ISA Delhi Section

Setting the Standard for Automation™

"How Fertilizer industry is adopting advance Instrumentation Technologies in existing plants"

Presented By:

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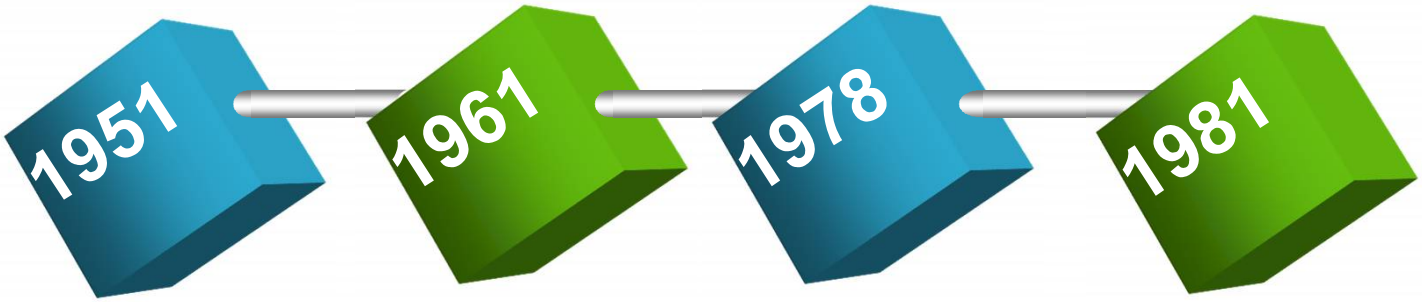
The International Society of Automation
Delhi Section

Standards
Certification
Education & Training
Publishing
Conferences & Exhibits

PDIL PROFILE

MILESTONES



1951	1961	1978	1981
Established as Technology wing of FCI with an objective to obtain Technological-Self reliance	Activities enlarged and it became Planning & Development (P&D) Division of FCI Limited	FCI restructured and P&D became an independent entity & incorporated on 7th March, 1978 as FPDIL	FPDIL renamed as PDIL to reflect diversified activities in areas beyond fertilizers & chemicals

Became Mini Ratna I in 2011

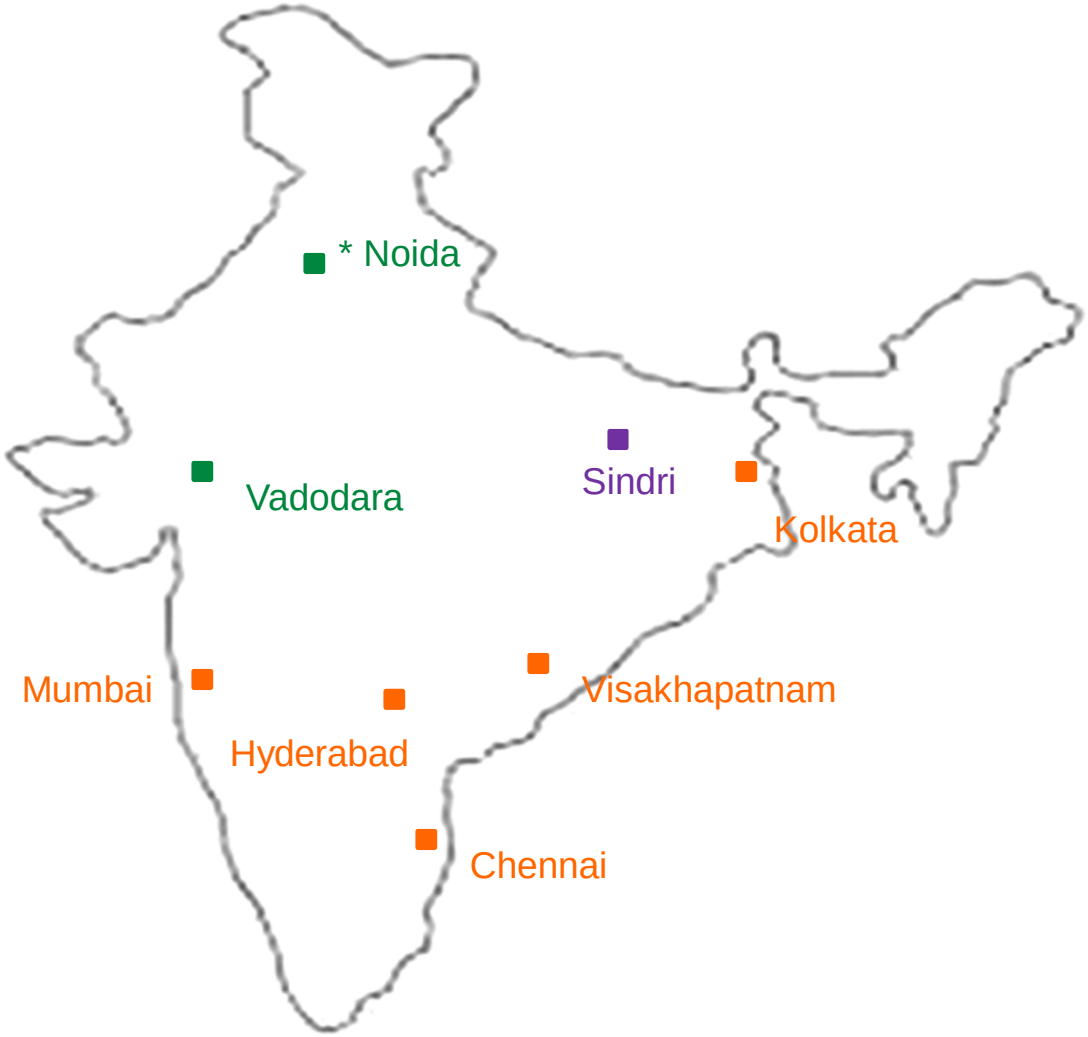
PAN INDIA PRESENCE

Regional cum Inspection Offices

Inspection Offices

Catalyst Production Centre

*Corporate Office



MAJOR SECTORS SERVED

Refinery

Fertilizers

Infrastructure

Oil & Gas

Chemicals

Offsite/ Utilities

SERVICES OFFERED

PRE-PROJECT SERVICES

- Market Demand Study
- Techno Economic Feasibility Report (TEFR)
- Detailed Project Report (DPR)
- Site Related Services
- Environment Impact Assessment and Risk Analysis

ENGINEERING & PROJECT MGT.

- Project Engineering Services
  - Detailed Engineering
  - Procurement Services
  - Project Management
  - Scheduling & Monitoring
  - Construction Management
  - Commissioning
- Project Management Consultancy

THIRD PARTY INSPECTION and NDT SERVICES

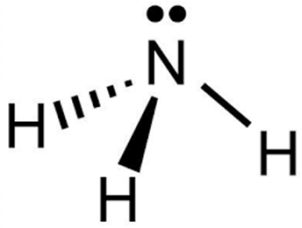
- Project & Third Party Inspection (Shop & Field Inspection)
- Work Assessment & Evaluation of Vendors
- Expediting of Supplies

OTHER SPECIALISED SERVICES

1. HAZOP Study
2. Due Diligence Study
3. Energy Audit/ Electrical Audit/ Safety Audit
4. Revamp/ Retrofit/ De-bottlenecking Studies
5. OISD Norms Study
6. Environmental Engineering
7. SSP (Single Super Phosphate) Audit

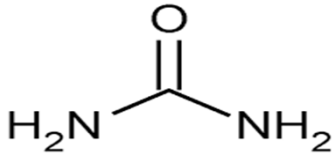
EPCM CREDENTIALS IN FERTILIZER SECTOR

67 AMMONIA



Greenfield/ Expansion	**26**
Overseas	**1**
BFPL, Australia- the then largest single stream gas based Plant in world	
In India	**25**
Coal Bed Methane based	1
Gas Based	15
Naphtha based	4
Fuel Oil based	3
Coal based	2
Feedstock Changeover	**1**
Capacity Enhancement	**21**
Energy Saving	**12**
Other Revamps	**7**

70 UREA



Greenfield/ Expansion	**38**
Capacity Enhancement	**17**
Energy Saving	**12**
Other Revamps	**3**

PMC CREDENTIALS IN FERTILIZER SECTOR

25 PRE-LSTK AWARD

Greenfield	**5**
Expansion	7
Brown field	**3**
Energy Saving	**6**
Feedstock Changeover	4

11 POST-LSTK AWARD

Greenfield/ Expansion	**1**
Feedstock Changeover	4
Energy Saving	**6**

PROJECTS EXECUTED IN NON-FERTILIZER SECTOR (Oil & Gas, Refinery, Pipeline)

1. Hydrogen Plants
2. Sulphur Recovery Unit
3. Refinery projects
4. LPG Import Terminals
5. POL Terminals/Depots
6. Cross Country Pipelines
7. Mounded Storage Facilities
8. City Gas Distribution
9. LPG Bottling Plants
10. Gas Gathering Stations
11. Enhanced Oil Recovery

Major Clients:

ONGC, IOCL, BPCL, HPCL, NRL, GAIL, IGL, CPCL, Kochi Refinery, Essar Oil

“How Fertilizer industry is adopting advance Instrumentation Technologies in existing plants”

ADVANCE IN INSTRUMENTATION TECHNOLOGY CAN BE SEEN IN FOLLOWING ASPECTS

- Field Instrumentation
- Transmission Technologies
- Signal Processing & Controller Technologies

FIELD INSTRUMENTATION

PRSSURE / DIFFERENTIAL PRESSURE:

1. Direct mount type pressure measurement devices, connected directly to main line minimizing impulse piping/tubing
2. Electronic remote type transmitters are replacing capillary type, For differential pressure measurement
3. Multivariable transmitters (pressure/temp two variables at a time)

   the main advantage is to have just one single device in the field instead of several transmitters.

LEVEL MEASUREMENT

- **Guided wave radar**
  - Measures level directly without any impact from density & conductivity changes
- **Non Contacting Radar**
  - Since its non contacting ,good for Corrosive & dirty applications
- **Ultrasonic**
  - Similar to non contacting radar type in application, while works better in case of services where agitation is present
- **Magnetostrictive type**
  - Can be used together with Magnetic level gages as a combined assembly
- **Hydrastep & bicolor level gauges**
  - Are used in boilers

FLOW MEASUREMENT

- **Mass flow meter**
  - Based upon Coriolis principle, high density accuracy, not affected by medium & temp changes
- **Vortex flow meter**
  - Low Delta P, No impulse piping required ,easy maintenance
- **Ultrasonic flow meter**
  - Bidirectional flow measurement, large dynamic Range, Not required Delta P
- **Electromagnetic flow measurement**
  - Used in conductive liquids like cooling water, Not required Delta P

TEMPERATURE MEASUREMENT

- **IR based pyrometers-** In Reformers

- Main problem faced in transient due to lightning or other process equipments , now transmitters are available with special diagnostics to eliminate these transients

- Use of sapphire protection tubes in gasification area reduces maintenance and increase life of instrument

ANALYZERS SYSTEMS

- **PH & Conductivity Analyzers**

  -Fast temperature response, Built-in temperature sensor.

- **Gas Analyzers**
  - **Thermal Conductivity(He ,Ar,H2,CH4)**
  - **Infra red (CO,CO2,SOx,NOx,Ch4)**
  - **Paramagnetic type(O2)**
  - **Zirconia (O2)**
- **Gas Chromatograph**

- **Mass Spectromter**

  Chromatographs are been replaced by mass spectrometer due to higher accuracy and better resolution

ENVIRONMENTAL MONITORING SOLUTIONS

These systems allow the monitoring of multiple parameters simultaneously, data can be easily uploaded

Continuous Emission Monitoring Systems (CEMS):-

Measuring gas concentration at the point of emission (Stack/Duct). Stack emissions monitoring involves monitoring CO, CO2, NOx, SO2 and others with specially designed gas analysers.

AMBIENT AIR QUALITY MONITORING SYSTEMS (AQMS):

Ambient Air Quality Monitoring involves the measurement of "CO, NOx, SO2, NH3, PM2.5, PM10" air in urban, industrial and rural areas.

These measurements are used to determine the human exposure to pollutants and can be combined with trace/background monitoring as well as stack monitoring to assess an organisation's contribution to pollution, and the effect this has compared to natural levels.

VALVES AND ITS ACCESSORIES

- Wide ranges of body material, packing material, trims materials & designs, stem materials.
- Triple offset butterfly valves are used for higher size on/off services (tight shutoff, class VI leakage)
- Actuators (Pneumatic, electric, electro hydraulic)
- 2oo3 Solenoid valve manifold.
- Smart postioner with magnetic linkages are used.
- Partial Stroke test provision

TRANSMISSION TECHNOLOGIES

- 4-20mA with HART Protocol
- Foundation Field bus(FF)
- Wireless HART

4-20mA HART

- HART("Highway Addressable Remote Transducer")
- Best overall solution for obtaining value-added device and diagnostic information in digital form while retaining compatibility with legacy 4-20 mA automation architectures.
- All Closed Loops, critical open loops, and ESD signals uses HART protocols
- Hybrid protocol because it combines analog and digital communication. It can communicate a single variable using a 4-20 mA analog signal, while also communicating added information on a digital signal. The digital information is carried by a low-level modulation superimposed on the standard 4-to-20 mA current loop.

FOUNDATION FIELD BUS

- A field bus is an all-digital, serial two-way, multi-drop communication System.
- H1 (31.25kbps) interconnects field equipment (Sensors, Actuators & I/O).
- HSE (High Speed Ethernet, 100mbps) provides integration of high speed controllers, subsystems (via Linking Device) and data servers and workstation.

Advantages

- Distance up to 1900 meters(Add repeaters for extended length upto 4 repeaters 9500m)
- 10-12 devices per segment
- 120m from device to jb.

WIRELESS

- **Uses** Wireless HART® Protocol (IEC 62591 2.4 GHz ISM band)
- Frequency: 2.4 - 2.4835 GHz
- Channels: 15
- Modulation: IEEE 802.15.4 compliant DSSS

This solution can be used in following areas currently

- Storage tank temperature control and gas vent monitoring
- Tank storage level monitoring and overspill protection etc

Advantages:

- Less Cabling
- Low power requirement
- Less Engineering requirement
- No JB,Marshalling cabinets, I/O cards etc

SIGNAL PROCESSING & CONTROLLER TECHNOLOGIES

In early 1970s, a panel operator was assigned for operation per panel. However, by the introduction of a DCS, operators' ways of working have drastically changed. Operators can grasp the plant-wide operation by sitting in a central control room (CCR). And their work scope has largely been extended

DISTRIBUTED CONTROL SYSTEM

- As the technology evolved, plant monitoring and control have changed amazingly.
- Advanced Graphic interfaces increased operator machine interface
- Advanced Alarm Management system and annunciation systems also improved
- Redundancy in power supply, closed loops and critical open loops ,data bus etc
- Non critical open loops will have non redundant cards
- Some manufacturers are offering fuzzy logic, claims to have performed 40% better than normal PID

ESD SYSTEM

- As the technology evolved other than controlling application, safe shut down of the plant became an important area
- Dedicated ESD systems are now being implemented in fertilizer units for safe shut down
- TMR system with SIL-3certification is now being used as ESD system
  - Will haveTMR redundancy in processor, buses, and IO levels
  - 2oo3 Logic for sensing
  - 2oo3 SOV in field side
  - 2oo2 Logics for Vibration related trips etc

OTHER DEDICATED CONTROL SYSTEMS

Together with these, Dedicated systems are also being used

1. **Machine monitoring systems**
2. **Speed Governors**
3. **ITCC**
4. **AntiSurge controller systems etc**

Trends

As the no of system increases there should be sufficient inventory too. No of AMC will be increased, to reduce these some of the clients are trying to implement all the logics in a single systems

As reliability confirms, on latest instrumentation technologies, fertilizer industry adopt advance developments without much delay.

Thank you