

NEWSLETTER
of
THE MUMBAI REGIONAL CENTRE
INDIAN INSTITUTE OF CHEMICAL ENGINEERS
(www.iichemrc.org)

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Editorial

‘The Next Big Thing is Really Small’. No prizes for guessing that this is the hype for ‘nanotechnology’. It is more than three decades since the term ‘nanotechnology’ was coined, but it continues to buzz. It is only now that we appear to be on the threshold of the next big revolution that ‘nanotechnology’ has been promising to deliver for so long.

Shorn of all the hype and jargon that envelopes every new concept, nanotechnology is the science behind molecular level manufacturing. The only real success that has emerged so far from the nanotechnology stable is the stain resistant fabric, using embedded nano-particles. But there are lots of promising potential in the pipeline. Chief among them are nano-structured materials like nanoclays, nanocomposite coatings, nanotubes etc with myriad applications. The automobile industry is expected to remarkably transform with lightweight, longer lasting and more fuel efficient cars being rolled out. Nanocatalyst is another exciting area if it lives up to the promise of converting coal efficiently into liquid fuels.

But the real potential that can elevate nanotechnology from the mundane to the sublime lies in its applications for life sciences. Nano-pharmaceuticals, precisely delivered and with finely controlled release can improve the quality of our lives. These will be kind of artificial viruses invading our body and releasing the active ingredient into the target cell. Life, it appears, will no longer be the same with nanotechnology around.

We are offering a 2-day international seminar in May with an attempt to give an overall perspective and prospects of nanotechnology. This is also the time to constitute a fresh committee to handle the affairs of MRC and I hope young committed engineers come forward to serve the profession.

K.Sahasranaman

Chairman's Message

You will be pleased to know that IChE MRC has been very active in organising a variety of interesting events in last few months. I am particularly happy that we have succeeded in drawing the attention and interest of a large segment of young chemical engineers.

The 2nd Dhirubhai Ambani memorial lecture delivered by Dr.N.Sivaram Director NCL on "Plastics - the material of the millennium" had the participation of over 200 Students amongst an audience of about 500. The RB Roy Choudhary Memorial Lecture on "Emergence of India as global engineering hub" was delivered by Dr. Rama Iyer, Chairman of Aker Kvaerner Powergas and was attended by over 150 Students amongst an audience of around 200. The inaugural Henning Holck Larsen memorial lecture was delivered by Dr.Haldor Topsoe was attended by over 600 Students and young members amongst an audience of 1000.

Student chapters of Datta Meghe College and MGM College organised ChE fests for the first time with the involvement of many young and energetic Chemical Engineers from Mumbai. The IChE-ChEA annual symposium and the N.R.Kamath memorial Quiz Competition at IIT Bombay witnessed huge student turnout.

At IChE MRC's next major event, a seminar on "Nanotechnology – Perspectives & Prospects" there will be a poster competition for Young ChEs to bring in fresh thoughts & ideas. I am confident that our programmes will create a platform for senior Chemical Engineering professionals from industry and academia and the student fraternity and younger members in and around Mumbai to share knowledge and also have fun. On behalf of IChE MRC, I look forward to your support in order to increase the contribution of Chemical engineering to India's growth and the society at large.

Thank you & God Bless!

K.Venkataramanan

HOLCK LARSEN MEMORIAL LECTURE - A Report

On 7th Feb 2006, IChE MRC organised a Memorial Lecture in honour of the late Mr Henning Holck Larsen, co-founder of Larsen & Toubro. The speaker was Dr Haldor Topsoe, renowned doyen of Chemical engineers in the area of Ammonia Synthesis and Catalysis, and founder Chairman of the Topsoe Group. The impressive Tata Auditorium at NCPA, was brimming with an attendance in excess of nine hundred engineers, young and seasoned alike, to benefit from the wealth of experience from Dr Topsoe who spoke passionately about the bright future of chemical engineering, and how we could all tailor its principles to address and solve most of our pressing problems. The Guest of Honour was Dr Homi Sethna, former Chairman Department of Atomic Energy, who reminisced about his association with Holck Larsen and said that India should be grateful to this Dane who consciously chose to intertwine the future of his company with that of his adopted nation.

The topic of Dr Topsoe's lecture was **“Challenges to the Indian Energy Industry and to Indian Supply of Heavy Equipment for the Energy Related Indian Process Industry”**. Dr Topsoe recalled that he and Mr Larsen had shared the idea about India's future as a self-supporting country capable of world-scale research and developing technology and industry under its own inherent momentum. In this scheme of things multi-national companies would be one of the key vehicles for initial transfer of science and technology to develop knowledge and business in their host countries. He expressed confidence that India was capable of massively participating in financing and executing technology work for the construction of large energy-intensive plants both here and abroad, and even supply the required very heavy equipment from Indian sources.

On the nuclear front, he felt that India was indeed capable of solving all the complex inter-connected problems. His view was that instead of creating problems the western world could have advantageously established a closer collaboration supporting the Indian programmes. In all fields of science India has large and very active research institutions across the country having established engineering capabilities in many Indian

companies and deriving the advantages created by large companies formed generations ago. The West needs to pay more attention to the opportunities in India, whether in science or technology and industry or even in trading.

On the crisis looming large on the running out of oil, the option to go nuclear would require tremendous investments irrespectively of the scheme used. The other option was of course natural gas present in quantities which are about similar to the reserves in liquid hydrocarbons. In India natural gas is a big problem because of the necessity to increase import, maybe through pipelines maybe mainly through LNG. It seems true that today one can land LNG at terminals in India for a viable price but it is also certain that it could create dangers to the economy if India were to depend on supplies which can be cut off. One would need to consider alternatives of using indigenous coal for conversion to natural gas – to SNG, the technology for which is available. It is attractive to use coal for conversion to hydrocarbons in the form of SNG because you do not have to invest in new infrastructure. Another option for short and mid-term is the conversion of coal to liquid fuels including transport fuels - based on existing technologies for manufacture of synthesis gas through gasification of coal – and the conversion of synthesis gas through the Fischer-Tropsch process . He felt that in the more immediate future one will see the coal-to-synthetic gas option as the most attractive one to reduce dependence on import of hydrocarbons, or to avoid the risk of being cut off overnight from vital resources. Dr Topsoe felt that the future for energy lay in coal of which India has abundant resources to last over a couple of centuries. Coal is definitely a cheaper option although the processes for its use would need refinement to make it a cleaner option.

The large mass of students present was charmed by the boundless energy and ready wit and repartee of the 92 year 'young' Dr Topsoe who was visibly vibrant as he spoke from the podium for nearly an hour. Few would have imagined that he had earlier in the day addressed a business gathering soon after a gruelling 12 hour transcontinental flight .

Dr Sethna felicitated Dr Topsoe with a Medallion and a Scroll of Citation. Dr Topsoe in his inimitable style raised the medallion high and waved it around in glee. Needless to say, the young minds present were ignited enough to be welling with questions that they wished the jolly patriarch to respond to. Sheer paucity of time made us resort to

taking the questions offline on chits of paper, to which Dr Topsoe graciously sent in his responses later. These are reproduced below.

On behalf of IChE , we wish to place on record our gratitude the untiring help of many volunteers who ensured that the lecture was conducted in splendid fashion and one that had much to write home about .

K. Jayanth Pai

Selected Questions to Dr Topsoe and his responses

1. What would be the impact of nanotechnology in reducing / contributing to energy crisis, if any? (Mr. Raja Gopal, IIT Bombay)

Nanotechnology is the basis for many efforts in better understanding of metallurgy and catalysis. Therefore indirectly it is important for everything having to do with energy from drilling to conversion processes.

2. Can some day plastic be future of steel? (Ramanand Chauhan, MGM College)

I think this is well dealt with in literature. It is simply amazing how plastic in many industries, not the least the car industry, has taken the place of steel; but plastic cannot replace steel in low temperature applications.

3. What is the most important and unique feature that a chemical engineer must possess? (Krishnan Lakshminarayanan, MGM College)

The answer depends on the field in which the chemical engineer wants to work. Generally he must be a chemist. Many chemical engineers forget this. He must also be an engineer which means that he will need the competence required to bring chemistry into practical use whether in the bio-field or other industries. Therefore the answer to the question is that he must be competent in many fields and normally it is dangerous if you talk about one important and unique feature.

4. What is the future of Bio-diesel in India? In an agro based country like India, why bio-fuels are not used on large scale? (Nikhil Belgaonkar, MGM College)

Bio-diesel can have an important future in India but the problem is how to balance between agricultural production for improving food supply and for making substitutes for hydrocarbons. Once this question is solved, you have the cost of bio-fuel compared with hydrocarbons which depends on so many unforeseeable things.

5. What is the future of Chemical Engineers and Chemical Industries in India, 20 years from now? (Bandesh Rao, Datta Meghe College)

As I said during my lecture I am very optimistic about India's possibilities in all sciences and derived engineering activities.

6. If chemical engineer gets a placement in IT industry, are 4 years of chemical engineering worth? (Pawar Rohit, Datta Meghe College)

People trumpeting about the wonderful high-tech IT industry forget that for the advancement of science IT has been very important. One has made very complicated programmes which can tell us about properties of reactions, thermodynamically possible equilibria, kinetics, catalysis, phase equilibria etc. etc. Indeed before IT development as a tool for economic transactions etc. - not the least help for the tax man! - impressive progress was made by the use of IT in science and engineering. For chemical engineering it should be noted that IT permits one to calculate very complex reactor systems.

7. How bright is the future of chemical engineering? (Manoj Dube, Datta Meghe College)

Very bright.

8. Can energy be created from water other than hydroelectricity in developing countries like India? (Santosh Deshpande, Datta Meghe College)

Some people believe in wave energy and indeed in my country some people have formed a company to develop that. I do not believe in it, but maybe I will be proven wrong.

9. How chemical engineers can help in the upcoming energy crisis? (Meenakshi Singh, Jondhale College)

Engineers have a big role to play in upcoming energy crisis. If you focus on nuclear energy there is a lot to do for chemical engineers both in the fuel cycle and in design of stations. If you focus on coal to hydrocarbons there are opportunities for development of new processes, reactors, catalysts etc.

10. What are the most reliable unconventional sources of energy in present situation? (Diksha Kale, Jondhale College)

I do not know what is meant by unconventional. The most important sources for India besides hydrocarbons are coal, bio, nuclear and wind. Of course, you also have solar.

11. Conventional (non-renewable) sources of energy are depleting, renewable sources (solar, tidal, wind) cannot generate magnitudes. With this situation, what could be the reliable and economically viable energy source that developing countries can make use of?

See above, but as this question mentions solar energy, it is reliable but expensive and cannot stand alone.

12. Moon atmosphere contains large quantities of Helium 3. About 25 tons of Helium 3 is said to be sufficient for satisfying energy requirements of USA for 1 year. Is Helium 3 a potential source of energy?

Like wind it cannot stand alone and is very expensive.

13. Why do Indian chemical industries lag behind China? What are the future prospects of Chemical Engineering Profession in India? (Nilesh Yadav, Bharati Vidyapeeth)

There is no reason why India should not get a good position in chemical industries but like India so many countries have the difficulty of expensive basic raw materials like natural gas and hydrocarbons.

14. In conventional nuclear power plant, steam is used for driving the turbines. Any direct mode of energy transfer is possible? (Sugato Banerji, Bharati Vidyapeeth)

Many people have debated this before. I am not aware of any real interesting proposal.

15. In the context of increased awareness of the importance of organic farming what will be the future of chemical fertiliser industry? (Suresh Bharadwaj, L&T)

I think that we can hope for new improvements in farming that will increase the production per hectare provided additional chemical fertilisers etc. are available.

16. What advice would you give for young engineers to become successful entrepreneurs in core industries? (Apurv Hohari and Swastik Nigam, L&T)

Why is the question emphasising core industries, it is probably easier to establish entrepreneurship in niches and then move on if opportunities appear to core industry.

17. Despite the fact that India has the finest mind in the world, we have not been able to lead / contribute to the development of technology as west did. What should India learn from the west to become the leader in technology development? (P. K. Sinha)

I think you are learning and that the "finest minds in the world" will bring you ahead.

18. Do you think that India has the political will to embrace non-conventional sources of energy?

I do not dare answer this.

19. Can you tell something about fusion energy (principle, control, quantity and when it is possible for India)?

I think it is impossible for anybody to forecast when fusion energy will be industrial. It certainly will not happen within the next generation.

20. What is the potential of energy savings by energy audits?

Surely, energy savings can reach more than 20% and certainly the audits can help.

Chemical Engineering Quiz (ChEQ-06)

Followed by the competition of Outstanding Young Chemical Engineer (**OYCE-05**) conducted in Dec 2005 to unfurl the talents of young Chemical Engineering fraternity from academia and industry, IChE - MRC, in a joint venture with Chemical Engineering Association (ChEA), IIT Bombay, held an event called **ChEQ – 06** on 12th March at IIT Bombay. CHEMTECH Foundation was the chief sponsor and Aker Kvaerner Power Gas India Ltd was the associate sponsor.

ChEQ is an intercollegiate **Chemical Engineering Quiz** for the colleges in around Mumbai, with a rolling Trophy in memory of eminent Chemical Engineer late Prof. N.R. Kamath. Eight colleges participated, each represented by a team of two. The colleges that participated were : IIT-Bombay, UICT, Thadomal Shahani College of Engineering, Datta Meghe College of Engineering, D. J. Sanghvi College of Engineering, MGM College of Engineering, Bharati Vidyapeeth and Jondhale College

The programme commenced with unveiling of the trophy by Prof. Ashok Misra, Director, IIT-Bombay, followed by a talk by Prof G. D. Yadav of UICT on “God is a Chemical Engineer”. Two preliminary rounds were conducted featuring four teams each. Two best teams from each round were selected for finals. Prof. T. S. Raghunathan of IIT-Bombay who would be retiring in June 2006 was felicitated by IChE. He was also the quiz master for the finals. The other quiz masters were Prof. S.S. Bhagwat from UICT and Mr. Sahasranaman from UHDE India Ltd.

The rolling trophy was lifted by team from UICT represented by Mr Sujit Jogwar & Mr S. Navaneetha Krishnan, which also received a cash prize worth 10,000 sponsored by L&T (E&C division) while the runner-up team from Thadomal Sahani College of Engineering represented by Mr. Anand Upadhyay and Mr Bimal Nambiar received a cash prize worth Rs. 7,000.

It was also decided that each college would take turns to host ChEQ, accordingly the present host IIT Bombay handed over the ChEQ torch to Thadomal Shahani College of Engineering, who would host ChEQ-07. The overwhelming response of more than 200 students from all participating colleges was the key factor to the grand success of this event. The organising committee thank the other sponsors, Abhishek Scientific Lab instruments, Schenectady Herdillia Ltd. and IPCL for their generous contributions and patronising the event.

P.K.Kannan

Dr. R.B. Roy Choudhury Memorial Lecture by Dr. Rama Iyer

Dr. Rathin Basu Roy Choudhury (1933 – 1998) had a brilliant academic career. He obtained his Ph.D. in Applied Chemistry from Calcutta University in 1957. He then went to U.S. for further education and research in Chemical Engineering. In the U.S. he worked with Dr. Raymond Reiser, a pioneer in the field of lipid Chemistry. His research contributions, published in international and Indian Journals have been well appreciated. He was an active member of Indian Institute of Chemical Engineers till he passed away on 29th January 1998. He was the Chairman of Indian Institute of Chemical Engineers, Mumbai Regional Centre for three consecutive years.

The annual R.B. Roy Choudhury Memorial Lecture was started by the Indian Institute of Chemical Engineers, Mumbai Regional Centre in 1999 to cherish the memory of this great soul, accomplished chemical engineer and humanitarian. This year the Lecture on “India – A Global Hub for Engineering Services” was delivered by Dr. Rama Iyer, the Executive Chairman of Aker Kvaerner Powergas India (AKPG). Aker Kvaerner Powergas is one of the leading engineering and consultancy organisations serving the Chemicals, Petrochemicals, Synthetic Fibres, Polymers, Oil and Gas, Ferrous and Non-Ferrous metal Industries, both in India and Overseas.

Dr Iyer spoke of the globalised economy and the resultant optimisation taking place in the field of engineering services. He gave the large gathering of chemical engineers an insight into the dynamics of the international Engineering Services industry. It was evident from his words that engineers in India would be so much in demand that a shortage of talent was imminent. He highlighted the need for academia and industry to take proactive measures to improve the quality of education and enhance the employability of our engineers to prevent an impending crisis.

Avinash Sankholkar

INDUSTRIAL VISIT by TSEC Student Chapter – a report

The IChE student chapter of Thadomal Shahani Engineering College arranged a three day industrial visit to Vapi, Gujarat from 26th to 28th March for second and third year chemical engineering students as a part of their curriculum. The trip primarily planned to expand the horizons of the undergraduate students and to show them the practical aspects of chemical engineering also included a variety of recreation programmes

The group of around fifty undergraduate student members of IChE left for the industrial visit on Sunday 26th March, 2006 by train. They were accompanied by Mr. Sanjay Dalvi, a faculty member. The group of enthusiastic students arrived at Vapi at 1.30 pm. The accommodation was at Hotel Shilton, Daman overlooking the Devaka beach. After a sumptuous lunch and some rest, the students went to the beach for a game of cricket and soccer. The IChE student chapter committee had arranged for a special DJ Nites later that night which saw most of the students matching their steps to the latest soundtracks. After the tiresome travel from Mumbai to Vapi, the recreational activities freshened up the students for the industrial visits in the next two days.

The two industries visited on Monday 27th March, 2006 were Atul Industries and Jolly Containers. At each of the above industries prior arrangements had been made by the committee to ensure that the working of the chemical plants would be explained to the students by a well qualified instructor.

The students studied the working of two Chemical Plants at Atul Industries -. the formaldehyde manufacturing unit and the 4,4 DDS pilot plant. The students were given a first hand account of the working of the plants. The experience of witnessing the working of a real life chemical plant was new for most of the students and they were awed by the sights of autoclave used in ammonification, phosgene derivative unit, huge tray dryers etc. Further the students were also made aware of the risks involved in the working of the plant and the necessary safety measures undertaken to ensure the safety of the plant as well as the people working there. The students later enjoyed a hearty lunch at the company's club.

Thereafter the group visited Jolly Containers which has a wide clientele ranging from paint manufacturers to household containers. Here the students studied the various forms of plastic moulding. The main raw material used was polypropylene granules which were moulded into a myriad of shapes. The students were given live demonstrations of the various processes like extrusion moulding, blow moulding etc. They were also shown the various means of printing the labels on the moulded article like offset printing. Finally the finished goods were tested for durability, mechanical strength etc.

After a long day of learning the students relaxed on the beach playing their favourite sports. A special bonfire was arranged in the precincts of the hotel.

The final day of the industrial visit saw the students visiting Aarti Inorganics situated on the outskirts of Vapi. The students were initially given a talk on the safety measures undertaken by the factory to ensure the smooth running of the chemical plant. Later the students were accompanied by their professor Ms. Elizabeth Joseph to the main chemical plant manufacturing mono, di and tri chlorobenzene. They were shown around

the distillation columns, cooling towers, storage tanks, pressure vessels etc. Thus the students could see their textbook diagrams come alive in an impressive manner. Finally the students were shown the control room wherein the entire chemical plant was controlled by means of Distributed Control System (DCS).

After partaking the lunch provided by Aarti Inorganics, the students returned to Mumbai by Saurashtra Express. Thus the first Industrial Visit planned by the TSEC student chapter of IChE was a grand success as it coupled both Chemical Engineering Fundamentals as well as enjoyment in the right dosages, and left everyone looking forward to many more such visits in the future.

Reshma Menon & Ranjita Shanbhag

Website of the Month

This month's website <http://www.automation.com> is an online resource for process control and instrumentation. The site provides industry news, product information, technical articles and white papers, application case studies etc. in the area of process control and instrumentation.

Numerology

This month's number is **Bond Number**. Bond number is proportional to { (gravitational force) / (surface tension force) } and is used in momentum transfer in general and atomisation, and motion of bubbles and droplets calculations in particular. It is normally defined as follows:

where

d – droplet / bubble diameter

g – gravitational acceleration

g_c – dimensional constant

ρ – droplet / bubble density

ρ_f – surrounding fluid density

σ – surface tension

Did you Know?

That Yokogawa released the world's first Distributed Control System (DCS) in 1975.

Forthcoming Programmes

25th/26th May
Prospects

International Seminar on Nanotechnology : Perspectives and
at TIFR, Colaba, Mumbai

16th June (tentative) AGM

Keep watching our website www.iichemrc.org for further announcements.

Election of the Executive Committee for 2006-07

Nominations are invited for the Executive Committee for the year 2005-06. Nominations may be forwarded to the designated election officer, Mr. V.R.Salvi in the prescribed format given below (photocopy can also be used) before 15th May 2006.

To
Mr.Vasant R.Salvi
Accounts Department
University Institute of Chemical Technology(UICT)
Matunga, Mumbai 400019
email : vasantsalvi@yahoo.co.in

Name of the Candidate : _____

Membership No. : _____

Address : _____

Proposed By

Seconded By

Name : _____

Name : _____

Membership No.: _____

Membership No. : _____

Address : _____

Address : _____

Signature : _____

Signature : _____

Declaration by the candidate

I hereby agree to serve in the Executive Committee of the Mumbai Regional Centre of Indian Institute of Chemical Engineers.

Signature :

Important Note

Any member desiring to contest the elections for the Executive Committee should be a corporate member of the institute of at least three years standing, and whose subscription should have been fully paid by 31st March 2006.