, WTO and GATs

- Institutions will be subjected to international academic market place regulated by WTO.
- Result is – swamped by overseas institutions and programs with intent on earning profits and not or less focus on nation development.

- Spanish sociologist Manvel Castells – one of the leading authorities on globalization states

  "Effects on the university/ institutions will be more drastic than industrialization, urbanization and secularization combined. It is the biggest challenge that the university has ever faced for more then a century and half".
- Mr. Michilesh Kumar Singh of Education Research Foundation worries about

  " Social Disorder".

Initiative by SVNIT, Surat

- Introduced a post graduate cource entitled, "Industrial Process Equipment Design", in Collaboration with L & T Hazira in 2005-06.
- Sanctioned intake : Initially-10 Present: 25
- Salient Features of this PG program:
- Curriculum was jointly framed by Faculty of Mechanical Engineering Department of SVNIT and Top level management of L & T Hazira.

Initiative by SVNIT, Surat

- Teaching-Learning Process is shared by both SVNIT faculty & L & T personnel.
- Infra-structure of L&T Hazira is made available to the students.
- PG dissertations are on live projects of L&T Hazira.
- 5 to 10 students are selected and sponsored in totality by L & T Hazira from day-1 they register this PG program.
- Employability of this program is 80 to 100%.

CONTOURS OF REFORM FOR BETTER EMPLOYABILITY

CONCLUSIONS

1. Status of Engineering Institutions in India[2010-11]:

Degree Level Institutes

IIT's	: 17
NIT's	: 30
State Level Government/Private Engineering Colleges [AICTE approved]	: 3274
Total	**: 3321**

CONCLUSIONS

Diploma Level Institutes:

Govt. Polytechniques	: 1081
Private Polytechniques	: 2628
Others	: 07
Total	: 3716

CONCLUSIONS

Industrial Training Institutes:

Government	: 817
Private/ Others	: 2653
Total	: 3470

CONCLUSIONS

Under Graduates:

IIT's : 9618

NIT's : 15395

Other Engineering Colleges :Approx. 140000

CONCLUSIONS

Post Graduates:

IIT's : 5,287

NIT's : 4,569

Other Engineering Colleges: Approx. 20000

CONCLUSIONS

Skilled Technicians [ITI's]:

Total : **279416**

CONCLUSIONS

Research Publications:

IIT's : 41831

NIT's : 9389

CONCLUSIONS

Innovations/ Patents:

IIT's: 877

NIT's: 35

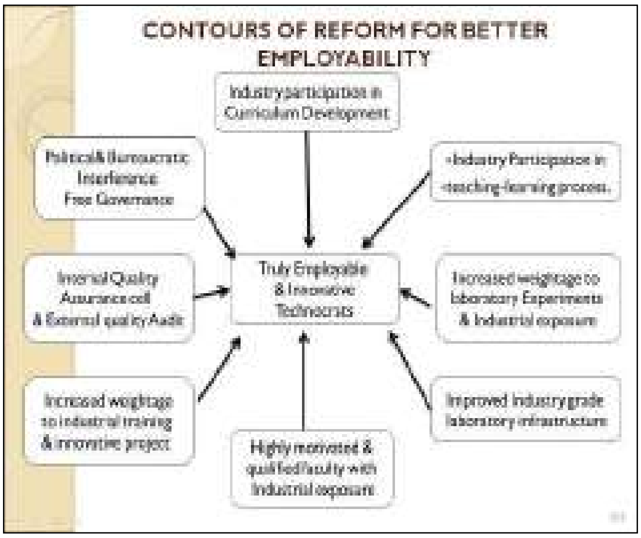
Chaina: 3.08 Lacs (2009-10)

USA :1.85 Lacs (2009-10)

INDIA: 29960 (2009-10)

CONCLUSIONS

- Employability:
- 1950-70 : Nearly 100%
- 1970-90 : More than 80 %
- 1990-2000 : 60-70%
- 2000-2010 :Less than 40%



References

- ALL INDIA COUNCIL FOR TECHNICAL EDUCATION APPROVAL PROCESS HANDBOOK (2012 – 2013).
- ALL INDIA COUNCIL FOR TECHNICAL EDUCATION APPROVAL PROCESS HANDBOOK (2011 – 2012) .
- RANGAN BANERJEE AND VINAYAK P. MULEY, "ENGINEERING EDUCATION IN INDIA", ENERGY SYSTEMS ENGINEERING, IIT BOMBAY POWAI, MUMBAI, SEPTEMBER 14, 2007.
- INTELLECTUAL PROPERTY OFFICE, INDIA, ANNUAL REPORT 2009-10.

Websites

- www.iitbbs.ac.in
- www.iitb.ac.in
- www.iitd.ac.in
- www.iitgn.ac.in
- www.iitg.ac.in
- www.iith.ac.in
- www.iiti.ac.in
- www.iitk.ac.in
- www.iitkgp.ac.in
- www.iitkgp.ac.in
- www.iitm.ac.in
- www.iitp.ac.in
- www.iitrpr.ac.in
- www.iitm.ac.in
- www.iitdmj.ac.in
- www.iitdm.iitm.ac.in
- www.iita.ac.in
- www.iitr.ac.in

- www.nitagartala.in
- www.manit.ac.in
- www.mnit.ac.in
- www.nitc.ac.in
- www.nitdgp.ac.in
- www.nith.ac.in
- mnit.ac.in
- www.nitj.ac.in
- www.nitjsr.ac.in
- www.nitkkr.ac.in
- www.vnit.ac.in
- www.nitp.ac.in
- www.nitrr.ac.in
- www.nitrkl.ac.in
- www.nits.ac.in
- www.nitsri.net
- www.svnit.ac.in
- www.nitk.ac.in
- www.nitt.edu
- www.nitw.ac.in
- www.nitdgp.ac.in
- aieee.nic.in
- www.jee.iitb.ac.in
- www.myengg.com

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- My M.Tech student Bhavin, Viral, Chetan, Jigar
- My lab staff Hitesh

Technical Education System – Institute Industry Cohesion

H. J. Thaker
Chairman, Indian Institute of Metals,
Baroda Chapter, Vadodara &
Profit Center Head (Fabrication Unit)
M/s. Patel Alloy Steels Pvt. Ltd., Ahmedabad.

The Theme

- It is my great pleasure to day to be with all of you at this great occasion.
- My sincere thanks to the organizers for the same.
- The theme of today's Convention is very important for future generation benefiting to all, the Students, the Industrial sectors, & the civilization as a whole.
- To day's deliberations may lead a long way for modifications & up gradations of the syllabus of various branches of Engineering & Technology courses, which will certainly be more befitting to the current & future requirements of industrial & service sectors.
- This will not only take care of the basic future needs, but will also help to keep the pace with time & simultaneously improve the acceptance of the out going students of the Universities, the future citizens giving them better work satisfactions & better living.
- Today we shall try to cover the following topics

Main Topics

- Challenges
- Initiatives & Efforts
- Need of The Hour
- The Way Forward
- Expectations From Industrial Sectors
- Expectations From Institutes
- Expectations From Government
- Global influence
- Professional Expectations
- The Reforms
- conclusion

Challenges

- Rapid obsolescence of curricula & course contents due to infrequent revision and much delayed response to technological advances & consequent market demands.
- Resource constraints, low efficiency of utilization of existing resources, lack of mechanism for sharing physical & human resources of sister institutions, etc. have led to large scale obsolescence of physical resources, deterioration of quality of teaching / learning processes & lowering of competence of teachers in some cases.
- Multiple control mechanisms & controlling regulations have adversely affected innovative initiatives for : Student Admission, Faculty Recruitment, Curricula Revision & up gradation, Financial management, etc.

- Failure to attract & retain high quality faculty due to archaic recruitment & promotion procedures, absence of incentives for quality performance & lacking of staff development policies in most institutions.
- Low internal efficiency of most institutions.
- Quality of education level & Quantity of available intake, both needs to be attacked simultaneously.
- To motivate and develop the personality of the students
- To prepare "industry ready manpower"
- Despite impressive achievements over past 50 years, significant concerns remain to further improve the same.

Initiatives & Efforts

- In recent past, several institutes for imparting quality education & conducting research in specialized areas have been established.
- On the basis of the recommendations of a high power review committee, Government of India has declared few institutions as National institute of technology (NIT) & declared them as deemed universities for ensuring high standards of education and research on the pattern of IITs.
- The NITs would be administered by a professional body, enjoy complete academic autonomy & interact closely with the industry to conduct joint research, update curricula, and also conduct short term courses for working engineers.

- Some projects for developments were also taken up which were financed by World Bank and many other finances.
- Many similar activities are already on the way for execution.
- As a result, as it can be observed in figure 1 and figure 2, there is remarkable growth of degree institutions and hence, the sanctioned intake for graduate engineers, during 1995 to 2007 This has further increased substantially in past 5 years.
- However, streamlining all these activities, along with relevant modifications & Industry institute joint efforts, can lead us to great success.

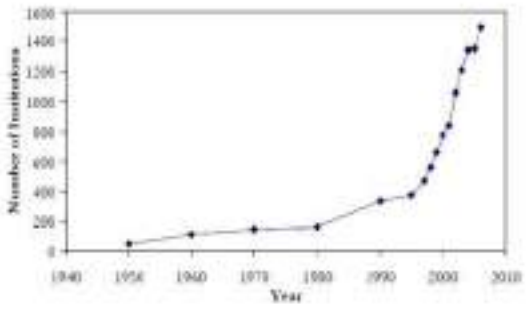


Figure 1 : Growth of Degree Institutions 1950-2006

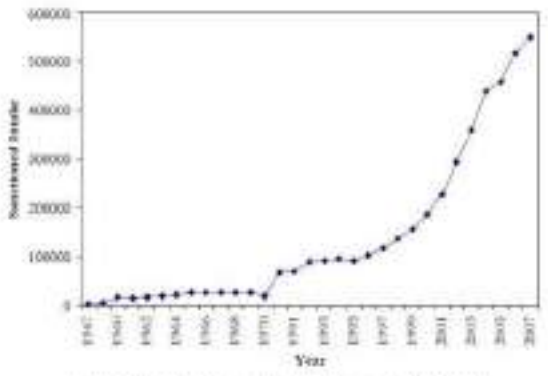


Figure 2 : Growth of Sanctioned Intake of Graduates 1947-2007

Need of the Hour

- Thus, good efforts in various directions are already initiated, but overall resultant effect can only be achieved by systematic transformation of the technical & Engineering education system as a whole.
- The need of the hour is to improve quality of technical education system, to enhance existing capacities of the institutions, to become dynamic, demand driven, quality conscious, efficient, forward looking, which can, by & large, satisfy the futuristic needs of the industries & society in general.
- This should be fast & timely, responsive to rapid economic growth & simultaneous technological developments occurring world wide, i.e. both at national & international levels.

- It should be recognized that, technical expertise and skilled manpower of high quality at all levels, play **key role** for rapid growth and development of national economy as well as, for export of technology & specialized services of the Indian professionals.
- The efficiency & effectiveness of the technical education **management system** needs continuous improvement. (Concept of KAIZEN)
- The requirement is to achieve, time to time, the targets of excellence & sustain the same with autonomy and accountability. The targets may keep on changing , time to time, to keep pace with the time.
- All these just can not be done by any one body or institution, it certainly requires **well defined joint efforts by all relevant bodies** & institutions. We can certainly succeed fast , while working together.

The way Forward

- The future of India will be fashioned in her class rooms. As such India has made great strides, in improving her education system. This gives a better platform to take it up further, to meet the futuristic needs.
- As we all know, whatever changes were getting effected in more than 100 years in earlier times, was reduced to less than 50 years. Now, it may be in less than 10 years, and will further keep on reducing continuously in future.
- Accordingly, the competitiveness in the Industries is also increasing substantially. In the modern world, only **the fittest can survive**.
- The industries can survive, if that can keep the pace with the time, and continuously & effectively maintain the competitive edge all the time. This is a good challenge.

- To face this challenge, continuous input of right quality level **professionals**, the human input, the basic skilled manpower as raw material, is required to the industries.
- This human raw material should be already trained & **ready to use**. They should be able to start the actual working confidently, within short time or almost immediately.
- This can be possible, if Industrial on the job training, becomes mandatory as a part of the syllabus, along with proper coverage in the overall grading system.
- This practice is already existing in IITs & now in NITs. This is one of the basic reason that the acceptance of the out going (students) engineers is better(in comparative terms) in industries. However, looking to the current industrial needs, & global scenario, they also should modify & improve their programs, to **keep pace with the time.**

- Now, it is the world of result orientation. Whether it is a new project, or an on going project, or a well established industry, either in corporate level or otherwise, everywhere targeted **timely completion, or desired output** is must.
- Rather, The Best Quality at Minimum Cost along with Timely Delivery (the **Q C D** triangle) has practically become the minimum basic necessity, to maintain the competitive edge. To meet this situation, right human force, which is disciplined, understands shop floor situations, has got relevant on hand experience along with proper subject knowledge, should be made available by the teaching institutes.
- This calls for **revolutionized modifications** in overall education methodology & the system. Such a suitable system should first be devised, executed & implemented.
- Figure 3 gives an idea for **schematic of inputs & out puts** of engineering education. This is only representative. Actually many more aspects both on in put side and out put side can be added.

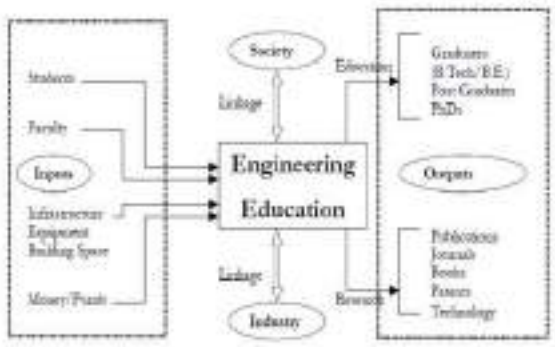


Figure 3 : Schematic of Inputs and Outputs for Engineering Education – Only Representative

Expectations From Industrial Sectors

- My Dear Friends, it is not at all easy, as we talk, to execute the same.
- This requires total involvement & joint efforts of all concerned bodies i. e. Industries, Institutions, State & Central Governments & corporate world.
- Industrial sectors should clearly understand that, these activities are **directly beneficial to them**, they must join hands together, & come forward providing whole hearted support in this direction
- Let us first consider the supports required from the industrial sector.

- The whole hearted & committed industrial support becomes basic requirement, particularly for following:
  - Industries need ready functional hands. This is the **human raw material for them.**
  - To **specify & indicate clearly** their requirements / expectations from fresh, out going students, to whom they will provide suitable employment. They are their future managers , who ultimately will lead the **productive & economic growth successfully in future.**
  - These requirements, as & when needs **major modifications**, should be able to predict well in advance, and communicated in **well defined way**, so that accordingly suitable modifications can be worked out timely, in the relevant syllabus, executed & implemented.

  - All these can not be done by any one industry, but should **authentically represent** the overall industrial sector of the relevant field.
  - Industries should accept the students for **on the job training**.
  - There should be suitable grading system for the performance of the students , during this on the job training period, which should be part of the overall grading & evaluation system.
  - Experts from industries should spare their time regularly, for this noble cause, **take initiatives & provide guidance** on relevant subjects of importance with latest information.

Expectations from Institutes

- Similarly, Institutes also should have their whole hearted commitments for following :
  - The out going students are **their own products**, & they should match the basic requirements of the employer, time to time.
  - Wide acceptance & good progress of these products will certainly add prestige of the Institute & the faculties.
  - The efforts should not only be customer satisfaction, but for **customer delight.**
  - The facilities, including laboratory & other equipments and expert faculties should have **modern touch** with appropriate up gradation & suitable training, time to time.

- Should have expert visiting faculties on relevant subjects regularly.
- Should not only accept the required changes, but should be able to effectively execute & **implement the changes timely**
- Should have periodic visits to relevant industrial sectors to exactly **understand** the needs of the hour as well as futuristic needs.
- The grading system should appropriately take care of all these parameters.

- All relevant Institutes should also join hands for suitably **sharing** their faculties, facilities, etc., within themselves.
- The overall syllabus, teaching methodology, grading systems etc. should be **uniform** at all relevant institutes.
- Should help to build **good character** of the students.
- Should help the students to have the general **feel of the shop floor.**
- A pragmatic approach, for healthy balance between wholeness of knowledge and specialization that caters to current technological demands, along with character building is to be taken.

Expectations From Government

- The Government has to play the **key role** to understand, systematize and control the entire activity.
- The systems should be developed suitably, studies undertaken & specialized training carried out to enhance the **overall capability** of the technical education **management system.**
- The administrative & financial aspects should be covered up suitably.
- The execution of **the pre defined and accepted Reforms** needs to be smooth.
- The basic minimum standards of the syllabus coverage, the methodology & grading system needs to be maintained **uniformly through out**

- Equivalent **minimum level of the competency** of students coming out of different institutions for same discipline should be assured.
- To improve **Innovation and competitiveness** in the global economy, joint research programs by academia & industry should be encouraged
- The detailing for effective implementations of these factors needs in-depth study & wide acceptance.
- More and **more platforms** should be developed that would bring together higher education institutions & industries to evolve modalities for collaboration in order to meet India's long term skills & business demands for the 21st century.
- Figure 4 indicates **engineering graduates per million of population** in India. Even after all positive efforts, this number is 214.
- If we compare this with other countries, in figure 5, we have yet to a long way.

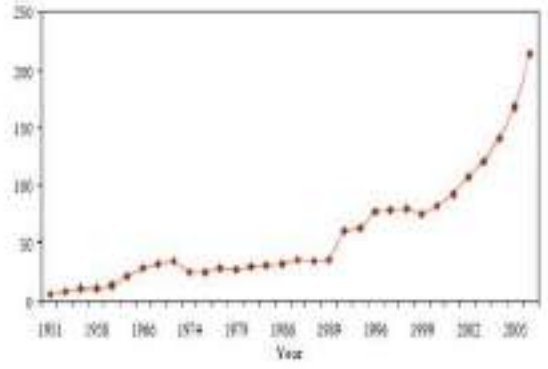


Figure 4 : Engineering graduates per Million Population in India

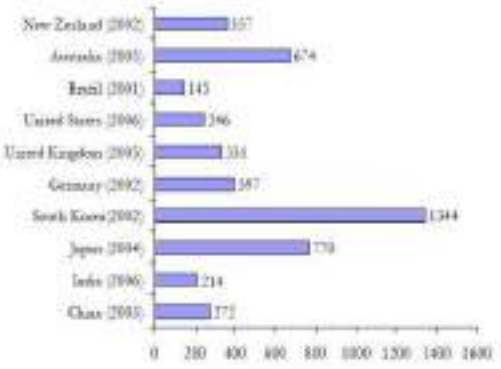


Figure 5 : Engineers per Million Population for different countries

Global Influence

- The demand is for new and constantly developing skills to retain **global competitiveness.**
- The internationalization of higher education will become more valuable to the individuals, to the institutes, as well as for the nation.
- **Globalization and advancements** in technological & business methods, will increase access to the world and the subjects should reflect global out look. In addition, education should also take care of various factors such as interconnected systems on ecological, cultural, economical, political & social sciences, humanities, etc. etc.

- This overall system, should rather not only help to reduce the **brain drain** going out of our country, but should rather attract the students from other countries.
- Further increase for **intake capacity** of students should also be worked out simultaneously, of course, without compromising the standards.
- To improve innovation and competitiveness in the global economy, **joint research programs** by academia & industry should also be encouraged.
- As shri **Aurobindo** has said, - The teacher is a helper and a guide, who shows the students, how to acquire the knowledge for himself. Teachers should concentrate on teaching concepts and applications of these towards problem solving.

- This provides the **royal road** for continuous progress, all the time in future
- Even other wise, as we all know, education **neither begins nor ends** in the university.
- For all practical purposes, the out going engineers should automatically be placed on the **royal high way**. The high way to acquire experience along with increased information & knowhow, utilizing the knowledge, leading towards various growths, individual growth, industrial growth, economic growth, social growth, national growth, etc. clubbed with **all-round success**.

Professional Expectations

- To achieve these growths, the out going engineering graduates Should possess following professional competencies.
  - Sound knowledge of fundamentals.
  - Technical competence in usage of the tools & techniques.
  - A high degree of **self confidence** for well informed Decision making.
  - An ability to work individually, as well as, as a part of **a team**.
  - Creativity and design skills.
  - Quality consciousness and pursuit of excellence.

  - Group work, mentoring, leadership and multitasking.
  - System level perspective, user orientation and **entrepreneurship**.
  - Attentiveness to details critical thinking.
  - Well developed sense of engineering ethics and principles that help in making moral choices in the professional concept.
  - Reasonable familiarity with computational aids, numerical techniques and simulation.
  - Problem solving initiatives.
  - Value addition in working.
  - To deal with interdisciplinary functions involving safety, aesthetics, reliability, economics, law, sociology, etc.
  - Integrity, authenticity, accountability and responsibility.

The Reforms

- At the out set, this may look to be quite difficult, but once the implementation process starts, it will certainly be possible. Any transformation or change needs lot of in puts.
- Here, let us take an example of **Medical** education. The system is such that, any out going student, at any level, may it be graduation or post graduation, he or she is confident to perform, either own consultation & provide services or any relevant job, from day one.
- At the same time, the **employer is also equally confident** for his / her performance without any hesitation. He can share the **responsibility along with accountability.**
- The raw material available is **ready to use**.
- Of course, further refinements, may depend on various factors such as , once own grasping & intelligent levels, actual job content & liking , functions involved, etc.etc., which takes the individual to greater heights in short time frame.

- But, the **acceptance** is there, both by the employer as well as by the society in general.
- Similar is the case for **Chartered Accountants**.
- Let us take an example of **Automobile Engineer**. He should have the working knowledge for all functional parameters, i.e. mechanical, electrical, electronics, computers, etc..
- The Administrative & working parameters of these disciplines should be studied by us & similar feasible pattern may be worked out.
- Perhaps, the basic reason is that, this not only covers the syllabus or course content, but **simultaneously cover all relevant aspects required to perform the function or a job**.
- The individuals have self confidence to perform the function smoothly as per expectations and targets, taking care of all related parameters, with **success**. If this is possible for other disciplines, it will certainly be feasible for engineers.

- Perhaps, we should also look for changes in the basic disciplines of engineering branches.
- The engineering education should be redesigned, process wise or **function wise**, the actual functions which are required to be performed in the modern world, instead of age old, **branch wise** education system.
- This needs basic conceptual change.
- This opts for in-depth studies with open mind and transparency with futuristic approach.
- This may be the appropriate path, for **reformation** of engineering education system, to be **industry specific**.

conclusion

- There is an urgent need for the industry, government and academia **to formulate strategy** for engineering education in India.
- In addition to other factors, this should necessarily take care of three well defined aspects, **knowledge, know how & character**.
- India has the potential to be a **leading research & design hub** in the world. We need to have a mechanism to identify important areas & disciplines that should grow & develop policies & institutions that facilitate this.

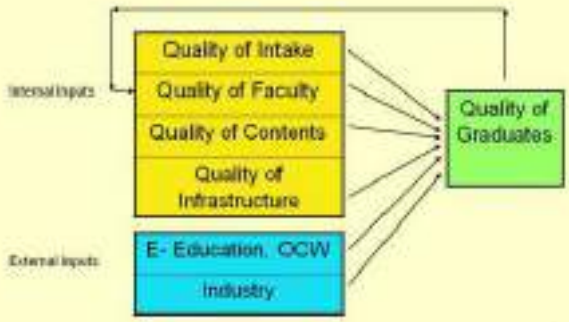
- There needs to be a high level **think tank** that continuously reviews the higher engineering education system, and provides directions for future growth. The think tank can facilitate debates & discussions on the future directions of higher technical education and provide the **vision & new directions** required, time to time.
- Timely execution & implementation of these should be managed effectively.
- If this is done honestly & transparently, it will certainly take a long way, not only for the education system, but will give individual **satisfaction & growth**, which in turn will provide rapid industrial & social growth along with strengthening national economy, & can lead the world in future.

Optimizining Teaching Learning Process Utilizing Available Resources

Dr. R. D Gupta

Advisor, ITM Universe

Quality is the Baby of Quality



What is Ailing higher technical education?

- Inferior Primary & Secondary Education
- Large intake of students (Poor to V. Good)
- Faculty Inadequate , absence of senior faculty, Poor retention
- Education without focus on objectives
- Very ineffective Industry Institute interaction

2

Response on the part of Govt./ education planners/ Institutions

- **Open course ware** (OCW): Open access repository of academic knowledge.
- **In campus & off campus training** by industry (2-4 weeks)
- **Enhanced number of M.techs and Ph.Ds.** Twelth plan to produce more qualified manpower, mostly through distance Education predominantly by IITS and NITS

3

Some available OCW sources

- **MIT open courseware:** initative is a open access repository of academic knowledge created by the MIT academia (http://ocw.mit.edu)
- **Khan Academy:** Capturing the ambience of a chalk and talk traditional class room along with some magic of multimedia. The USP of the content is ofcourse the teaching style of khan itself. (http://khanacademy.org)
- **Stack exchange inc.** Network of 59 question and answer sites. (http://stackexchange.com)
- **The Google scholer:** This is a search engine dedicated to scholarly literature Journals, conferences, theses, books, abstracts etc. (www.scholar.google.com)
- **NP-TEL-** The Indian Response to OCW. National programme on Technology Enhanced learning by IITs. Course work tailor-made as per AICTE requirements. (www.nptel.iitm.ac.in)
- **The digital library of india:** Already has digitalized 231878 books in 81 million pages (dli.ernet.in)

4

Make Reforms with locally available resources

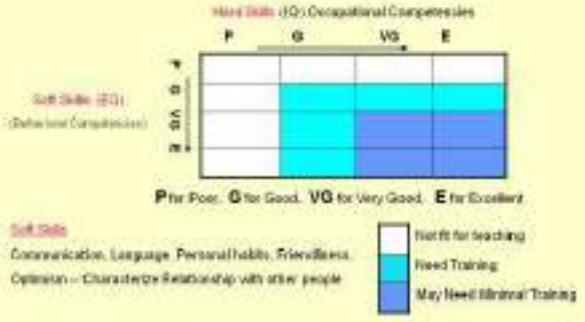
Existing situation dictates us to

- Groom & use faculty optimally
- Make use of guest faculty
- Take all steps to make Industry Institute interaction more effective.

  (e.g. Let all practical examiners to be appointed from Industry)

5

TRAINABLE FACULTY



Communication, Language, Personal habits, Friendliness, Optimism – Characterize Relationship with other people

Six Principles for gradual, Measurable Improvement

Principle#1: Expect Improvement to be continual, Gradual, and Incremental.

- Because teaching is a system that is deeply embedded in the surrounding culture, any changes will come in small steps.
- Learn to value small gains. Small improvements often are rejected as too 'little, too late' and are killed off before they have chance to become significant.

Principle # 2 : Maintain a constant focus on student learning goals

- The goal of teaching is student's learning. Sometime reforms forget the goals, gauging their success by changes in forms of teaching.
- Any complex system such as 'teaching' requires relentless focus on student learning and a commitment to evaluate changes with respect to these goals.

Principle # 3: Focus on teaching not teachers

- Many national boards have instituted a voluntary certification process to help raise the standard of teachers. Many of these programmes could not deliver.
- It is believed that long term improvement in teaching will depend more on the development of effective methods of teaching than on the identification and recruitment of talented individuals into the profession.
- We must focus on 'teaching' rather than teachers.
- Teaching persists while 'Teachers come and go'

Principle # 4 : Make Improvement In Context

- Teaching is a system having many elements of 'Local context' : Teachers, students, curriculum and so on. While considering improvements one has to take into account all of them.
- What works in one class room might or might not work in another.
- Teaching given its systematic, cultural nature is specially sensitive to context.
- Formal University courses, 'weekend workshops' for teachers have failed to deliver as they are disconnected with their context.

Principle # 5 : Make Improvement The Work Of Teachers

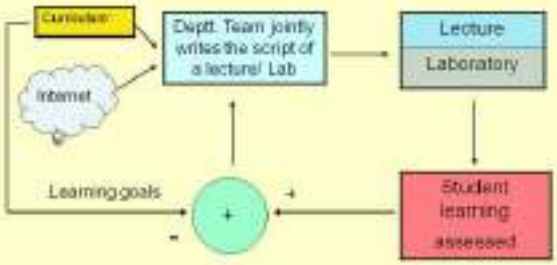
- Though teachers, students, parents and Educators are stake holders, teachers must be primary driving force behind change.
- The number of teachers, are far more than number of educational researches. The potential of 1.5 million teachers is far greater than few thousand researches.
- Teachers are necessarily the solution to the problem of improving teaching.

Principle # 6 : Build A System That Can Learn From It Own Experience

- Though there are very successful teachers we have no way to harvest what even the most brilliant teachers have learned, no way to share their knowledge to advance knowledge base of teaching.
- Each new generation of teachers must start afresh finding their own way.
- We have to find ways to accumulate knowledge about teaching and share this knowledge with new entrants.
- In the long run of course we need to change the teaching scripts that govern class room practice.

We need a system with memory.

Model For Long Term Improvement In Class Room Teaching



"Curriculum to be prepared by Academicians & Experts from Industry-

Must Specify Goals

Lesson Study Japan's Alternative To Reform

Lesson study- One of the most common component of kounikenshuu" is lesson study (jugyuu kenkyuu). In lesson study, groups of teachers and experts meet regularly over long periods of time to work on the design, implementation, testing and improvement of one or several "research lessons"

Lesson study maintains a constant focus on student learning

- Kounaikenshuu- Japanese word used to describe the continuous process of institution based professional development.

Engineering Council of India

7th National Convention

Industry-Specific Engineering Education for Better Employability of Engineers- Contours of Reform

P. N. Shah
Director

Engineering Council of India

Contours of Reform

·Engineering curricula- for producing multidisciplinary and multi-skilled engineers as required by the Industry

·Move out of the present engineering discipline-wise education to sector-specific engineering education

Engineering Council of India

Contours of Reform

·Duration of the course- 4 years to stay, as it is
·We should revert back to earlier practice of having common courses during the first two years; and the branch should be allotted in the third year

·Mandatory project-based during-the- course industrial training
·Mandatory Internship with an Industrial unit after the course

Engineering Council of India

Contours of Reform

·Compensation to Industry for the Expenditure that it may incur on the internship

·Common Admission Test

·Delivery Mechanism of Engineering Education

Engineering Council of India

Contours of Reform

·Technology of Delivery of Engineering Education

·Case Study-based delivery

·Reference Books- Use of Case Studies for explaining the concepts

Contours of Reform

- New Branches could be introduced such as :
- B.E. (Construction)
- B.E (Infrastructure)
- B.E (Manufacturing)
- B.E (Engineering)
- MBBE- a combined degree in management and engineering of five years including six months of paid internship
- B E (Transport Engineering) - Roads, railways, ports, etc.
- B E (Public Health & Environmental Engineering)
- BE (Hydro Carbons)

Contours of Reform

- MBBE degree should be of five years duration with six months of a mandatory paid internship with an industrial unit.

Contours of Reform

- The other variants of civil engineering suggested by Shri K.K Agrawal
- BE (Structural Engineering)
- BE (Soil Mechanics & Foundation Engineering)
- B E (Transport Engineering)
- B E (Construction Management)
- B E (Public Health & Environmental Engineering)
- B E (Irrigation Engineering)
- B E (Rural Engineering)
- It is opined that these, being specialized degrees, could be considered for M.Tech courses.

Contours of Reform

- For seeking admission to the PG courses, there should be a mandatory requirement of one-two years of practical experience.
- The contents and duration of the PG courses also need re-orientation and reform so as to make them research-oriented industry – specific.
- Subject Credits is a matter of in-depth discussions after we have narrowed down suggested alternatives

Contours of Reform

- The present regulatory mechanism for the higher technical education in the country needs to be reformed and made seamless and more effective and efficient

Engineering Council of India

Contours of Reform

- Regulation of Engineering Profession
- Medical, Legal, Architects, Chartered Accountants, Company Secretaries ,etc
- All these are regulated
- Engineering Profession is not
- So the Engineers Bill should be moved to Parliament without further delay for its enactment as Engineers Act

List of the Delegates

1. Shri A. K. Gupta
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   Reliance Industries Ltd. (IPCL)
   Vadodara

2. Shri Ajay Mishra
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   Vadodara

3. Dr. Anil Kane
   President, Emeritus WWEAC
   Advisor, Suzlon Energy Ltd.

4. Shri B. S. Kandpal
   Area Manager
   Bureau Veritas India Pvt. Ltd.

5. Ms. Bhargi Adhyaru
   Vadodara

6. Shri C B Kharpate
   Dy. General Manager, LML
   Baroda

7. Shri C. H. Mehta
   Asst. Vice-President
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   ITM Universe, Vadodara

9. Prof. D. L. Shah
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    ITM Universe, Vadodara

11. Shri Deepak V. Acharya
    President, Inox India Ltd.
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    Vice-Chairman
    Indian Institute of Metals
    Baroda Chapter

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14. Shri Gurudeep Rao
    Manager,
    Reliance Industries Ltd. (IPCL),
    Vadodara

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19. Prof. J. L. Juneja
    Principal,
    Ahmedabad Institute of Technology,
    Ahmedabad

20. Prof. K. Baba Pai
    Director, ITM Universe
    Vadodara

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    Ex-Director, VJTI, Mumbai and
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22. Prof. Ketan M Tamboli
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Anand

23. Shri Keyur Shah
Head of Industries(Baroda BRCH)
Burean Veritas India Pvt. Ltd.
Baroda

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25. Shri Komal Patel
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ITM Universe, Vadodara

26. Shri Lalit S. Thakur
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OSD, ACPC- Ahmedabad

28. Shri M.N. Qureshi
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Faculty of Tech. & Engg.
M. S. University of Baroda, Vadodara

29. Ms. Madonna Lamin
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ITM Universe, Vadodara

30. Shri Manu Naik
Rtd. General Manager
IPCL, Vadodara

31. Shri Mayank Dave
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Multi Fastners P Ltd.,
Vadodara

32. Shri Minesh Patel
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ITM Universe, Vadodara

33. Shri N. C. Shah
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MSU Baroda

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Chancellor, ITM University, Gwalior

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Mech. Engg. Dept,
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Dean (Academic)
ITM Universe, Vadodara

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A.P. Chemical & Technical Services
Vadodara

54. Shri Trupti Engineer
Asst. Professor, Civil
Sigma Institute, Vadodara

55. Dr. Uddesh Kohli
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Asso. Prof., Mech. Engg. Dept
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Trivedi & Associate Technical Services Pvt. Ltd.
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67. Shri Mitul Jani
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Research Institute, Mehsra

68. Shri Anand Damle
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69. Ms. Pragya Bhargava
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Hazira , Surat

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75. Prof. P. B. Joshi
Metallurgical & Material Engg. Department
M. S. University of Baroda, Gujarat

76. Prof. Bhavin K. Ganatra
Associate Prof.
ITM, Universe

77. Shri M. N. Dave
Retired Invitee

78. Shri Kiran Baxi
Ex. General Manager
GSFC

79. Ms. Gajjar Payal
MSU

80. Ms. Janki Joshi
MSU

81. Shri Naresh Kumar Singh
SVIT, Vasad

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SVIT, Vasad

83. Shri Jigyasu Keyur
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85. Shri Dhara Shah
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86. Shri Mruga
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91. Shri Gaurav Chudasama
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100. Ms. Priya Patel
Student, ITM, Universe

101. Ms. Disha Shah
Student, ITM, Universe

102. Shri Dhara Patel
Student, ITM, Universe

103. Shri Vraj Shah
Student, ITM, Universe

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Student, ITM, Universe

106. Shri Bijal Shah
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109. Shri Thushara Josepn
Student, ITM, Universe

110. Shri Jigr Burot
SITG

111. Shri Hima
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112. Ms. Pooja
Student, MS Univ. of Baroda

113. Shri Yash
Student, MS Univ. of Baroda

114. Shri Yogendra
Student, MS Univ. of Baroda

115. Prof. S. M. Joshi
Ex-Pro. VC MS Universty,
Vadodara

Engineering Council of India (ECI)

ECI was established on April 4, 2002, by coming together of a large number of Professional Organizations / Institutions of engineers, to work for the advancement of engineering profession in various disciplines, for enhancing the image of engineers in society, by focusing on quality and accountability of engineers and to enable the recognition of expertise of Indian engineers and their mobility at international level in the emerging WTO / GATS environment. It has emerged as a common voice of its member organizations.

Objectives

The main objectives of ECI are to work for the advancement of engineering profession in various disciplines and for enhancing the image of engineers in the society. To this end, ECI is focusing on quality and accountability of engineers, professionalism and their mobility for delivering engineering services in other countries, with expertise of Indian engineers developed, recognized and accepted at the international level.

Tasks

- Representing Member Associations in government and non- government bodies, and interacting on common policy matters relating to engineering profession
- Working for the setting up of a Statutory Council of Engineers and later interfacing with it, providing support and inputs for developing systems and procedures for the registration of engineers, CPD, code of ethics
- Facilitating authorization of member associations to register engineers; assisting them in developing internal systems for undertaking registration, CPD, enforcing code of ethics; and providing common forum for CPD to support the member associations
- Assisting member associations in interaction with academic institutions and regulatory bodies in regard to their examinations, award of degrees etc
- Providing forum for exchange of information and experience among member associations, coordination, common thinking and views on important matters
- Helping in the analysis of existing education systems / bodies and making suggestions in order to make the education relevant for the engineering profession and employability
- Setting up a Resource Centre and Database of Engineers, which can provide necessary information required for the development of the profession
- Interacting with professional associations / bodies in other countries & international bodies
- Undertaking and supporting research for the development of the engineering profession

Engineers' Bill

ECI has facilitated formulation of a conscious draft Engineers' Bill for the consideration of the Govt. of India. Which lays down the criteria for the process of registration of Practising Engineers and provide necessary statutory framework for the same. The draft is being processed by the Ministry of Human Resource Development.

Membership

Membership of the ECI is open to societies / organisations of engineers who meet the following requirements :

- having been established statutorily or registered in accordance with law.
- having atleast 100 corporate members
- having existed for at least four years, and
- the accounts being audited annually.

ITM Universe

Vadodara

ITM Universe Group was established by Samata Lok Sansthan Trust which has now established ITM University in Gwalior, MP State under section 2(f) of UGC Act and notified in MP gazette. ITM Universe, Vadodara was established in June 2011 with a mission to develop students in all aspects by imparting quality education and a vision to develop a World Class University in Gujarat. ITM Universe, Vadodara is located around 25 Kms. from Vadodara City on Halol Highway and approximately 2 Kms. from Jarod Town.

Presently, this Institute of Technology and Management Universe is offering B.E. and Management (MBA) Courses recognized by the AICTE and affiliated by Gujarat Technological University. The institute is likely to include Architecture, Applied Art-Craft, MCA, Polytechnic, Nursing institutions during the academic year 2012-13 as a part of Multi-discipline Campus with nearly 50 acers of land. The campus in-houses some of the monumental sculptures and renowned works and painting of artists of national and international repute. Apart from being an eco-friendly campus an area of 20 bighas of sapodillas and mango orchids adds to the beauty of the campus.

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Prof. P. Trimurthy	President, Computer Society of India
Shri Rajeev Kher	Jt. Secretary, Dept. of Commerce, Ministry of Commerce and Industry
Prof. D.V. Singh	Member, Indian National Academy of Engineers
Shri B. N. Puri	Sr. Consultant, Planning Commission
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Shri Lalit Gupta	Director (R&D), DGCA, The Aeronautical Society of India
Shri S. L. Swami	Chairman, The Institution of Civil Engineers (India)
Shri R.K. Gupta	President, The Institution of Electronics and Telecommunication Engineers
Dr. Sanak Mishra	Past President, The Indian Institute of Metals
Shri Ashok K. Sehgal	Member, The Institute of Marine Engineers (India)

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Dr. Uddesh Kohli *Chairman*	Chairman Emeritus Construction Industry Development Council
Shri Mahendra Raj *Vice Chairman*	President Indian Association of Structural Engineers
Shri Chander Verma *Treasurer*	President International Council of Consultants
	Chairman Construction Industry Development Council & Indian Society for Trenchless Technology
Members	
Dr. S. Chatterjee	President Consulting Engineers Association of India
Shri P. R. Swarup	Director General Construction Industry Development Council
Shri R.K. Gupta	President The Institution of Electronics and Telecommunication Engineers
Shri P. N. Shali	Director Engineering Council of India

Office Bearers of ECI

Dr. Uddesh Kohli
Chairman

Mr. Mahendra Raj
Vice Chairman

Mr. Chander Verma
Treasurer

Engineering Council of India

ECI has been formed by coming together of a large number of professional associations / institutes of engineers. The present members are :

1. Association of Consulting Civil Engineers (India)
2. Broadcast Engineering Society (India)
3. Computer Society of India
4. Construction Industry Development Council
5. Consultancy Development Centre
6. Consulting Engineers Association of India
7. Indian Association of Structural Engineers
8. Indian Buildings Congress
9. Indian Concrete Institute
10. Indian Geotechnical Society
11. Indian Institute of Chemical Engineers
12. Indian Institution of Bridge Engineers
13. Indian Institution of Industrial Engineering
14. Indian Institution of Plant Engineers
15. Indian National Group of IABSE
16. Indian Society for Non Destructive Testing
17. Indian Society for Technical Education
18. Indian Society for Trenchless Technology
19. Indian Society of Agricultural Engineers
20. Institute of Urban Transport (India)
21. Institution of Mechanical Engineers (India)
22. International Council of Consultants
23. The Aeronautical Society of India
24. The Automobile Society of India
25. The Indian Institute of Metals
26. The Institute of Electrical and Electronics Engineers. Inc.
27. The Institute of Marine Engineers (India)
28. The Institution of Civil Engineers (India)
29. The Institution of Electronics and Telecommunication Engineers
30. The Institution of Surveyors