IIChE-NRC Newsletter

Mar-Apr 2016

THE FIELD OF CHEMICAL ENGINEERING

Proliferations

by Karthikeyan Prakash , Hari Bajpai

Chemical Engineering is one of the most basic fields of engineering whose presence is vital to our life, starting our day with plastic used in our toothbrush to ending with synthetic materials and polymers used in mattress and pillow. Numerous others come in between without seeking much attention from us for the technology and science used behind. As impact chemical engineering is so much imbibed in our lives that we rarely think about 20 million people delivering their efforts to produce more than eighty thousand commercial products.

To touch upon the fields and its diversifications and also to setup a framework for the future edition of IIChE-NRC newsletter this text is dedicated to the segmentation of the field and the role of chemical engineers in very broad sense.

The Industry and Institutions

For sake of simplicity we can classify this field into horizontally, based on nature of fields, and vertically, based on the product and/or chemical.

Horizontally the field can be classified into three broad categories viz. the industry, academia and other institutions. **Industry** itself is one major chunk which includes production facilities, applied research, services and consultations. **Academia** is strong source of human capital and facilitation of basic and applied research. Academia is growing as industry and getting stronger and stronger. Then there are **other institutions** like IIChE, PCRA, API, FAI, TEMA, etc which are contributing in their own means by collaborating, sharing and facilitating in one way or other.

Segmenting the industry vertically is even more challenging. There are many industries which are overlapping and many other are associated to chemical engineering but still identified as separate subgroup like mining and minerals, biotechnology, metallurgy, environment and pollution control, etc. Though the broad segmentation can be as oil and gas, chemicals, polymers and others or miscellaneous. Others here is very wide group and has a long exhaustive list in its own.

Oil and Gas is one major chunk can be further divided into three subgroups. **Upstream-** exploration and extraction of oil, **Midstream-** stabilization of oil and gas and transportation and **Downstream-** fractionations and conversion to fuels and petrochemical feedstock.

IN THE FOLDS

Chemicals are classified into 5 major segments, **Bulk Chemicals-** basic organic chemicals (methanol, acetic acid etc) and basic inorganic chemicals (caustic coda, chlor alkali etc), **Specialty Chemicals-** or performance chemicals are derived from basic chemical and sold for their functions like adhesives, paints, etc., **Agro Chemicals-** insecticides and pesticides, **Petrochemicals-** olefins and aromatics produced from petroleum root, **Fertilizers-**inorganic and organic chemicals produced for plant growth like urea and phosphates.

Polymers are having two major groups, plastics and non-plastics and most widely used in everyday life from textile to footwear to paint and lubricants.

Others is one major group which include everything else which cannot be included above like, food, sugar, leather, carbon black, water treatment, ceramic and cement, pulp and paper, and many many more.

Role of Human capital

Human capital is one of the major aspects of any industry and field. Like any other technological field in chemical engineering as well the most basic and most important units are engineer. Chemical Engineers are contributing in many roles in different segments during different phases of careers or as per type of industry. Some of the major roles of chemical engineers are defined below.

Technical Manager is responsible for the engineering staff and programs at a facility. Manages people, research programs, and daily operations of the engineering functions.

Process Design Engineer designs manufacturing facilities and the equipment and materials used inside. Process design engineers work with teams of engineers to develop new or improved processes to meet a company's production needs.

Manufacturing Production Engineer is responsible for the day-to-day operation of a specific manufacturing process.

Project Engineer oversees the design and construction of specific processes in a facility.

Project Manager oversees the overall design and construction of a facility, and then manages ongoing operations. Project managers may manage a group of project engineers during the design and construction of a new facility.

Research and Development Engineer seeks out new and more efficient ways of using and producing existing products. Explores and develops new processes and products and determines their usefulness and applicability.

Technical Services Engineer works with customers, usually on-site, to solve production problems caused by a process or machine. Chemical engineers working in technical services may represent the manufacturer of a machine to determine why it is not performing as designed.

Sales and Marketing Engineer assists customers in solving production and process problems by providing products and services to meet their specific needs. Chemical engineers in sales use their technical knowledge to sell chemicals, equipment, and other products, and provide follow-up services and training, where needed.

Regulatory Affairs Engineer researches, develops, and monitors policies and procedures to ensure the proper handling of chemicals and chemical components.

Quality Control Engineer monitors the manufacture of product to ensure that quality standards are maintained.

Professor instructs students and conducts research. Professors may teach several classes in chemical engineering, be members of university committees, and conduct research using government, corporate, or private funding.

Process Safety Engineer designs and maintains plants and processes that are safer for workers and communities.

Consultant works for many different customers and brings specialized knowledge to individual projects

Business Coordinator develops budgets and capital projections for a facility or process. Business coordinators work closely with production and design team members to determine the exact needs of a new process, then plan the capital needs necessary to implement the program.

Consultant works for many different customers and brings specialized knowledge to individual projects.

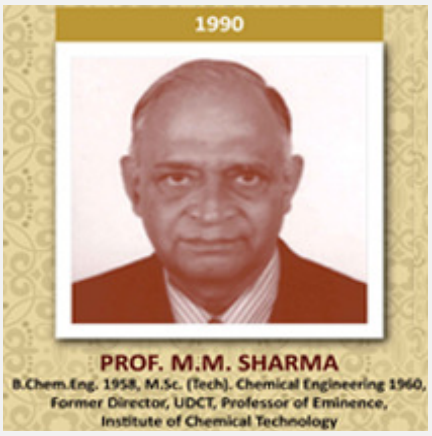
Attorney specializes in intellectual property law, patent law, technology transfer, environmental compliance, and safety issues. Patent attorneys obtain patents for clients and monitor the marketplace for possible patent infringements.

Resources:-
http://www.careercornerstone.org/pdf/chemeng/chemeng.pdf

Spurting the growth of Indian Chemical Industry
Handbook on Indian Chemicals and Petrochemicals Sector (FICCI 2014)

CONTRIBUTOR'S TALE

Dr M M Sharma



Prof. Man Mohan Sharma the Indian to be elected as Fellow of Royal Society, UK was born on 1 May 1937 in Jodhpur, Rajasthan. Educated in Jodhpur, Mumbai and Cambridge was appointed Professor of Chemical Engineering in the Institute of Chemical Technology (formerly UDCT), Mumbai He later went on to become the Director of Institute of Chemical Technology

Known for his work on the dynamics of multi-phase chemical reactions in industrial processes, he was awarded the Padma Vibhushan (2001), and Padma Bhushan (1987) by the President of India. He was INSA President (1989-90). He is a Fellow of the Indian Academy of Sciences, Bangalore, Honorary Fellow of the National Academy of Sciences (India), Allahabad, Fellow of the Royal Society, London. Subsequently he was elected Honorary Fellow by the Royal Academy of Engineering and is Foreign Associate of the US National Academy of Engineering.

His studies on Bronsted based catalysis in CO_2 hydration (published in the Transactions of Faraday Society) and subsequently kinetics of COS absorption in aqueous amines and alkanolamines brought out linear free energy relationship between CO_2 and COS absorption in solutions of amines and alkanolamines. He has contributed extensively on the role of microphases in multiple reactions which he pioneered.

As a researcher, teacher and academician he is a great source of inspiration and proud to the chemical engineers. (Source: Wikipedia)

IICHE-NRC EVENTS

Foundation Day (16 Jan 2016)
On the occasion of Foundation Day celebration two lectures were organized

1. Solarizing India: An overview of nation's vast solar potential by Mr. Anurag Mishra, Director Sunshine Technocon Pvt. Ltd., and
2. India's choice and options for clean, resilient and equitable energy system Dr Ritu Mathur, Professor, TERI University & Senior Fellow, GGRE Division, TERI .

One-day program on "Emerging Dimensions and Challenges for Polymer and Chemical Engineers" (21 Feb 16) onducted by Dept of Applied Chemistry and Polymer Technology, DTU in association with IIChE NRC. Following lectures were organized.

1. Innovation in Chemistry and Polymers - Key to Success by Dr. S. N. Chakravarty
2. Career Option for Chemical Engineers by Mr. Abhijit Pal
3. Non-Core career options for Chemical Engineers by D D Maheshwari

Annual Plant Visit to National Fertilizers Limited, Panipat (27 Feb 2016) coordinated by Mr. R. P. Luthra, Director-Admin. NRC.
There were approximately 35 members from IIChE-NRC and FAI, travelled to Panipat by a bus from IIChE-NRC office and picking member from pre-decided locations along the route. After a warm welcome at NFL Panipat,plant, a safety briefing was carried out followed by presentation on background of NFL and fertilizer industry in India. Visitors spent around 2 hrs in control room to understand the manufacturing operations and processes. This followed the felicitation of NFL management by IIChE and lunch. In the afternoon members started their return journey with new experiences and knowledge.

IChemE interaction (28 Feb 2016) by IIChE-NRC executive committee members.
Executive committee members of IIChE-NRC met Mr. Neil Atkinson Director- Qualifications and international development-IChemE after the executive committee meeting. The objective was to continue interaction, looking for potential opportunities for collaboration and joint membership of IChemE and IIChE.

EIL Gurgaon Office Visit (11 Mar 2016) by IIChE-NRC executive committee members.
Executive committee members, Mr Shyam Bang, Mr Abhijit Pal, Dr S Basu, Dr A K Saroha and Mr. Dayal Maheswari visited to EIL Gurgaon office to continue industry interactions and collaboration and to increase IIChE reach and visibility by encouraging memberships. From EIL , RP Mehrotra, Vartika Shukla, Kaberi Biswas, RN Maiti, Nambiar etc were among the many those participated in the meeting.

Upcoming events

Learning with Leader series: "Past Present and Future Coal - Clean Coal Technologies" - By Dr. Rajender Gupta. (08 Apr, 2016)

CHEMICAL ENGINEERING NEWS

Compiled by Karthikeyan Prakash

Exxon Mobil joins race to export crude as U.S. oil glut swells

Exxon Mobil Corp. has become the first major U.S. oil company to ship American crude overseas, joining a band of independent traders that are trying to ease a glut at home after a 40-year export ban was lifted.

India boosts purchases of West African crude as new refinery starts up

West African crude oil flows east are expected to stay strong in March as Chinese term buying remains elevated and several additional cargoes were booked for India. Traders said the startup of the 300,000-bpd Paradip refinery, wich started processing oil early in February, encouraged more bookings from West Africa to India.

Market fluctuations drive new emphasis on Brownfield projects

The current trend is to debottleneck existing units to reduce energy usage and improve profitability, rather than build new units. Tight capital constraints by many companies in the industry and wide fluctuations in energy costs are making many grassroots projects less economically feasible

STUDENT'S CORNER

Things to Remember

by Hari Bajpai

Being a chemical engineer if you are asked to name someone you are most thankful it would probably be difficult for many of us to remember the scientist from our eighth's standard book without using the word "Hypothesis". Yes the Avogadro and his hypothesis is something we chemical engineers use day in and day out. Let's have a look how he made this world simple to us.

The mole and gas volume concept

The magical number $6.023x10^{23}$ which connects all the gases by same virtue is actually no of atoms in 22.4 ltrs of any gas at 1 atm pressure and $273^{o}K$. This no is independent of gas so can be used to calculate volumetric flow or volume of gas if mass flow or mass is known and vice verse for any gas using ideal gas low.

$$n_1P_1v_1/T_1=n_2P_2v_2/T_2$$

Here one side can be used as n=1, P=1 atm, $T=273^{o}K$ and v= 22.4 ltrs and other side can be calculated for mass, volume, no of moles or density for any gas.

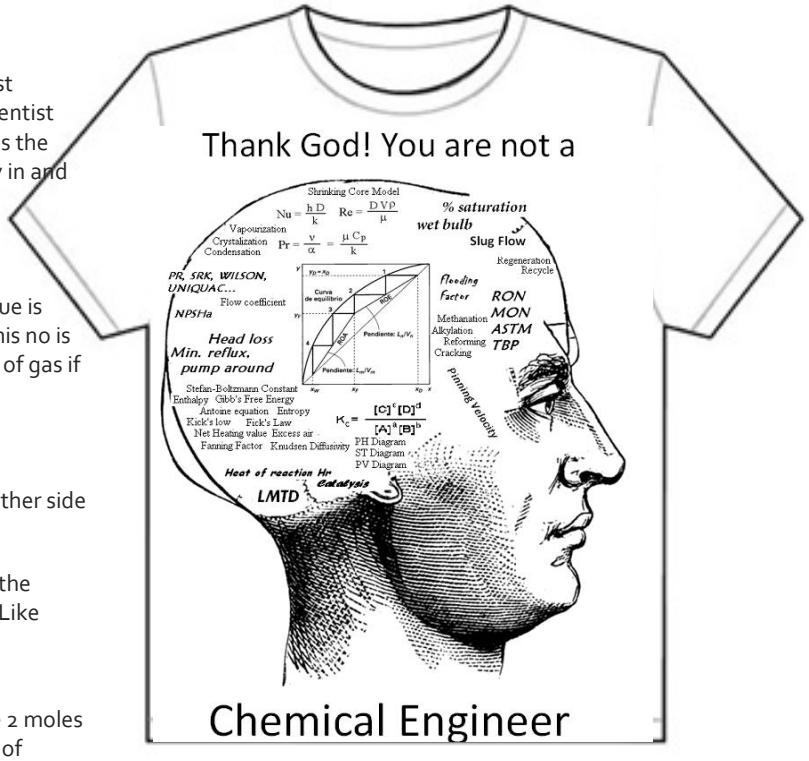
It also helps engineer in solving stoichiometric equations and calculating the volume of gas after the reactions as all reactions must be mole balanced. Like

$$2SO_2 + O_2 = 2\ SO_3$$

This equation confirms that 2 moles of SO_2 and 1 mole of O_2 will produce 2 moles of SO_3 which means the product volumetric flow will be two-third to that of reactant flow provided same conditions as that of reactants and 100% conversion.

T-Shirt Quote

by Hari Bajpai



Announcement:-

We are pleased to announce that Mr. Shyamsundar Bang is elected president of IIChE. He has over 40 years of experience in the chemical industry including 28 years of experience in Jubilant in various managerial and technical capacities. He holds a masters' degree in chemical engineering from the University Department of Chemical Technology (presently known as Mumbai University Institute of Chemical Technology), Mumbai and currently is an Executive Director of Jubilant Life Sciences. We congratulate him and looking forward to share his vision for IIChE.

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