INNOVATIONS IN POLYMER MATERIALS: APPLYING KNOWLEDGE IN DEVELOPMENT: THE SECOND DHIRUBHAI AMBANI COMMEMORATION DAY LECTURE

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The Indian Institute of Chemical Engineers has dedicated 28 December in the memory of the Founder Chairman of the Reliance Group, Shri Dhirubahi Ambani by instituting the Commemoration Day Lecture. Dr. S. Sivaram, Director of the National Chemical Laboratory, Pune delivered this Second Commemoration Day Lecture. Dr. Vijay Khole, Vice Chancellor of Mumbai University was the Chief Guest and Mr. Nikhil Meswani, Director of Reliance Industries Ltd delivered the keynote address.

Dr. Sivaram, in his scintillating and enlightening oration, titled 'Innovation in Polymer Materials, Applying Knowledge in Development' said that the process of innovation was very critical for the growth and development of the country at large. In today`s world, success increasingly depends on a nation's ability to master innovation.

Dr. Sivaram said that three important elements: technology creation, technology diffusion and human skills combine to form the national innovation systems (NIS). While the industrial revolution around 1850 began with the growth of chemistry and continued for one hundred and fifty years, today we are moving beyond manufacturing, beyond capital and into the knowledge era. Dr Sivaram said that 90% of everything we know in science has been generated since 1950. This knowledge is expected to double just in the next fifteen years.

"No single company or entity can have all the resources for the kind of innovation that are needed presently. Therefore, alliances, partnerships and networking have become important. New models of innovations need to be in place" Dr. Sivaram emphasized. Acquiring knowledge in a globalized world require several strategies, namely, technology prospecting, joining global value chains, conducting R&D and forging technology partnership. Ownership of knowledge assets is becoming increasingly critical. Global companies are experimenting with new innovation models namely "Venture" funding of in-house breakthrough innovations and moving Technology and Innovation Centers closer to where the talent resides. Promising areas that can serve as platforms for new technologies, according to Dr Sivaram include: information and communications technologies, biotechnology and life sciences and advanced materials including nanotechnology. As knowledge is no more local, having transited to totally global dimensions in its functioning and operation, it is important for research organizations to

join global value chains spanning various continents and forge international technology partnerships. Organizations have to upgrade technology capabilities and systems as well as leverage existing technologies to the maximum, exhorted Dr. Sivaram.

He also spoke of the internationalization of R&D taking place with several European and Asian countries increasing their stakes in S&T with concomitant reduction in the influence of US dominance over S&T.

Dr. Sivaram predicted that agro-based feed-stocks will provide the impetus for the next green revolution, closely integrating with industrial growth and knowledge creation. He said that the manufacturing sector is in search of new paradigms; every segment of industry is faced with greater competition and lesser margins. At the same time this provides a unique opportunity for India to be a global manufacturing hub. There are several factors intensifying the pressures on manufacturing, according to Dr. Sivaram, which include: demand from customers for more variety and content, pressures towards more environment friendliness, products having shorter life cycles and unrelenting driving down of margins. To combat all this innovation is necessary, Dr. Sivaram asserted.

Other challenges and limitations faced by industry, Dr Sivaram continued, include: unprecedented increase in prices of fuel and raw materials, which were rising faster than the possibility of companies to increase prices of end products and the fact that no new revolutionary growth platforms have emerged in the chemicals industry over the past decade. Globally, Dr. Sivaram said that while India and China were characterized by low R&D intensity, they have large markets and feedstock advantages; whereas the Middle East has excellent feedstock advantages, but very low domestic markets and hardly any R&D compared to the US, Japan and Europe which have significant technology and R&D strengths, diminishing internal markets and not much feedstock strengths. Consequently, there seems to be declining interest in investing in R&D in the US and Europe, whereas, in countries like India and China, R&D intensity is gaining. Over 100 major technology business organizations Dr. Sivaram said, have set up R&D centers in India. He exhorted organizations and companies to come forward to benefit from these emerging trends in R&D. At the moment, the R&D field in India continues to be dominated by CSIR, Dr. Sivaram quipped. He spoke of various challenges that Indian scientists could take up. For instance, he quizzed, can our technology provide pure water at 50 paise a litre or develop a low cost solar cell for power? In categorizing such problems and challenges he suggested four analytical perspectives, namely, 1. Problem exists – knowledge need to be developed 2. Knowledge exists – Technology also exists 3. Knowledge exists - Technology need to be developed and 4. Knowledge exists – but no clue to technologies.

Dr. Sivaram said that companies could consider various business models such as “contract research and manufacturing services, mission mode R&D projects, consortium models, startup enterprises etc” to address issues related to promoting innovations

Dr. Sivaram also spoke of the emerging Innovation cluster around NCL in Pune like the NCL Innovation Park & Technology Business Incubator. NCL was also engaged in setting up the Indian Institute of Science Education & Research to inculcate holistic science education by integrating fundamental sciences. NCL, he said, was also fostering several industry research partners. Consequently he hoped that in the years to come, there will be a vibrant science and technology cluster in and around NCL. Increasingly such clusters are the prime motivators for promotion of innovation

On a futuristic note, Dr. Sivaram said that while in the short time we will see chemical feed stocks to be based on natural gas, in the long term, there seems to be very interesting possibilities in carbohydrate based chemical feed stocks. Carbohydrates, he said, in fact could become the new hydrocarbon or oil. Research is in progress for the conversion of starches, cellulose, sugars, glucose etc to chemical products. If one looks at this conversion in a totally integrated manner, such as, an integrated bio-refinery then the economic viability becomes more attractive, Dr Sivaram said. NCL is working on a demonstration plant at an industrial location to establish the feasibility of one such concept.

Nikhil Mewari's address

In his keynote address, Nichol Messianic said "Shri Dhirubhai Ambani epitomized the dreams of millions of Indians and his life is an eloquent testimony of a resurgent India" Meswani said that Reliance is committed to change the Indian mindset "until we Indians earn our rightful place in the global economy and India emerges as an economic super power. This is the fitting tribute we can pay to Dhirubhai".

Global competitiveness in terms of effective productivity and intellectual capabilities has transformed India into a strong manufacturing base and a global science and knowledge hub. India has emerged as the second most entrepreneurial nation in the world and is emerging as a nation competing on cost and quality. Plastics are the material of millennium, which according to Meswani, will continue to transform our society. He said that in spite of the spectacular growth of the industry, current per capita consumption of plastics in India is abysmally low at 4 kgs against 20 kgs globally and 24 kilos in China.

Four areas that will drive growth of plastics are: Retailing, Agriculture, Infrastructure and Health care. The retail sector in India, Meswani revealed, is estimated at $240 billion with the organized sectors accounting for $ 5 billion – and growing annually at 40%. Some of the opportunities for plastics in the retail sector are packaging, material handling and construction at large. Similarly in agriculture, with favourable changes in food laws, plastics usage in agriculture can double.

Infrastructure, Meswani said, is another emerging area which will be attracting investments of more than $ 200 billion over the next 5-6 years. He said that plastics applications like pipes, profile, geotextiles, wires & cables will play a key role in infrastructure development. He quoted a recent II-Mckinsey & Co study that forecasts the growth of the Indian healthcare delivery market from $ 19 billion to $ 45 billion by

2012. India is well on the way to become the 'Global Healthcare Centre' of the world. Meswani said that packaging, disposable consumables and hygiene products along with equipment are the major application areas for plastics.

All these opportunities, Meswani continued could drive the domestic plastic consumption to touch 15 mt by 2012, exports of finished plastic products to 12 mt and enhance polymer consumption to around 27 mmt.

Meswani identified six areas that Indian plastics industry should focus on to be globally competitive: l World class & global scale (consolidation) l Intelligent manufacturing and enhanced design capabilities l Conformation to best global practices in production and quality l Effective energy management l Efficient knowledge management and proficient supply chain management.

Finally, Meswani said that it is only Science & Technology that can bring conveyance of back-end and front-end technologies to meet growing economic aspirations in a cost effective manner. Back-end technologies include: Feedstock securitization; Catalysts, chemicals & additives and energy management. Front-end technologies include the need to concentrate on nano-sciences, bio-sciences, composites, macro-molecular and combinational chemistry to develop a wide range of applications right from most advanced barrier packaging to most sophisticated auto components, remarked Meswani.

Earlier, Dr Vijay Khole, the Chief Guest said that it was difficult to imagine that one single person could have so dramatically changed the business scenario in India, by building an enviable business empire. Dr Khole mentioned about the new courses being started at Mumbai University on nano-technology, on green chemistry, urban studies etc. He said that Mumbai University is setting up a center for Green Technology under the aegis of UICT.

Earlier, Kamal Nanavaty of Reliance Industries read out the citation introducing Dr Sivaram, Mr. Venkat Raman, Director L&T and Chairman, Institute of Chemical Engineers introduced the chief guests and Professor G.D. Yadav welcomed the guests and managed the event. The event included a very lively panel discussion on "Plastics – Material of the Millennium".