



# IICHE NEWSLETTER

## Special Issue - 2020

DR. H.L. ROY BUILDING, RAJA S.C. MULLICK ROAD, KOLKATA 700 032

WEBSITE: [HTTP://WWW.IICHE.ORG.IN](http://www.iiche.org.in), E-MAIL: [IICHEHQ@GMAIL.COM](mailto:iichehq@gmail.com)

TELEPHONES: (033) 2414 6670, 2412 9314

### Publication Committee for e-Newsletter

**Prof. Alpana Mahapatra**, Chairperson  
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**Mr. Praveen Saxena**, Vice-President  
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**Ms. Nandini Roy**, IICHE Headquarters  
**Ms. Munmun Jana**, IICHE Headquarters  
**Mr. V. Vinay Kumar**, Student, OU

### All correspondences shall be addressed to:

The Honorary Secretary  
Indian Institute of Chemical Engineers  
Dr. H.L. Roy Building, Jadavpur University Campus,  
188, Raja Subodh Chandra Mullick Road, Kolkata 700  
032, India

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### From the President's Desk



Dear Members,

I begin this column hoping that all of you are keeping well and staying safe amidst the unprecedented COVID-19 crisis across the globe. There is a saying that we grow only when we face a challenge. Indeed, as the world is going upside-down, everybody is trying his/her best to stay afloat, cope with the challenges and adapt to the new situation. This is true at the very individual level as well as at the larger macro level. As far as IICHE is concerned, during the last five months, in the face of serious adversities, the Institute has not only ensured its sustenance, it has successfully ventured into newer paths and organised meaningful activities with a view to promoting Chemical Engineering education and profession.

### OSIP-2020

On 23 May 2020, an innovative Online Summer Internship Program (OSIP-2020) was launched for the students of Chemical Engineering. The first part of the Program concluded on 31 July 2020. The inaugural programme, conducted through a Webinar, included an Orientation Session in presence of Prof. G. D. Yadav, Past President, IICHE; President, Indian Chemical



Society; and, Emeritus Professor of Eminence and Former Vice Chancellor, ICT, Mumbai as the Chief Guest. Many senior Members of the Institute, including myself, played the role of Mentor. Dr. Avijit Ghosh, Honorary Secretary, was the Convenor for the entire initiative.

The Internship program was conducted on nine subjects, including, Six Sigma Training, Chemical Process Technology, Biochemical Process, Process Safety Management, Petroleum Refinery Engineering and Biochemical and Biomedical Engineering. There were as many as 13 Course Coordinators and 65 subject experts – each of them are accomplished academics and industry experts of repute. In between the regular sessions, Four Special Sessions were held. These Sessions were conducted by Past Presidents and renowned authorities from the academia and industry. Certificates will be issued to each of the students who registered for OSIP-2020. With over 1800 students enlisting for the program, the response we received has been beyond our expectation. What has given us even greater confidence and encouragement is the fact we have been able to successfully conduct such a program that required a high degree of coordination among the students, the resource persons and the Coordinators along with sound logistic support. Our experience from this maiden session will help us to fine-tune the program so that the next session becomes even more productive and educative.

#### **Panel Discussion on Safety Management**

Hyderabad Regional Centre of IIChE organised a very important and timely panel discussion on digital platform, titled, ‘Best Practices of Safety Management in Chemical Industry’ on 31 May 2020. Process safety is an essential aspect of chemical industry across the board. Its relevance became all the more clear in view of the unfortunate accident of styrene vapour leak at a polymerization unit in Visakhapattanam, Andhra Pradesh, on 7 May 2020. The mishap occurred when the plant was being recommissioned following a two-month lockdown period during which almost all the industrial activities had come to a standstill. Padmashri Prof. G.D. Yadav was the Chief Guest and the Moderator. I had the good fortune to participate in the programme as the Guest of Honour.

The eight panellists were renowned authorities in their respective field, having profound knowledge about the key aspects of Process Safety in the Chemical Engineering field. The panellists were: Mr. P. Vijayaraghavan (Former President, Reliance industries Ltd. and Past President, IIChE); Mr. D. M. Butala (Chairman, Process Safety Group, IIChE, Former Executive Director, GSFC Ltd., Vadodara, and Past Vice President, IIChE); Mr. Sushil Kumar (Former President, Reliance industries Ltd and Past President, IIChE); Mr. D.P. Mishra (Past President, IIChE and former Director General of Indian Chemical Council ); Mrs. Sheela (Former Deputy Chief Executive, Safety, NFC); Mr. Madan Gavane (Process Safety Consultant, TUV –SUD); Mr. V. V. Mahesh Kumar (Head, Safety Department, NFC); and, Dr. R. Venugopal (Deputy Chief Controller of Explosives, PESO, Ernakulam, Kerala). Each of the panellists made exhaustive presentations, offering invaluable insights into the industrial safety practices. At the end of the discussion, the panel decided on recommending constitution of a National Safety Board (NSB) for India. A detailed report of the panel meeting is included in this issue of the Newsletter.



### **Plans Ahead**

Indeed, it is very heartening to share with you that many of our Regional Centres and Student Chapters have been regularly holding seminars and discussions through Webinar during the last couple of months. I sincerely acknowledge all of them for taking these dynamic initiatives at this difficult hour. Meanwhile, at IIChE, we are brainstorming regularly through virtual sessions and exchanging ideas with the senior members of the Institute to find new approaches and avenues for reaching out to the Student Members as well as professional Members of the Institute. A few of the plans that are being seriously pursued include (i). Software Training Programme in collaboration with industry, and, (ii). Online Certificate Credit Course as part of the B.Tech (Honours) curriculum. This course will be based on the AICTE model. Both these initiatives will necessitate thorough ground work and logistic support to take off effectively. We are working on all the practical aspects. We will update our Members regarding these courses as we make headway.

Ever since the World War II, humanity has not faced a calamity of the magnitude that we are facing today while grappling with the pandemic. In this changed world, the concept of normal is being redefined altogether. All said and done, one has to admit that this crisis has also forced us to learn a few new lessons and start a few new practices, which we have long ignored and which would, in the long run, ensure that we live in a cleaner, greener environment and lead a more healthy life. So, let us be positive and optimistic as we wait for light at the end of the tunnel.

**Prof. V VBasava Rao**



## MESSAGES FROM PAST PRESIDENTS



**Mr. Ashok Panjwani**

I feel very proud to have been an Associate and Life Member of IIChE for more than 3 decades. Being a Past President of IIChE, a National Body of Chemical Engineers, I enjoy its growth in the field of Chemical Engineering based education.

In today's world Chemical Engineering is applied in almost all walks and stages of life. With inculcation of Chemical Engineering among a large number of technocrats, professionals and students, various novel and innovative ideas are enriching the importance of Chemical Engineering.

As an apex body of Chemical Engineering professionals, IIChE has over 30,000 members as on now with 41 Regional Centres and 166 student Chapters across our country. The valuable contributions of IIChE contribute to the sustainable development of the nation.

IIChE is celebrating its 73<sup>rd</sup> Foundation day this year within a lot of constraints due to Covid-19. However, the decision to come out with a Special Issue of Newsletter from its Head quarter is praiseworthy.

I wish the venture every success and hope that the mission of IIChE will be widely accepted at all levels and contributions from all will further strengthen its overall growth.

Wishing IIChE, presently under the Presidentship of Prof V.V. Basava Rao, all success in many years to come.



**Mr. P. Vijayaraghavan**

My hearty congratulations for stepping onto the podium of foundation day in the year 2020, striving for the well-being of mankind through excellence in chemical engineering profession providing a unique bridge amongst the academia, R&D professionals and industry practitioners, thankfully appreciating the contributions of each of those veterans of this great institute.

I feel privileged to have been part of the national Council and President for a short but cherishable period, having a close understanding of reputed colleagues, not only from industry but also from academia and research. With the support of veterans in this profession and the entire member family, I'm confident that the Institute makes giant strides to become a jewel among professional institutions with a prominent position in the on-line education/training, especially in the HSE field, duly recognised by the government/regulators and social media like LinkedIn, similar to AIChE, IChEMe, Mary Kay O'Connor Process Safety Centre, and others. My best wishes for a successful campaign for membership with special reference to organisations and younger professionals.

Salutations and greetings on this milestone day.



### **Prof. P. De**

At the outset, I congratulate IIChE as it celebrates its 74<sup>th</sup> Foundation Day on 18 May through digital platforms while the nation is undergoing a never-before Lockdown in the middle of Covid pandemic. My connection with IIChE goes back over three decades. All these years, I have been witness to many ups and downs that the Institute has gone through. Nonetheless, its inner resilience and ability to remould its role have time and again enabled IIChE to stand its ground, never losing its relevance.

Over the years, the Institute has become an important stake holder in a number of statutory and professional bodies of reckon in India. One significant development was induction of the IIChE President in 2018 to the AICTE Governing Council, which wields immense influence over policy matters involving engineering education in India. Presence of a top IIChE representative in AICTE's Council has opened up an important channel for the Institute to advocate important issues for promotion of Chemical Engineering education.

I would also commend the latest initiative of the Institute, namely, Online Summer Internship Program 2020 (OSIP 2020), that has been launched in the middle of countrywide lockdown. I understand OSIP 2020 has evoked very positive response among the student community. The initiative is particularly praiseworthy because it has been flagged off amidst widespread uncertainty and difficulties in the wake of the pandemic. The fact that such a dynamic program is being spiritedly conducted at this crisis period reiterates the inherent dynamism of IIChE and commitment of those who are closely involved with the Institute.

Process Safety in the Chemical Industry is another area where IIChE can boast of substantial expertise. This area will demand special attention as the industry units will be gradually resuming production after prolonged shutdown. I believe, the Institute is aware of the opportunities at this hour and will take steps to play a proactive role by creating safety awareness among the personnel and advising the management, particularly in the SMEs, about the essential safety practices.

IIChE still has miles to go. I wish it every success as the Institute strides ahead and crosses many milestones.



### **Mr. Kuthoore N Venkatasubramanian**

I am indeed glad to know that a Special Issue Newsletter will be brought out in commemoration of the 70 plus years of the organisation. I am sure it will continue to grow from strength to strength.



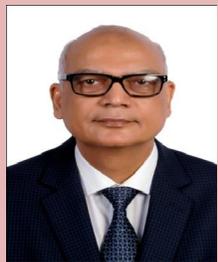
**Mr. P.K.N.Panicker**

It is really heartening to see the progress IIChE made over the last 73 years. I had the opportunity to preside over the destiny of the Institute during 1994 and 1995, a period which indeed was trying, a period when the Institute had yet to recover from the shock and destabilizing pressures of an economic mismanagement and fraud involving some staff members.

I recollect the untimely death of the then president, Dr. Jagannathaswamy, almost when the financial fraud was unearthed and the very efficient professional way in which the interim President Mr. K.P. Mohandas Rao handled the situation) and recast its work ethos. I am happy to note that from those trying days the Institute has emerged, grown and is walking the path of progress, thanks to the sincere effort of my succeeding presidents and other office bearers, all eminent persons in the profession. But one name that needs a special mention is Dr. G.D. Yadav, my good friend.

I was fortunate to have had a few occasions to talk to our esteemed founder president, the doyen of Chemical Engineering in India, Dr. H.L. Roy - once when I was in BHU and secondly when in IIT Kharagpur. I learnt from him that Engineering is a profession wherein the practitioners have to be extremely cautious, meticulously measuring and weighing every component, all the involved dimensions, before analyzing and taking decisions. But at the same time, it is the one that demands unflinching bold decisions even in situations where precise data may not be available or not accessible – decisions that will lead to successful completion and attainment of the desired object. To stand back hesitating to take decisions is no engineering.

I trust and hope that the Institute will continue to grow both in numerical strength and in its stature and in ability to motivate our younger generation of professionals to boldly take up innovative challenges that can and may contribute to the ultimate comfort and happiness of humankind and life at large on this earth.



**Mr. Shyam Bang**

Indian Institute of Chemical Engineers has played significant role in strengthening chemical engineering profession in India. Chemical engineers have contributed in the growth of various industries in India like petroleum, petrochemical, fertilizer, chemical, pharmaceutical, agrochemical, polymers, dyes, paints, etc. Products from these industries being available within the country also supported the growth of several other industries.

Chemical engineers are engaged in teaching, research, industries and Government organisations. Many of them have occupied high /leadership positions in their respective organisations and got international recognition. It is essential to bring such achievers together to share their knowledge and experience which will contribute to nation's economic development and inspire young generation.



Indian Institute of Chemical Engineers is working in this direction and efforts should be enhanced further in future. This knowledge sharing platform also helps engineers to upgrade their knowledge and skills. It also gives an opportunity to professionals who acquired degrees in other branches of engineering and science to develop understanding of chemical engineering to support their career.

I wish that coming generations of chemical engineers will take this Institute to new heights which in turn, will support their career.

### **NOTICE BOARD**

In the face of unprecedented Covid-19 crisis across the world, CHEMCON 2020, which was scheduled to be organised by the Bhubaneswar Regional Centre of IIChE during 27 – 30 December 2020, has been postponed to 2021. However, the IIChE headquarters in Kolkata will host Dr. H.L. Roy Memorial Lecture and the DhirubhaiAmbani Commemoration Day, two signature events of CHEMCON, during December 2020 in Kolkata.

Detailed information will be provided on the IIChE website accordingly.



## IICHE PRESIDENTS



**Prof V V Basava Rao (2020)**

Hyderabad, Telengana

**Email**

profbasavarao\_1964@yahoo.com

**Contact No.**

(0)9989156705



**Prof S V Satyanarayana (2019)**

Anantapuramu Dist, Andhra Pradesh

**Email**

svsatya7@gmail.com

**Contact No.**

(0)9849509167



**Prof Vinay K Srivastava (2018)**

Navi Mumbai, Maharashtra

**Email**

vksriv1954@gmail.com

**Contact No.**

(0)9833621629



**Prof P De (2017)**

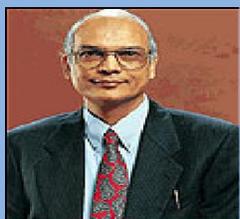
Kolkata. West Bengal

**Email**

parameswar\_de@rediffmail.com

**Contact No.**

(0)9433010927



**Mr Shyam Bang (2016)**  
New Delhi

**Email** shyam\_bang@jubl.com

**Contact No.** (0)9810106660



**Mr G V Sethuraman (2015)**  
Hyderabad, Telengana

**Email** gvsethu@yahoo.co.in

**Contact No.** (0) 9849028854



**Prof Ch V Ramachandra Murthy (2014)**  
Visakhapatnam, Andhra Pradesh

**Email** prof.chvmurthy@sify.com

**Contact No.** (0)94403 89136



**Prof V K Rattan (2013)**  
Chandigarh

**Email** vkrattanpu@yahoo.com

**Contact No.** (0)9815334198



**Mr P Vijayaraghavan (2012)**  
Vadodara, Gujarat

**Email** pvrags@gmail.com

**Contact No.** (0)9815334198



**Mr A Bhasker Reddy (2011)**  
Hyderabad, Telengana

<b>Email</b>	bhaskerreddy@enfabind.com
<b>Contact No.</b>	(0)9849028935



**Prof V K Srivastava (2010)**  
New Delhi

<b>Email</b>	iitdchemvks@yahoo.com
<b>Contact No.</b>	(0)9818263545



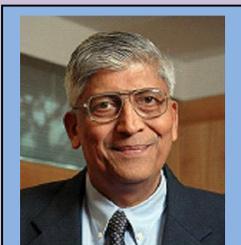
**Mr Sushil Kumar (2009)**  
Bharuch, Gujarat

<b>Email</b>	sushilkumar.ril@gmail.com
<b>Contact No.</b>	(0)9998970021



**Dr S Ganeshan (2008)**  
Mumbai, Maharashtra

<b>Email</b>	ganeshan50@gmail.com
<b>Contact No.</b>	(0)9820986067



**Mr K Venkataramanan (2007)**  
Mumbai, Maharashtra

<b>Email</b>	kv@larsentoubro.com
<b>Contact No.</b>	(0)9821089289



		<b>Prof S Venkateshwar (2006)</b> Hyderabad, Telengana
	<b>Email</b>	svenkateshwar49@gmail.com
		<b>Prof B K Dutta (2005)</b> Kolkata, West Bengal
	<b>Email</b>	binaykdutta@yahoo.com
		<b>Mr D P Misra (2004)</b> Mumbai, Maharashtra
	<b>Email</b>	dpmisra43@gmail.com
	<b>Contact No.</b>	(0)9820049581
		<b>Dr P G Rao (2003)</b> Jorhat, Assam
	<b>Email</b>	pgrao42@hotmail.com
	<b>Contact No.</b>	(0)9435052702
		<b>Prof S K Sharma (2002)</b> Panchkula, Haryana
	<b>Email</b>	Panchkula, Haryana
	<b>Contact No.</b>	(0)9815654192



	<table border="1"><tr><td data-bbox="459 310 729 401"></td><td data-bbox="729 310 1433 401"><b>Prof G D Yadav (2001)</b> Mumbai, Maharashtra</td></tr><tr><td data-bbox="459 401 729 491"><b>Email</b></td><td data-bbox="729 401 1433 491">gdyadav@yahoo.com</td></tr></table>		<b>Prof G D Yadav (2001)</b> Mumbai, Maharashtra	<b>Email</b>	gdyadav@yahoo.com		
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<b>Email</b>	gdyadav@yahoo.com						
	<table border="1"><tr><td data-bbox="459 604 729 716"></td><td data-bbox="729 604 1433 716"><b>Mr Sunil Kapadia (2000)</b> Ankleshwar, Gujarat</td></tr><tr><td data-bbox="459 716 729 793"><b>Email</b></td><td data-bbox="729 716 1433 793">sunilvkapadia@gmail.com</td></tr><tr><td data-bbox="459 793 729 865"><b>Contact No.</b></td><td data-bbox="729 793 1433 865">(0)9824008764</td></tr></table>		<b>Mr Sunil Kapadia (2000)</b> Ankleshwar, Gujarat	<b>Email</b>	sunilvkapadia@gmail.com	<b>Contact No.</b>	(0)9824008764
	<b>Mr Sunil Kapadia (2000)</b> Ankleshwar, Gujarat						
<b>Email</b>	sunilvkapadia@gmail.com						
<b>Contact No.</b>	(0)9824008764						
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	<table border="1"><tr><td data-bbox="459 1234 708 1339"></td><td data-bbox="708 1234 1433 1339"><b>Prof A K Mitra (1998)</b> Kolkata, West Bengal</td></tr><tr><td data-bbox="459 1339 708 1417"><b>Email</b></td><td data-bbox="708 1339 1433 1417">asitmitraju@yahoo.com</td></tr><tr><td data-bbox="459 1417 708 1516"><b>Contact No.</b></td><td data-bbox="708 1417 1433 1516">(0)9831323588</td></tr></table>		<b>Prof A K Mitra (1998)</b> Kolkata, West Bengal	<b>Email</b>	asitmitraju@yahoo.com	<b>Contact No.</b>	(0)9831323588
	<b>Prof A K Mitra (1998)</b> Kolkata, West Bengal						
<b>Email</b>	asitmitraju@yahoo.com						
<b>Contact No.</b>	(0)9831323588						
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<b>Dr K V Raghavan (1997)</b> Timarpur, New Delhi  (Expired: 12.10.17)							



**Mr A Panjwani (1996)**  
Bharuch, Gujarat

**Email**

panjwania@uniphos.com

**Contact No.**

(0)9909994902



**Mr P K N Panicker (1995 & 1994)**  
Chennai, Tamil Nadu

**Email**

pknpanicker@sify.com

**Contact No.**

(0)9382740755

**Professor K K Tiwari (1993 & 1992)**  
Mumbai, Maharashtra

**Email**

k\_k\_tiwari@hotmail.com

**Contact No.**

(022) 2583-7640



**Mr K P Mohandas Rao (From May 1991)**  
Mumbai, Maharashtra

**Email**

mohandasr@yahoo.com

**Contact No.**

(0) 9324606255



**Dr. B Jagannadhaswamy (Upto April 1991)**  
**(Expired: 1991)**



**Mr K N Venkatasubramanian (1990)**  
Chennai, Tamil Nadu

**Email**

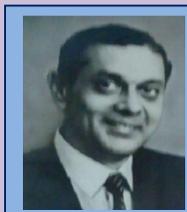
kuthoorn@vsnl.net

**Contact No.**

(0)9884621332



**Dr. P V S Namboodiripad (1989)**



**Dr. A N Dravid (1988)**  
Mumbai, Maharashtra

**Email**

arundravid2@gmail.com

**Contact No.**

(0)9821216295



**Mr T K K Krishnan (1987)**

**Prof M K Sarkar (1986)**



**Dr S K Mukherjee (1985 and 1977)**

**(Expired)**

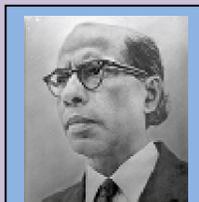


	<b>Prof G J V J Raju (1984)</b> Visakhapatnam, Andhra Pradesh	
	<b>Email</b>	gjvjrju@yahoo.co.in
	<b>Contact No.</b>	(0)9849122678
	<b>Prof M Satyanarayana (1983 &amp; 1982)</b> Mayaguez, Puerto Rico	
	<b>Mr S D Bhasin (1981)</b> New Delhi  (Expired: 2005)	
	<b>Prof N K Bose (1980 &amp; 1979)</b> Kolkata, West Bengal  (Expired: 16.08.04)	
	<b>Mr A K Basu (1978)</b> Mumbai, Maharashtra	
	<b>Contact No.</b>	(0)98208 24609, (022) 23641572 & 23635677



**Prof D K Dutt (1976)**  
Kolkata, West Bengal

**(Expired: 2011)**



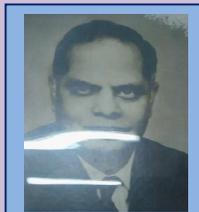
**Prof N R Kamath (1975 & 1974)**  
Mumbai, Maharashtra

**(Expired: 19.07.83)**



**Mr J P Kapur (1973)**  
New Delhi

**(Expired: 26.07.14)**



**Prof D Venkateswarlu (1972)**  
Bangalore, Karnataka

**Dr K S Chari (1971)**  
Chennai, Tamil Nadu



**Dr T K Roy (1970 & 1969)**  
New Delhi

**(Expired: 04.08.19)**



**Prof G S Laddha (1968)**

Chennai, Tamil Nadu

**(Expired: 2010)**



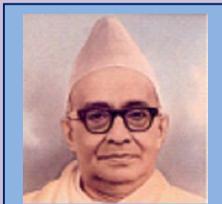
**Prof J D Adhia (1967)**



**Prof M N Rao (1966 & 1965)**



**Dr P S Mene (1964 & 1963)**



**Prof (Dr) Hira Lal Roy (1962 & 1961 and 1947 - 1950)**

Kolkata, West Bengal

**(Expired 26.7.65)**



**Dr G S Kasbeker (1960 & 1959)**

**Dr L A Bhatt (1958 & 1957)**

**Dr S K Sircar (1956 & 1955)**



**Dr G P Kane (1954 & 1953)**



**Dr H R Hattiangadi (1952 & 1951)**

A few Presidents, including, the Founder President, Prof (Dr.) H.L. Roy , served more than one terms at different times. In this list, tenures of these Presidents have been clubbed together.



## ATMANIRBHARBHARAT - PHARMA INDUSTRY

**Shyam Bang**  
**Chairman-FICCI Task Force for Manufacturing Excellence**

Chemical and Pharma Industry in India has grown like other industries in the last seven decades. Initially licences were issued to produce, considering demand projections in India. Restrictions on imports and high tariff barriers protected Indian chemical industry. Exports of chemicals from India were negligible. All bulk chemicals and fine chemicals were produced in India. Normally, bulk chemicals are produced in continuous process plants and fine chemicals in batch process plants.

Gradually, countries with petroleum resources started making bulk chemicals as value addition, which gave direct competition to Indian Industry. In the beginning of last decade of the last century, India agreed to gradually remove tariff barriers and integrate its trade with global trade. The first casualty of trade globalisation was bulk chemical industry in India. Gradually, bulk chemical production in India lost cost competitiveness and products were imported. Large capacity plants were built in the Middle East and products were shipped to India.

However, production of speciality chemicals, fine chemicals, agrochemicals, bulk drugs continued to increase in India. Their capacities increased and products were exported to various countries. Many companies in India were globally recognised suppliers of agrochemicals and bulk drugs, etc. Because of batch operations, labour cost was high, which gave competitive advantage to Indian industry.

In the beginning of this century, large capacity plants were built in China and they dominated fine chemicals market all over the world. Indian industry, which had strength in fine chemicals, bulk drugs etc., lost in competition and several of these products are now being imported in India from China.

Gradually, the pharmaceutical industry in India has become dependent on API's (Active Pharma Ingredients), intermediates and other speciality chemicals coming from China. The story is the same for other industries also which are dependent on China for their raw materials and components.

This dependence on China is posing a threat to the growth of pharmaceutical industry in India. The Indian pharmaceutical industry has grown over the years and got global recognition. It is the 3<sup>rd</sup> largest by volume and 11<sup>th</sup> largest in value terms globally. The size of industry is USD 41 bn. with equal contribution from domestic sales and exports. The net annual trade surplus is USD 11 bn. The industry revenue is projected to reach USD 120 bn. by 2030 and generate a trade surplus of USD 35 bn.



In the global COVID-19 crisis, Indian pharma industry has been serving the country and the world with uninterrupted supply of life saving drugs. However, dependence on China for raw materials is a challenge for the growth and sustainability of the industry. It is estimated that currently 68% of API's are being imported in India and majority of that come from China. Value of API imports in India is estimated between 25,000 and 30,000 crores annually.

Taking note of the situation, the Government of India has announced an economic package to promote API manufacturing in India. Bulk pharma parks are being developed in the country. The Government of India has sanctioned 3000 crores of rupees to support the State Governments to develop these parks. Three parks are planned to be promoted in three different states (one in each). Seventy per cent (70%) of the cost of developing a bulk drug park (90% in case of hill state) will be funded by the Government of India, subject to a limit of 1,000 crores. In addition, the Government of India will also give incentive to manufacturers in India who set up new manufacturing facilities for API's or drug intermediates or key starting materials. These facilities can be in pharma parks or outside. The government has identified 53 API's of strategic importance, which include Penicillin G/6, Cephalexin C/7, Erythromycin thiocyanate, Clavulanic acid, etc. The Government of India has sanctioned Rs. 7,000 crore to give production-linked incentive to manufacturers in India. The companies will be required to invest between 20 and 400 crores, excluding the cost of land to get benefit of this scheme. Investment in building and plant and machinery should be at least 45% of the total investment. The investment must be done within the committed time frame after project approval.

Fifty-three(53) selected products have been put in four categories, viz.:

- |  |                           |
|--|---------------------------|
| (i) Fermentation based Key Starting Materials (KSM) and Drug Intermediates (DI). | (iii) Synthetic KSM/DI    |
| (ii) Fermentation based KSM/DI/API   | (iv) Synthetic KSM/DI/API |

Different rates of incentives varying from 5% to 20% have been fixed for different products.

The key feature of this policy is that it is completely transparent and leaves no scope for manipulation. Criteria for selection of state/site for bulk drug park and selection of companies for production-linked incentive is clearly defined. Parameters have been laid out and score for every parameter is defined. All applications will be evaluated based on the score.

With the announcement of this package, API industry in India should see a good growth in the coming years. Technologies for most of the API's and intermediates are available in India because they were earlier produced here. Trained manpower is also available. In the past, Indian plants were not competitive because of low capacities. Over the years, the size of Indian companies has increased significantly.



They have got global recognition. India is called the pharmacy of the world. Now companies can (and should) build large capacity plants to economise the cost of production. As the plant capacity increases, yield is better, power consumption/ unit production goes down, manpower cost, inventory carrying cost, infrastructure cost, logistics cost, per unit production go down. Large capacity makes solvent recovery, by-products recovery viable, which further reduces the cost. It has been observed that cost of production in large capacity plant can be less than half of that in a small capacity plant.

The Government of India's economic package for API industry in India has come at a right time and we will see substantial growth in the production of API's and intermediates in India, reducing the dependence on imports and moving towards 'Atmanirbhar' Bharat.

#### NOTICE BOARD

The IICChE Headquarters will organise Students CHEMCON (SCHEMCON) 2020 on October 9 and 10 2020. Further details will be provided on the IICChE website accordingly.



## Online Summer Internship Program-2020 (OSIP-2020)

IIChE embarked on a novel initiative, namely, 'Online Summer Internship Program-2020 (OSIP-2020)' on 23 May 2020. The Internship program, being organised in batches till 31 July 2020, is being held with Dr. Avijit Ghosh, Honorary Secretary, IIChE as its Convenor. With over 1800 students registering for the program, it has evoked tremendous response from the Chemical Engineering student community from all across the country. What is even more satisfying and encouraging is the fact that the program took off under tremendous logistical and technological constraints during the nationwide lock-down due to the Covid-19 pandemic. Even coordination among the resource persons and experts as well as the Subject Coordinators proved to be an uphill task during this period. The all-round devastation, wreaked by super cyclone Amphan in Kolkata (from where the program was primarily coordinated), was an added blow.

OSIP-2020 was inaugurated on 23 May 2020 with an Orientation Programme held through Webinar. Padma Shri Prof. G.D. Yadav, Past President, IIChE; President, Indian Chemical Society; Emeritus Professor of Eminence and Former Vice Chancellor, ICT, Mumbai was the Chief Guest and Prof. V.V. Basava Rao, President, IIChE was the Guest of Honour. Prof. Yadav's insightful presentation on the overall scenario regarding the Chemical Engineering study as well as profession and Prof. Basava Rao's extensive introduction of IIChE and its functions set the right tone for the program. Mr. P.K. Saxena, Vice President, IIChE also offered important inputs. Dr. Avijit Ghosh, Honorary Secretary, IIChE coordinated the session. In fact, for the entire sessions of OSIP-2020, Padma Shri Prof. G. D. Yadav; Prof. V.V. Basava Rao; Prof. S. V. Satyanarayana, Immediate Past President; Mr. P.K. Saxena; Prof. M.V. Rao, Vice President, IIChE are playing the role of mentor for the enrolled students while Dr. Avijit Ghosh is overlooking the entire initiative.

The Internship Program, is being conducted on nine subjects, namely, i. Zero Liquid Discharge Management, ii. Six Sigma Training, iii. Chemical Process Technology, iv. Biochemical Process, v. Process Safety Management, vi. Petroleum Refinery Engineering, vii. Petrochemical Engineering, viii. Biochemical and Biomedical Engineering, and, ix. Biochemical Process. Each of the subject heads comprises exhaustive course contents, covering wide grounds. There were as many as 13 Course Coordinators, ensuring smooth conduct of each session. Course Coordinators, all of whom are consummate academics or accomplished industry experts, include Prof. N. Balasubramanian, (Zero Liquid Discharge Management); Mr. Abhijit Bikas Pal (Petroleum Refinery Engineering and Petrochemical Engineering); Prof. Sunil Baran Kuila (Refinery and Petrochemical Engineering); Dr. Sidhartha Mukherjee (Petrochemical Engineering); Dr. T L Prasad (Process Safety Management); Mr. Dhawal Saxena (Six Sigma Training); Dr. T L Prasad (Process Safety Management); Mr. Dhawal Saxena (Six Sigma Training); Prof. Biswajit Mandal (Biochemical Process and Biochemical and Biomedical Engineering) and Mr. Kishalay Kumar (Petroleum Refinery Engineering and Petroleum and Petrochemical Engineering). Dr. Avijit Ghosh supervised all the subjects as the Chief coordinator.



The list of 65 Subject Experts is equally impressive and comprehensive. For the sake of brevity, a few names are mentioned here. Biochemical and Biomedical Engineering was handled by Dr. Debabrata Das (Former Professor-in-Charge, P K Sinha Centre for Bioenergy, Indian Institute of Technology, Kharagpur); Prof. (Dr.) SebakRanjan Roy (MaulanaAbulKalam Azad University of Technology), Prof. Gourab Chatterjee (Haldia Institute of Technology) and Mr. Ashok Kumar Jain (Jubilant Life Science Ltd). Ms. Neeru Gupta, (Manager – Olefins & Detergent Technology, Honeywell UOP) took charge of Petrochemical Engineering; 6-Sigma Training was handled by Mr. Amitabha Saxena (MBB Project Manager: Principal Consultant and Trainer); Prof. J. Hayavadana (Osmania University, Hyderabad); and Mr. Sushanta K Roy (Former Chief Manager (Tech. Services & System Certification), Balmer Lawrie & Co. Ltd.). Process Safety Management had Mr. Vijay V. Bhujle (Senior VP- Technical, GVS Cibatech Pvt. Ltd.); Mr. Joy M. Shah (Founder and Chief Consultant, Innov8 ProTech Solutions) and Mr. D. M. Butala (Corporate Executive specialising in corporate management, design, operations & maintenance).

Chemical Process Technology was handled by Mr. Rilesh M Mehta (Solvay Specialities India Pvt. Ltd.); Mr. Samarjit Chowdhury (Deputy Manager, BPCL); Mr. Subhasish Sinha (Technical Team Lead, ECOLAB-Nalco Water India Ltd.); Mrs. Dipika Sinha (Sr. Territory Manager, Diversey Hygiene India Pvt. Ltd.) and Mr. Apurba Bhattacharyay (Asst. Manager, Praxair India Pvt. Ltd., Haldia Plant) Mr. Subrata Chatterjee (Quality Manager, Bengal Beverages Pvt. Ltd.) handled Biochemical Process. Zero Discharge Liquid Management had Dr. P. Shanmugam (Sr. Principal Scientist (AcSIR, Environmental Science Lab, CSIR); Dr. Sachin A. Mandavgane (Associate Professor, Visvesvaraya National Institute of Technology, Nagpur); Dr. Girish R. Pophali (Principal Scientist, WWT Division, CSIR-NEERI); Prof. Animesh Kr. Golder (IIT, Guwahati) and Mr. K. Sadanand (Regional Sales Director, Solenis LLC, Jakarta, Indonesia).

Petroleum Refinery Engineering had Mr. D. Chakraborty (CGM-TS, IOCL, Gujarat Refinery); Mr. A.K. Singh (GM [F&S], IOCL, Gujarat Refinery); Mr. A.R. Mishra (DGMT [T], IOCL, Mathura Refinery); Mr. Asheesh (Senior Technical Services Manager, Indian Oil Corporation Ltd., and Mr. Soumitrea Ray Chaturvedi (Chief Manager [Production], Gujarat Refinery, Indian Oil Corporation Ltd.); Mr. Chetan Borkar Choudhuri (Dy. General Manager (HSE), Indian Institute of Engineers).

Four Special Sessions were held during the entire duration of the Internship Program. These Sessions were conducted by Past Presidents and renowned authorities from the academia and industrial fields. All the four Special Sessions were chaired by IIChE President, Prof. V. V. Basava Rao. The first Special Session was conducted on 4 June 2020, in which Distinguished Speaker, Mr. D. D. Misra, Past President, IIChE and former Deputy MD, Jacobs delivered a lecture on the 'Prospects of Indian Chemical Industries'.



The second Distinguished Speaker for the session was Mr. D. D. Maheswari. He shared his vast work experience with Hindustan Unilever Ltd., EIL, Calico Synthetic Fibres Ltd., Jubilant Life Science Ltd., etc.

The second Special Session was held on 17 June 2020. The respective Distinguished Speakers were Mr. Ashok Panjwani, Past President, IICChE and Executive Director, UPL Ltd., and Prof. B.K. Dutta, Past President, IICChE and Visiting Professor, IIT, Kharagpur. Mr. Panjwani's subject of lecture was 'Learnings during Journey of 70 Years' and Prof. Dutta's subject of lecture was 'Environmental Protection on Chemical Engineering Aspects'. This Special Session had Prof. P. De, Past President, IICChE and Prof. M.V. Rao, Vice President, IICChE as the Special Guests.

The third Special Session was held on 22 June 2020. Mr. Sunil Singhal, Fluor India, was the Distinguished Speaker. Mr. Singhal is a Technical Consultant for Multi-project Execution and Project Development. Special Guests for this Session was Prof. S.V. Satyanarayana, Immediate Past President, IICChE and Prof. M.K. Jha, Treasurer, IICChE.

The last of the Special Sessions was held on 29 June 2020. This Session had three Distinguished Speakers, namely, Prof. (Dr.) Saikat Maitra, Vice Chancellor, MAKAUT, West Bengal; Prof. (Dr.) M.K. Surappa, Vice Chancellor, Anna University, Tamil Nadu; and Mr. Probir Roy, Director, Kalyan Bharti Trust and Former Managing Director, BCPL. The theme of the final Special Session was 'Impact of Covid-19 on Higher Education'.

At the end of a session, students, enrolling for and attending the program, have to submit an assignment report. Certificate will be issued to the students at the completion of OSIP-2020. The student community is an important stakeholder for IICChE to succeed in its mission. The highly positive response, received from them for this program, has given a tremendous impetus to the Institute. This is more so because it was flagged off in the face of a lot of adversities. The feedbacks received, both positive and negative, will be of much help to rectify the loopholes and shortcomings, experienced during this session so that the next initiatives prove to be even more empowering and enlightening.



## OSIP-2020 – FEEDBACKS

### Course Coordinators



**Dr. Siddhartha Mukherjee**  
**Air Liquide Global E&C Solutions India Pvt. Ltd.**

It was a very efficiently conducted Internship Program. Everything went very smoothly and as per schedule. The students are also very happy. Only comment – Next time we should change the video conferencing tool.



**Dr. T L Prasad**  
**Bhaba Atomic Research Centre, Trombay**

It was organised well at short notice. Some more controlling features of the online platform are required for such courses.



**Mr. Kisalay Kumar**  
**Indian Oil Corporation Ltd., Gujarat Refinery**

Excellent visionary example in Covid-19 pandemic. Excellent leadership, management and coordination. But Regional Centre involvement should be increased. Excellent organisation over online platform for the first time. Good app selected for the web meeting but restriction on participants entry observed poor. Marks distribution on assignments, final reports, case study, discipline and attendance must be predefined to the students. Syllabus and classes should be predefined for each subject. Maximum 3 subjects for a faculty must be fixed in each subject. In place of cash, Gift Voucher should be preferred as honorarium. Internship course schedules should be fixed during Summer and Winter vacation time in colleges. Course Certificate copy should be showed in advertisement. Course registration fees should be below others but near about RIL.



**Prof. Sunil Balan Kuila**  
**Haldia Institute of Technology**

It was a successful effort to make the students aware of the process industries during this pandemic situation of Covid-19.



## Subject Experts



**Prof. Debabrata Das**  
**Indian Institute of Technology, Kharagpur**

It was a great experience to deliver two seminar talks titled 'Biofuel Production from Renewable Energy Sources' and 'Zero Carbon Gaseous Fuel Production Processes by Mesophiles' in the OSIP 2020, organised by IIChE on 7 June 2020. Our research group has been involved with the Bio-energy production processes for more than three decades in three major areas: a) Bio-hydrogen production, b) Algal bio-refineries, and, c) Microbial fuel cell.

We are aware that fossil fuel reserves will be exhausted very soon. So it is necessary to explore an alternative and sustainable energy source. Bio-energy production processes have dual purpose: energy generation and bioremediation of the organic wastes. Students are the future of the country. So this was a unique platform to get an opportunity to share our research experiences with them so that they can carry forward our research work in the future for the benefit of our country.

**Prof. (Dr). SebakRanjan Roy**  
**MaulanaAbulKalamAzaeUniversity of Technology**

The programme of OSIP 2020 is an excellent attempt under this crisis period due to Covid 19 epidemic when all the academic activities are at standstill. Such online courses are to be conducted regularly in various fields of choice to cater to the students across the institutes. Class hour should be increased or segregated so that topics should be covered and properly justified. There must be platform for students to interact with the Speaker. They should see each other. There should be a scope for assessment of students, bases on their feedbacks. System should be full proof as far as possible. Everybody should be audible.



**Dr. Dwaipayan Sen**  
**Heritage Institute of Technology, Kolkata**

Nice knowledge sharing platform.



**Mr. Samarjit Chowdhury**  
**Bharat Petroleum Corporation Limited, New Delhi**



First of all, I want to sincerely thank IIChE as a faculty for young chemical engineers of India. All across the country, chemical engineering students missed the opportunity of Industrial Training due to Covid-19 pandemic. It was a great initiative by IIChE to fill the gap as much as possible by online classes and interactions by chemical engineering professionals. Students, all over the country, overwhelmingly participated and it was a real joy to teach and introduce them with industry related issues. Inquisitiveness of those upcoming generations were really noticeable during the online sessions. Assignments of each session were very successfully coordinated with students and faculties by IIChE. Altogether, it was a memorable association. Wish all the best to all the chemical engineering students and IIChE.

**Mr. Sushanta K Roy**  
**Former Chief Manager, Balmer Lawrie & Co. Ltd.**



I am privileged to be part of the Association in sharing my learning with the young minds. I would have preferred to be in a platform where I could have shared my thoughts in more interactive ways with the participants. Though this was more of a monologue, I enjoyed it a lot. But I extend my heartiest thanks to the coordinator and the organiser for giving me the opportunity and would love to be in many more such sessions in future.

**Mr. Rilesh M. Mehta**  
**Solvay Specialities India Pvt. Ltd.**



OSIP-2020 was a one of its kind program in the need of time in the difficult situation of pandemic. It was a great effort to support students against summer internships, which would help them academically as well as for personal learnings. It was a difficult task even for me to give my two cents to the program via virtual tools. It was a very well managed and structured initiative by IIChE team who gave their time and efforts to make it successful despite various challenges.

**Dr. Ujjal Kumar Ghosh**  
**Seeking Academy**

OSIP-2020 is an excellent initiative. It helps students from different parts of India to learn from experts on different offered courses.



**Prof. Ananta Kumar Das**  
**MaulanaAbulKalam Azad University of Technology**

It was a beautiful interactive session. All the students were very much enthusiastic and were present throughout the online training session. I feel this type of session will be helpful for the budding engineering students to get them acquainted with the operation and maintenance in industries well in advance before joining. More online internship program can be organised in near future.

**Mr. Souvik Jana**

Excellent initiative and coordination.



**Mr. Apurba Kumar Bhattacharyya**  
**Praxair India Pvt.Ltd.,Haldia Plant**

Very good initiative and it is very helpful for students.



**Mr. Debashish Chakraborty**  
**Indian Oil Corporation Ltd., Gujarat Refinery**

Excellent group of students. Very inquisitive. Wish best of career for all of them.



**Mr. K. Subhash**  
**Indian Oil Corporation Ltd., Gujarat Refinery**

Excellent initiative.



**Mr. A.K. Singh**  
**Indian Oil Corporation Ltd., Gujarat Refinery**

The initiative taken and the program design were excellent. Now online teaching has become part of the new normal. I appreciate and congratulate the organizers for creating such a wonderful platform for students to undertake vocational training session online. I am thankful that subject of Fire and Safety was given due importance in the learning program for bright engineers who will be taking our country ahead.



**Mr. Joy M. Shah**  
**Founder and Chief Consultant, Innov8 ProTech Solutions**

Process Safety Management is the need of the hour for high hazards chemical industries. Chemical engineer plays vital role from cradle to grave. My compliments to IIChE for providing basic training to chemical engineering students, which will play significant role in professional life of them. It was the first online session. It was my pleasure to provide overview to budding engineers. My best wishes to them and IIChE to play lead role like CSB. Thank you for may engagement.



**Mr. Sukhen Das**  
**MCPI Pvt. Ltd.**

Excellent coordination and nice teaching environment.



**Prof. J. Hyavadana**  
**University College of Technology, Osmania University, Hyderabad**

It was very well-planned and very useful.



**Mr. Sudhhanya Choudhury**  
**Indian Oil Corporation Ltd.**

Was good and wonderful experience.

**Mr. Santanu Kumar Sarkar**  
**Indian Oil Corporation Ltd., Gujarat Refinery**

Innovative and effective mode of communication platform for budding engineers.



**Mr. Vijay V. Bhujle**  
**GVS Cibatech Pvt. Ltd.**

It was a good initiative on the part of IIChE to conduct online internship programs for students during lockdown period. Main aim was to expand students knowledge in a particular field with practical tips/advice from industry experts. This would help students in enhancing employer valued skills required in industry. I was involved in process safety management course. The course was conducted by Mr. Joy Shah, Mr. Butala and me. Initially, I was a little apprehensive about conducting online course with about 200 students. This course was well coordinated by Dr. T.L. Prasad. The online platform and course arrangements were well done by IIChE (mainly Dr. Avijit Ghosh). This is a way forward with probably less number of students so that the online course can be made more interactive. The course was well received by the students. Personally, I enjoyed conducting the online course and interacting with budding engineers. Overall, well done IIChE.



**Mr. A Balaji**  
**Indian Oil Corporation Ltd., Gujarat Refinery**

Excellent program.



**Mr. Abhay Raj Misra**  
**Indian Oil Corporation Ltd., Mathura Refinery**

During the Covid-19 pandemic, excellent initiation has been taken by IIChE and it has given a platform to all those aspirants who had not enrolled themselves as vocational trainee in industry like Refinery and Petrochemicals. I truly appreciate your efforts and wish its continuation in future too. Stay safe.



**Dr. Madhusudan Ghosh**  
**Haldia Institute of Pharmacy**

I enjoyed a lot from this OSIP-2020 through my lecture in the Drug Development from Pharmaceutical Medicinal Chemistry & Bio Process Engineering as well as in the Question hour.

**Dr. Gourab Chatterjee**  
**Haldia Institute of Technology**

It was a great experience to have been associated with IIChE team as a Course Tutor for both Biochemical Process and Biochemical & Biomedical Engineering Internship Program. I have thoroughly enjoyed and looking forward to work again.

**Mr. D. Diravyam**  
**Indian Oil Corporation Ltd., Gujarat Refinery**

Excellent.

**Mr. Subhojit Sarkar**  
**Indian Oil Corporation Ltd., Gujarat Refinery**

Well organised.

**Mr. Sunil Singhal**  
**Fluor Daniel India Pvt. Ltd.**

Good initiative in difficult times.



## **Students Feedback on OSIP-2020**

### **ANIKET KUMAR (Indian Institute of Petroleum and Energy, Visakhapatnam)**

The internship provided by IICHE is a great source of knowledge. The professors are expert in their respective fields.

### **OVI DESHMUKH (SRM Institute of Science and Technology, Chennai)**

Since it was combined with different years of students, it is a bit challenging as the speed of teaching is quite fast, but overall it's a learning experience and it made me realise what I'm truly interested in. Thankyou

### **PROTIM DAS(Jadavpur University, Kolkata)**

This is my first internship as a second year student. Now, I have gathered knowledge about the reality behind chemical engineering. Thanks IChE.

### **ARPIT GUPTA (IIT, Bombay)**

I really enjoyed this programme and the format it was presented in. For me, I learn and retain much more through an online class due to the fact you can do the course as an open book. This really makes me search for the answer and in return, I retain more information. I found it relaxing to be able to turn the work on the assignments at my leisure and when I had the time. To be honest, there is nothing that I disliked about the course. I will definitely be taking another online course from you!

### **YASHI VIJAY (Rajiv Gandhi Institute of Petroleum Technology, Mumbai)**

This is my first year - second semester. So I'm unable to relate much with the subject allocated to me. But otherwise it is very helpful if we see a long term effect down the line.

### **P HEMANTH (Siddaganga Institute of Technology, Tumakuru)**

The contents were really good. Few students in initial classes spoke nonsense by switching on their mike. You didn't take any action. See to that you maintain things strictly.



**YOGENDRA SINGH(Malviya National Institute of Technology Jaipur)**

It is very helpful programme, it is useful in my revision of the concepts that I learned and also in learning something new about Chemical engineering.

**BONGULA RAKESH ROSHAN(University College of technology, Osmania University, Hyderabad)**

This has been a very good thing happened in this lockdown, this experience was a very new one to me, I have learnt many things regarding the petroleum refinery and i hope this internship would be very useful in my future studies.

**MANASWINI GOWTHAM V(M S Ramaiah Institute of Technology, Bengaluru)**

The course has been very informative and helpful. The interactions with experienced industry personnel have been very fruitful. Would like to undergo more such training/courses even after graduation

**SURADA KAVYA (Indian Institute of Petroleum and Energy, Visakhapatnam)**

It would be nice if you provide recorded videos. It will be helpful for students who have missed it by any chance.

**BORSE MOHIT DILIP(Shivaji University, Kolhapur)**

The Online summer internship helps to enhance our knowledge and skills. But some of the lectures are too fast due to lack of time. Iiche had taken great initiative to enhance student skills in post-pandemic Covid 19 lockdown. I thank IICHe and each and every one associated with it for conducting OSIP2020 and surely this will help me in future. I also request IICHe that under Students Chapter at various college they should enhance activity like industrial visit. I also want to request IICHe to give student opportunity of internship in respective companies with which they are linked.

**SATYAM(Dr. SSB UICET Panjab University, Chandigarh)**

The way of teaching is really awesome and interactive. The techniques used for completing the syllabus are quite appreciable. A suggestion is to use some another App instead of go-to-meeting because some students sometimes keep their Mike and video cameras on which creates a lot of disturbance and which become uncontrollable for teacher.

**MUGILAN L.(SSN College Of Engineering, Kalavakkam)**

I really enjoyed the online course. I thought it was well planned and layed out, easy for me to follow. The work assignment was just enough, so i could finish everything with enough time, learn about the topics and not feel over loaded and rushed. The course has introduced me to various tools that are very useful to my training.



**NIKHIL R(National Institute of Technology, Tiruchirapalli)**

This internship has been interesting. It has provided with me much needed insights into chemical process technology. It has made me pretty interested in the subject which I never thought I would be. But one suggestion I have is that the quality of the content and the way in which it can be delivered can be improved

**HEMA CHANDRA GOKAVARAPU(RVR & JC College of Engineering [Autonomous], Guntur)**

Please spread your reach by collaborating with industries around the world and please continue this program for many years to come. It has been a great experience to learn directly from experienced industrial personnel from all over the country just by sitting at my home. Thanks for the organizers for this

**PRIYANSHI(Deenbandhu Chhotu Ram University of Science and Technology, Sonipat)**

Although the lecturer and subjects are good yet there is a lack of management. Sometimes audio problem and interruption of other students make it tough to follow the teacher. Otherwise, everything is good.

**NEHA G(Ramaiah Institute of Technology, Bengaluru)**

It would be good if we know the timetable and the duration of the class one week ahead.

**SARVAR-E-ABBAS(Birla Institute of Technology, Mesra)**

Video quality should be improved.

**SHIVA(IIT Madras)**

Overall Internship was good, given the situation that our country faces right now because of Corona Pandemic. All lectures by experts were beneficial to understand the core concept of manufacturing Process of Different Kinds of Chemical Engineering Industries and I hope that at sometimes later in future maybe I could use them in future, In the end, I want to conclude by saying thanks to(IICHE) for Organising such a wonderful online Internship for all the students of Chemical Engineering across India.

**S.AISHWARYA (Vellore Institute of Technology, Vellore)**

The OSIP-2020 organised by IChE provided to me a great platform for learning, understanding and grasping knowledge related to my field of engineering, Chemical Engineering. The subject Chemical Process Technology helped me to look into the details of the various processes that take place in the industry and gave me a clear view of the entire industry. During this time of pandemic and lockdown, this program really benefitted us by teaching us new things and at the same time helping us to recollect what we have learnt before. Every topic was clearly discussed and I am grateful for it.



**HIMANSHU SALUJA (DCRUST, Murthal)**

Dear Avijit Sir, I may not always say it, but I mean it whenever I say it. Thank you, Sir, for all the extra efforts you make to help us grow and the challenges you encourage us to face to help us become who we are. You are not only our Sir, you are friend, authority and guide, all rolled into one person. Thank you so much for all that you have done. I only hope that I can return the favour sometime in future. It would be impossible to count all the ways that you have helped me in my career.

You groomed us very diligently and made working with you an interesting and memorable experience. Thank you so much for your efforts and hard work. We will always be grateful to you for all your support and kindness.

**ISHIKA PADHY (National Institute of Technology, Rourkela)**

The lectures are very insightful. It is a great opportunity for us to study under the guidance of the experts who have experience for many years. The only suggestion I have is to find some alternatives to conduct the class so that random people won't join the meeting and disturb the whole class with nuisance activities. Please kindly look into it.

**ALIVIA RAY (Jadavpur University, Kolkata)**

This internship was a very good opportunity for me to accrue industrial knowledge even in this pandemic situation. Also the eminent members of IIChE helped us to industrial work cultures.

**SANBED DAS (Heritage Institute of Technology, Kolkata)**

The webinars and the assignments were extremely helpful for the study of this process safety management topic.

**VAIBHAV JAIN (Malaviya National Institute of Technology, Jaipur)**

It is a good way of giving the internship opportunity and utilising the time during such a big pandemic when we had left with no internship. OSIP allows sufficient time for a complete conversation and questions. It provides an insight of our own learning experience and challenges, discuss how we might handle situations differently in future, whether to avoid negative behaviours or to improve on positive ones. It encourages the intern to ask the question about the next steps of growth. So on an average it is a good way of utilising the free time but there is always a lack of some practical knowledge in online learning.

**YALAMANCHILI RAGA PRATHYUSHA (University College of Technology, Osmania University, Hyderabad)**

Good training programme and helpful in gaining the knowledge about the new course



## BEST PRACTICES: SAFETY VERSUS PRODUCTIVITY

### Preface:

Chemical industry sector is critically linked to safety and loss prevention. Moreover, hazardous chemical materials pose even greater risk due to situational factors like trial runs, abnormal idling spells in chemical units and their subsequent restart, etc. The recent unfortunate accident at a polymerization unit in Visakhapatnam (Andhra Pradesh) that witnessed loss of a few lives as well is a case in point. The specific abnormality as compared to an otherwise normal activity was probably associated with the manner of 'recommissioning' the process segment, which was non-operational for about two months due to the Lockdown restrictions on account of Covid-19.

In this backdrop, the Hyderabad Region Centre (HRC) of IIChE organized a panel discussion, titled 'Best Practices of Safety Management in Chemical Industry' on 31 May 2020 on the WebEx Meet digital platform.

Padmashri Prof. G.D. Yadav, Emeritus Professor of Eminence and Former Vice Chancellor, Institute of Chemical Technology, Mumbai graced the occasion as the Chief Guest and the moderator. Prof. V.V. Basava Rao, President, IIChE was the Guest of Honour.

Prof. Yadav presented an overview of the global scenario concerning safety issues in the chemical industry. In majority of the cases, human error was responsible, he pointed out. Prof. Yadav also observed that general perception of high probability of accidents during reaction time is not realistic. Several accidents do happen in the storage tanks. He emphasized upon the need of learning the lessons from these accidents so that such mistakes do not recur. He also advocated the requirement of confidence building between chemical companies and the communities living in the vicinity of these companies. Prof. Basava Rao emphasized the importance of releasing a White Paper based on the overall outcome of the panel discussion, which will benefit all the stakeholders.

Due to paucity of space, excerpts of the presentations and recommendations, made by the elite panellists, is presented below:

### I: Mr. P. Vijayaraghavan, Former President, Reliance industries Ltd and Past President, IIChE

#### Risk Assessment, Scaling & Management.

Typical safety management system in any industry is a 3 tier-pyramid:

- Work place safety system at the bottom, equipped to eliminate high frequency/low consequence events
- Process Safety Management in the middle to prevent high consequence / low frequency events
- Operating Discipline at the top, equipped to steer and sustain the whole system with everyone doing it right first time/everytime.



The key focus has to be on reliable/enlightened employees driving the well-designed assets/systems/procedures. Human factors play an important role in incident prevention, especially when it comes to the interface between man and the machine, man and the systems as well as man and the procedures.

Some effective tools that have been in popular use:

1. Check list: The famous best seller "The Checklist Manifesto" by Dr Atul Gawande highlights the utility of checklists in both complex and routine tasks.

2. Risk management: One key aspect of risk management is risk assessment/risk Perception, specifically how each one perceives the risk of a hazard, resulting in an undesired event.

3. Human behaviour: Human behaviour on risk management depends upon how serious/immediate one perceives the threat posed by the hazard. Behaviour is generally unpredictable but can be moulded and influenced using risk assessment/perception. It could be mentored or moulded to do the right things, made aware of the risk and the ways to reduce it.

4. Bow Tie analysis: This is one such great tool used in risk perception. In simpler terms, it is used to depict most hazards with the event at the centre, all preventive steps to its left and mitigating measures to its right. Such depiction in bow-tie firstly enables one to understand the risk shown by the hazard leading to events, its real seriousness in terms of consequences, its preventive steps and the mitigating measures when the event occurs in one pictorial representation. Secondly, it enables to continually add more and more preventive steps as well as mitigating measures each time when reviewed with an actual event or otherwise. This can even be applied in health care to handle the current pandemic.

In conclusion, the current need is to focus on human factors instead of human errors and make people more reliable by enhancing their risk perception and commitment.

For future, Mr. Vijayaraghavan suggested that IIChE and Indian Chemical Council (ICC) should promote a Process Safety Institute similar to Mary Kay O'connor Process Safety Institute at Texas, offering on-line certification courses on Risk Management to industry practitioners.

**II : Mr. D. M. Butala , Chairman, Process Safety Group - IIChE , Former Executive Director, GSFC Ltd, Vadodara and Past Vice President – IIChE**

Following are the recommendations for storage tank, periodical inspection, restart up of plant and Styrene Storage Tank, as well as fire-fighting and safety:



### **Recommendations for Storage Tank M6:**

These are operating and process design guidelines for large capacity tanks.

1. The cooling system should be always in line. Provide Temperature Control Valve (TCV) on coolant outlet from tank for taking signal from Temperature Transmitter (TT) or Temperature Indicator (TI) provided on tank.
2. If the tank storage capacity is @ 2000 m<sup>3</sup>, there should be 7 to 8 temperature indicators (TI) placed at regular intervals on tank shell covering entire height of tank shell.
3. Storage temperature should be 15 Deg C. Increase in temperature is best measure of polymerization. Hence TCV should be sized for higher heat duty.
4. High Temp Alarm (TAH) and Extra High Temp Alarm (TAHH) should be provided. TAHH should be interlocked with TCV on coolant. TCV should be fail open type. The alarms should be on main control panel as well as in field control panel, if any.
5. Do not keep vent opening to atmosphere. Connect Tank Vent to either recovery - return system or condensers and liquid return to tank or vent to flare system.
6. If tank is not insulated, paint it with white paint.
7. For emergency consideration, provide remote operated sprinkler system on roof of tank.
8. Provide hydrocarbon sensors with alarms in control room, fire department control room, and field control room, if any. Establish periodical (once a week) testing of hydrocarbon sensors by safety department or by trained operator(s).

### **Recommendations for Restart-up:**

Following are actual plant practices and the part of Standard Operating Procedures (SOP).

1. Conduct pre-startup inspection jointly by operating and safety officers. Carry out prestart up safety audit.
2. Calibrate all instrument items and replace / carry out maintenance, wherever required. iii) Double cross check temperature of Styrene tank M6.



3. Check readings of all TIs mounted on tank.
4. Check coolant (refrigeration system) supply and establish flow rate.
5. Check for fire water spray over tank roof
6. Before start up, flush all top nozzles inlet particularly Safety valve nozzle, Flame arrester, Breather Valve and Tank Dip hatch (gauge) nozzle.

#### Recommendations for Fire fighting & Safety:

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| <ol style="list-style-type: none"><li>1. Carry out safety audit.</li><li>2. Conduct mock drills by identifying potential hazardous scenario for different emergency scenes during odd hours like night shift, early morning hours, lunch / dinner break.</li><li>3. Plan emergency disaster management group with support of nearby industrial establishments – known as Mutual Aid Group and carry out at least one joint emergency mock drill.</li></ol> | <ol style="list-style-type: none"><li>4. Maintain fire water storage for 4 to 6 hours and fire water loops under pressure with auto start of fire water pumps.</li><li>5. Inspect foam chamber mounted on foam nozzle on tank shell and integrity of glass of this unit.</li><li>6. Never use foam nozzle as overflow nozzle.</li><li>8. Train operating team in firefighting.</li><li>7. Train the people from nearby residential complexes for emergency evacuation.</li><li>10. Have a proper Public Address system.</li></ol> |
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### III: Mr. Sushil Kumar, Former President, Reliance industries Ltd. and Past President, IIChE

#### General guidelines:

1. Safety is the most important aspect in a chemical industry. However, accidents cannot be made zero. It is said that 96 % of the failures are due to human error. The human error factor encompasses three areas: failures arising out of Design, System and Procedure. All of them fall under the domain of management. Hence, top level intention and commitment are most essential to raise safety standards among industries in general and specifically in chemical units.
2. The tool of Operational Discipline (OD) can minimise the failures. OD consists of following elements: i) All safety information data on plant and equipment. ii) Material Safety Data Sheets (MSDS) of all chemicals being used. iii) All SOP's & Maintenance procedures. iv) Adequate quantities of appropriate PPEs along with their service and replenishment system.



3. All the alarm, trips and interlock systems should be explained to the entire workforce with logic.

4. All the safety procedures should be available. Compliance of i) All SOPs, including those of normal as well as emergency start-up/ shut down as well maintenance activities is important. ii) There should be regular audits and statutory provisions, including periodical inspections along with testing and certification by competent personnel.

5. All Standard Operating Procedures (SOP) and Standard Maintenance Procedure (SMP) should be available: normal operation, shut-down, emergency and start-up. Other points needing attention are (a) Imparting of training and refreshers, (b) Identification of any deviations from standard practices and execution of immediate corrective actions.

#### **IV: Mr. D.P. Misra, Past President, IIChE and former Director General of Indian Chemical Council**

##### **General views:**

Mr. D.P. Misra emphasised the need and scope for uplift of Safety standards in Chemical and Allied Industries. With his long association with chemical and allied industries from close quarters and at various key positions (including ICC), Mr. Misra advocated constitution of a Government-accredited and promoted board for safety in India like the Chemical Safety Board, USA, which is doing a yeoman service to the industry and society at large. The investigation reports of various mishaps, generated by the Board, (which consists of expert professional engineers) as well as the illustrative videos have become very popular around the globe.

Above all, Mr. Misra suggested that besides issuing notifications for strict compliance of the recommendations by the affected units, the Government should also issue proper notifications for further improvements in compliance of safety rules. In this context, he felt it tenable that IIChE takes a lead in sending a concrete proposal to the Indian Government's Department of Chemicals and Petrochemicals, requesting for the formation of such a Board here.

#### **V: Mrs. Sheela, former Deputy Chief Executive (Safety), Nuclear Fuel Complex, Hyderabad**

##### **General views based on professional experience:**

Basically, every material or chemical has an inherent hazard and only if they are managed well, the operations can be safe. The initial phase of Mrs Sheela's career was concerned with the production of natural and enriched uranium oxide fuels. All the operations in this field are associated with chemical engineering sector. They involve the use of hazardous materials, such as, nitric acid, ammonia, hydrogen, CO<sub>2</sub>, nitrogen, etc.

In this context, she discussed the design and operational aspects of producing enriched uranium oxide.

As far as production of enriched uranium is concerned, the starting material is Uranium Hexa Fluoride (UF<sub>6</sub>), which is solid at room temperature and sublimes at about 100°C. Apart from chemical reactivity, it also poses radioactivity and criticality hazards. UF<sub>6</sub> is received in cylinders and needed to be heated to draw the gas or UF<sub>6</sub> vapours from the cylinder for hydrolysis reaction.



Hydrolysis of UF<sub>6</sub> is a highly exothermic reaction and requires continuous cooling to control the concentration. Being Fluoride-based, material of construction for reaction vessel is a challenge. Moreover, since it involves enriched uranium, radioactivity and criticality management are also challenging tasks. To add to it, UF<sub>6</sub> being a very heavy gas, flowability is very poor and requires a carrier gas (Nitrogen gas), which should be bone dry, lest UF<sub>6</sub> hydrolyses and chokes the line.

Any leakage requires maintenance, involving extensive cleaning and decontamination apart from preventing exposure of personnel to radioactivity. It is, therefore, very important to ensure good health of all the equipment, carry out detailed safety analysis of entire process line, incorporate various safety systems, alarms, sensors, uninterrupted power supply, sprinkler system, isolation of most hazardous system, safety manual for regular testing of all equipment and pipelines and ancillary services, etc. for design, fabrication, installation, and commissioning and operation of the plant.

In safety systems, safety interlocks connected to various sensors, to actuate the sprinkler system, stop heating, initiate cooling or flushing, sound alarms, etc., may be added. Mechanical and engineering instructions, in detail, should be in place for any plant operation, inclusive of initial starting, routine operations, emergency stoppages, maintenance of various parts, safety analysis for each and every operation and equipment. The same should be available at work station, with safety engineering and maintenance groups as well as with various authorities.

These have to be approved by the authorised agency with provision for regular inspection.

#### **VI: Mr. Madan Gavane, Process Safety Consultant, TUV –SUD**

A good number of Mr. Gavane's recommendations were quite similar to what the first three speakers said. Additionally, he made the following recommendations with relation to the recent LG Polymer mishap.

His first emphasis was on trying to avoid any accident in the first place.

It is absolutely necessary to carry out Hazard and Operability Analysis (HAZOP) and risk assessment of chemical storage tanks since several hazards are involved in storages. While doing HAZOP, focus should be on critical parameters.

During incidents similar to this one, temperature could be the critical parameter. What can go wrong? What bad the consequences would be? What is the likelihood? All operating staff must have a Knowledge checklist of Pre Start-up safety review (PSSR). Operating & Maintenance staff must be trained properly and should also undergo periodic training with external agencies for updating with the emerging practices.



**VII: Mr. V.V. Mahesh Kumar , Head, Safety Department, NFC**

1. Accidents in chemical industry happen due to lack of knowledge or due to ignorance about the actions to be taken. Hence, training should be provided to all the employees about critical parameters, their significance and on how to take actions. It is advisable to provide training on legal aspects to the personnel at the level of manager and above so that they are aware of the legal implications in case of any such incidents.
2. Job rotation is advised with the recruits working in HRD, safety and maintenance before they are assigned to work in operations. This will help the personnel in gaining full information about processes, SOPs, safety practices and will ensure safe working.
3. Presently, Manufacture, Storage and Import of Hazardous Chemicals (MSIHC) Rules (Rule 10, 11, 12) under EPA specify emergency plans only when the premises have chemicals above certain threshold quantity. Instead, it is suggested to specify the requirement for on-site and off-site emergency plans based on consequence analysis for worst case scenarios.
4. To stop spread of impact, all those industrial organizations handling hazardous chemicals as listed in MSIHC Rules, shall have green cover within factory boundary for at least 100 m or 300 m or 500 m based on whether it is plant emergency or site emergency or offsite emergency.

**VIII: Dr.R.Venugopal, Deputy Chief Controller of Explosives, PESO, Ernakulam, Kerala**

1. Employers are required to compile written Process Safety Information (PSI). The compilation of written PSI enables in identification and in understanding the hazards posed by processes, which involve Highly Hazardous Chemicals (HHC). The PSI provisions require employers to keep accurate, complete, and up-to-date documentation of relief system design and design basis.
2. Process Safety Management (PSM) standards require that all equipment in PSM-covered processes comply with Recognized and Generally Accepted Good Engineering Practices (RAGAGEP). Examples of RAGAGEP include widely adopted codes, consensus documents, non-consensus documents, and internal standards.
3. Emergency shutdown procedures are important components of workplace safety. Examples of conditions that require emergency shutdown include (but are not limited to) failure of process equipment, loss of electrical power, loss of instrumentation, loss of containment, severe weather conditions, fires, and explosions. Qualified operators must be assigned emergency shutdown responsibility.



**Following good practices of pre-start up safety review (PSSR) are recommended:**

1. Assign a leader to be in charge of the PSSR team, having capability to decide and authority to delay the start up if required.
2. The leader should assemble an appropriate multi-disciplinary team of personnel to complete the PSSR and the additional follow-up activities.
3. The PSSR shall confirm that safety, operating, maintenance and emergency procedures are in place and are adequate prior to the introduction of highly hazardous chemicals to a process.
4. The employer should perform a PSSR for new facilities and for modified facilities when the modification is significant enough to require a change in the PSI.
5. For new facilities, a PHA should be performed and recommendations should be implemented before start up.
6. Proper review should be taken on the Safety Instrumented System (SIS) with associated Distributed Control System (DCS), Programmable Logic Controllers (PLC) and stand-alone digital or analog controllers and alarm systems.

Other eminent speakers participating in the discussion included Mr. G.V. Sethuraman, Past President, IICChE. He shared his experiences in the pharma sector. Prof. R. Shyam Sunder, Principal, University College of Technology, Osmania University narrated the way safety issues are addressed in companies involved in manufacturing of Fluorocarbons and Fluoropolymers.

In view of the recent mishap at the LG polymer unit in Visakhapatnam, all the panellists raised this issue. Besides offering their specific readings of the accident, the speakers emphasised strict maintenance of all the safety systems and thorough compliance of all the precautions before restart of a chemical unit after prolonged shutdown.

**General recommendation:**

The Panel unanimously recommended the creation of a National Safety Board (NSB) for India. NSB should be statutory body with branches in all industrial areas.

**CORRIGENDUM**

The headline of the final article (Part VI) under the series '**Process Safety and Risk Management**' by Mr. Joy M Shah, published in the IICChE-Newsletter, Issue 1, 2020 was wrongly published as 'Investigation of Process Safety Incidents'. The correct headline is '**Risk Management and Sustainable Operation**'.

The inadvertent error is regretted.



## IIChE UPDATES

The extraordinary global as well as national crisis in the wake of Covid-19 pandemic notwithstanding, IIChE has been trying its best to remain active and spirited. Despite several practical problems of communication and coordination, the Institute Headquarters, several Regional Centres and a few Student Chapters are regularly organising meaningful skill enhancement courses, panel discussions, seminars, etc., on online platforms. A brief outline of some of the important ongoing and upcoming programmes is presented below:

- ◆ The 4<sup>th</sup> batch of the 'Online Summer Internship Program-2020(OSIP-2020)' is underway. Following highly positive response from the enrolled students and constructive feedbacks from the Coordinators and Subject Experts with regard to the previous three sessions, there are high hopes about similar success of the present session as well.
- ◆ The IIChE Headquarters will introduce a Certificate Course on Chemical Engineering Designing Software – 'Prosimulator' – towards the end of September 2020. The Course will be suitable for practising engineers, students as well as faculty members.
- ◆ A Webinar has been planned on 'National Education Policy 2020'. To be organised by the IIChE Headquarters, the programme has been tentatively scheduled to be held in October / November 2020.



## IIChE Council 2020

**Prof V V Basava Rao**  
[profbasavarao\\_1964@yahoo.com](mailto:profbasavarao_1964@yahoo.com)

**Prof S V Satyanarayana**  
[svsatya7@gmail.com](mailto:svsatya7@gmail.com)

**Mr Praveen Saxena**  
[praveensaxena1951@gmail.com](mailto:praveensaxena1951@gmail.com)

**Dr M Venkateswara Rao**  
[mvrao79@gmail.com](mailto:mvrao79@gmail.com)

**Dr Avijit Ghosh**  
[avijitghosh.che@gmail.com](mailto:avijitghosh.che@gmail.com)

**Dr Madhu Agarwal**  
[madhunaresh@gmail.com](mailto:madhunaresh@gmail.com)

**Dr M K Jha**  
[jhamkin@yahoo.co.in](mailto:jhamkin@yahoo.co.in)

**Dr Gaurav Rattan**  
[grattan@pu.ac.in](mailto:grattan@pu.ac.in)

**Prof N Balasubramanian**  
[nbs.bala@gmail.com](mailto:nbs.bala@gmail.com)

**Prof Suddhasatwa Basu**  
[drsbasu@gmail.com](mailto:drsbasu@gmail.com)

**Mr D M Butala**  
[dmbutala27@yahoo.com](mailto:dmbutala27@yahoo.com)

**Prof Sudip K Das**  
[drsudipkdas@vsnl.net](mailto:drsudipkdas@vsnl.net)

**Dr M P Jain**  
[mpjain2000@yahoo.com](mailto:mpjain2000@yahoo.com)

**Dr C Karthikeyan**  
[drcktech@rediffmail.com](mailto:drcktech@rediffmail.com)

**Prof Alpana Mahapatra**  
[alpana1mahapatra@gmail.com](mailto:alpana1mahapatra@gmail.com)

**Prof (Dr) S C Naik**  
[rkl\\_snaik@bsnl.in](mailto:rkl_snaik@bsnl.in)

**Dr T L Prasad**  
[tlprasad63@gmail.com](mailto:tlprasad63@gmail.com)

**Dr K B Radhakrishnan**  
[drkbrnair20@gmail.com](mailto:drkbrnair20@gmail.com)

**Dr G S V Ratnam**  
[gsvratnam@gmail.com](mailto:gsvratnam@gmail.com)

**Dr Anil Kumar Saroha**  
[aksaroha@chemical.iitd.ac.in](mailto:aksaroha@chemical.iitd.ac.in)

**Prof Narendra M Surana**  
[nmsurana@yahoo.com](mailto:nmsurana@yahoo.com)

**Mr Kalyan Kumar Basu**  
[kbasu2004@yahoo.co.in](mailto:kbasu2004@yahoo.co.in)

**Dr V S Sapkal**  
[vssapkal@gmail.com](mailto:vssapkal@gmail.com)