

# Industrial Polyclinic

## Background :

The Indian Chemical Process Industry (CPI) has been comprised of three sectors, viz., Large Scale, Medium Scale and Small Scale. Large number of Small and Medium scale (referred as SMSE sector) is engaged in production of a variety of organic chemicals, specialty chemicals, dyes, pharma intermediates, chemicals from crude, water and cooling water treatment chemicals, catalysts production, etc. – the list is big.

Like human beings, industry does face problems related to Skilled Manpower, Finance, Process technology – Operation of plants, Machinery, Market and approach to right solution.

As regards to Skilled Manpower, IChE has started Online Industrial Training Program for engineering students covering various areas including Process Safety, Energy and Environment. However, Indian CPI, irrespective of its size, does face Problems in Operation, Maintenance, Sustainability, etc. Large scale industries have the resources in terms of their own Technical Services and / or Design Depts. They can contact Process Licensors or Engineering Consulting Organizations. The SMSE sector always has limitations in terms of Technical / Design Engineers or may not be in a position to hire consultancy firms. Their endeavours are lacking right advice or solution.

## 1.0 Prologue :

Many of these industries have been established based on process technology developed in house, scaling of lab scale facilities, technology furnished by chemists working in other plants, old and obsolete technology. Because of maintaining of trade secrets from competitors / financial constraints / Lack of engineering knowledge / Poor design, etc., these SMSEs are facing various problems as well as grappling with Safety and Environment issues, making dents on their performance. Accidents have been taking place in this sector causing injury / loss of life to operating people, loss of property and profits. Incidentally safety record of the SMSE sector is poor as compared to big CPI. Many of such industries are wiped out because of product quality, poor production; higher cost of production, frequent maintenance problems, poor efficiency of processes, lack of will for technology upgradation / modernization, etc.

## 2.0 Issues / Problems of SMSEs :

I have tried to analyse the problems of SMSEs and have classified in various categories as mentioned below. The problems are:

1. Longer Reaction Time
2. Poor Conversion
3. Effect on Quality of product because of
  - Impurities generated due to raw material quality,
  - Side Reactions,
  - Contamination due to improper selection of Material of Construction,
  - Residence time, etc.

4. Heat Transfer limitations
  - » Poor cooling or Longer heating Time
  - » Problem of selection of right type heat transfer media
  - » Under designed heat exchanger (limiting heat transfer area)
  - » Under designed equipment
  - » Inadequate data
  - » Poor insulation – misconception on insulating materials used
5. Bad quality of Steam
  - ◆ Either too much superheated or
  - ◆ wet steam
  - ◆ Lack of or improper selection of steam traps
  - ◆ Poor Insulation
6. Cooling water treatment problem (poor treatment), Scaling, Corrosion, Fouling
7. Bad quality of Instrument & Process Air
8. For Polymerization Reactors surface finishing problem - Choking & Cleaning
9. Wrong selection of pump
  - Capacity Limitation
  - Discharge Head Limitation
  - Over capacity
  - Capacity smaller than minimum safe circulation capacity of pump
  - NPSH Problem
  - Improper selection of pump type and Material of Construction
10. Blowers / Fans / Compressors
  - » Selection Problem
  - » Carry-over of Liquids
  - » Improper separation of Gas-Solids
  - » Vapour – Liquid separation
  - » Inter-stage Cooling
11. Storage Tanks
  - Sizing of Vent v/s outlet or inlet
  - Breathing losses,
  - Thermal losses
  - Corrosion of Roofs for Sulfuric Acid or Other Acids service
  - Dykes
  - Disposal of Residue
  - Heating Provision
  - Selection of type of Tank : Floating / Fixed roof / Double wall
12. Effluent problems - Environmental (Gaseous / Liquid / Solids)
13. Safety problems
  - ◆ Safety valve sizing
  - ◆ Rupture Disc sizing
  - ◆ Safety for Hydrocarbons / Acids / Chlorine / Toxic Fluids Handling & Storage
14. Selection of Material of Construction
15. Energy Savings
  - Insulation: Hot & Cold as the case may be
  - Waste Heat Recovery
  - Energy savings / optimisation
16. Sizing & design of equipment
17. Distillation

- Poor distillation
  - Reflux & Reboiler problems
  - Trays v/s Packings
  - Long Batch cycle
18. Crystallization – Poor size of Crystals, Crystals Purity
  19. Separators (Vapor - Liquid / Solid Liquid / liquid – liquid)
  20. Centrifuge selection
  21. Piping sizing / selection of valves / online strainers / Type of flanges
  22. Gravity Flow v/s Pumps
  23. Mixing & agitator selection
  24. Control Philosophy: Auto Control valves v/s Manual Controls / PLC / DCS
  25. Gaskets selection
  26. Reactor Internals / Catalyst Supports / Catalyst selection
  27. Lack of Skilled Manpower
  28. Low Temperature (Cryogenic) operations
  29. Plant Start up / Plant Shut down Issues
  30. Others

### **3.0 IChE Support /Help :**

As a concern to Indian CPI and identifying the need of time, IChE has planned a Road Map ahead in the format of Industrial Polyclinic.

IChE has 46 Regional Centres (RCs), spread in 4 zones, viz., North, East, West & South Zones. RCs like NRC, Baroda, Ankleshwar, Mumbai, Hyderabad, Chandigarh, Kochi, and Kolkata are very active and have advantage of location as they are surrounded by Chemical Industry base. There are other centres which do not have strong CPI base near them but some of them are carrying out various activities. Considering technical problems experienced by Indian CPI, IChE have prepared a road map ahead as service to Indian CPI.

The road map is based on IChE's strength as Professional body to benefit the industry at large, including SMSE sector. Of course, large industries have their own system for development of their manpower and also database for their own field as well as financial strength. The problem is with SMSEs which have tight financial and other resources as well as which face various problems as mentioned at above 2.0.

### **4.0 Roadmap Ahead:**

#### **4.1.0 Formation of Industrial Clinic / Polyclinic for CPI and how it will function :**

4.1.1 Creation of a separate dedicated Portal on IChE web base in the name of Industrial Polyclinic

4.1.2 Formation of groups of experts as per their expertise in the areas mentioned at 2.0 and linked with portal for Industrial Polyclinic. Time to time, the list shall be reviewed and augmented.

4.1.3 The Industrial Polyclinic shall function as service to CPI and it will be free of cost.

**4.2.0 The industry will refer their difficulties on this dedicated portal of IChE Web page. The reply from experts shall be through this portal only. There can be more than one solution from various experts.**

4.3.0 Based on advice / suggestions of Industrial Polyclinic, concerned industry may go for further course of action. It may engage consultant of its choice or may contact the expert member. **However, subsequent consulting will be independent of IChE and in no way it will be binding to IChE.**

4.4.0 To begin with, a team of experts from the willing IChE members from respective Zones / RCs will support activity of "Industrial or Poly Clinic" as service to CPI without any financial obligations. Same pattern can be followed by RCs. Of course, this is a guideline and each RC can have its own path, based on its members' interest, involvement and their expertise. Once again, I repeat – this is a service to CPI and society at large by IChE without any business interests / obligations.

4.5.0 Let IChE HQ form a body or group of expert members from RCs, who can understand problems faced by these SMSEs. **As and when necessary, these members will coordinate with HQ through dedicated portal, created on IChE Web site.** If the problems are addressed properly, this group or body, having large number of practicing engineers as backup team, can look into their problems and give right advice to resolve the problems brought out.

It is observed that the SMSE sector is afraid of disclosure of their Technology / Know-how / Trade Secret and arising of competitors out of this. It is worth to note that the objective of Industrial Polyclinic Portal is to help existing SMSEs with support of experts, who are not interested in copying or disclosing their process technology but in augmenting the industry's operations.

I am sure that IChE's this unique Pan India-based CPI Oriented Professional initiative will benefit the CPI and SMSEs in particular immensely. I invite one and all to spread this message to CPI.



**D M Butala**  
**President, IChE**