Fieldbus Foundation
Fieldbus Foundation – India Marketing Committee

Technology Event

24th of August, 2007,
Hotel Intercontinental - The Grand,
Andheri (East), Mumbai INDIA
End Users Perspective – JERP Project

B.R.Mehta
Senior Vice President – Reliance.
ODC Movement on Haul Road
Crude Complex Overview

Reliance
Jamnagar Export Refinery Project
Aromatics Overview
CFP Racks & Heaters
CPP Overview

Reliance
Jamnagar Export Refinery Project
Utility Block Overview
Compressor House & Nitrogen Columns in Utility Area
Changing Skylines – A view of the project site
JERP Project Highlights:

- Jamnagar Export Refinery Project:
  - Located at Special Economic Zone (SEZ).
  - Crude processing capacity of 580,000 Barrels per Day.
  - Polypropylene plant with a capacity of 0.9 MTPA.
  - Completion target 36 months.
  - Highest standard of Health, Safety & environment.
  - First largest project in India to implement FF technology.
  - 20,000 plus Tags connected to FF.
  - More than 3500 Segments in the project.
  - 1200 Temperature Multiplexers on FF.
  - All selected devices to carry FF “Check mark” Logo.
  - Type testing done for all devices used on the Project as well as function Blocks used on the Project.
  - Host System using FDT / DTM technology.
Our considerations:

The future of Process Automation.
Life cycle stage

Proven Technology.
First FF systems delivered more than 5 years ago.

Openness.
Non Proprietary.
Continuity to evolve.
Adopt new technology.
Interoperability
Technology Adoption Cycle:

- Innovators
- Early Adopters
- Early Majority
- Late Majority
- Laggards
Blending of Vendors:

- DCS - Invensys IA
- Transmitters (Pr. & Diff. Pressure – Foxboro & Emerson)
- Temp. Transmitters – E & H & Emerson
- Field Indicators – ABB
- Temp. Multiplexers – P & F
- Coriolis Mass Flow meters - Emerson
- Vortex Flow Meters – E & H
- Magnetic Flow meters _- Krohne
- Guided wave Radar – Megnetrol
- MOV actuators _ Rotork
- Digital valve positioners – EPM (Fisher)
- FF Diagnostic Module – MTL
- FF Power supplies - MTL
- Field Barriers – P & F

The Freedom to Choose. The Power to Integrate
Expectations of the Foundation Fieldbus Technology:

- Interoperable products & Systems
- Elimination of proprietary Protocols
- Technology enables innovation by manufacturers
- Device Diagnostics
- Lower installation costs
- More information from the valves
- Multiple inputs from one device
- New instrumentation easier to add later
- Reduced wiring.
- Reduced terminations.
- Reduced commissioning time.
- Ability to implement control in the field.
- Reduced Control room space.
- Instrument Diagnosis.
The challenges:

- FF Technology relatively new in India as well as with foreign detail engineering contractors.
- Concurrent engineering at various locations around the world by Bechtel as well as interfaces with other engineering contractors like Foster Wheeler, Aker Kvaerner etc..
- Different skill set & experience required which is not available in India
- Very large scale implementation at the same time with large work Volume.
Engineering Methodology adopted by Reliance:

- Early involvement of all parties including operation & maintenance.
- Dedicated specification for Foundation Field bus implementation.
- System & device selection & evaluation team with engineering contractor.
- FF device HIST test programme with Invensys by testing each device in their development laboratory in U.S.A.
- FF system design training for all involved personnel.
- FF system early set up of training at Invensys, India for pilot testing dedicated to JERP project implementation.
- FF template development on IA system & testing of each devices.
- FAT of devices along with system by connecting available devices on a segment & loading of segments to its full capacity.
Engineering Methodology adopted by Reliance:

- Dedicated Foundation Field bus specification for JERP.
  - To ensure consistency across entire JERP.
  - Minimise design effort at various design centers
  - To simplify the overall field bus implementation process across various engineering contractors & engineering centers.
  - Minimise testing & commissioning related problems.
  - To get project common FF hardware components like FF Junction Boxes, Power supplies, Field barriers etc.
  - Field bus technology is applied to all major loop going to DCS in various units.

- Standardized to two type combination of Field barrier box
  1 off 4channel barrier for segment limited up to 4 device max.
  3 off 4 channel barrier box for segment limited up to 12 device max.
  
- JERP use for design up to 8 device max per segment.
Engineering Methodology adopted by Reliance:

- **Tree Topology adopted.**

- **Surge protection:**

  All Trunks have surge protection at both ends i.e. in the marshalling cabinet and the FF spur junction box. Surge protection for each instrument shall be considered in areas with a high susceptibility to lightning strikes these areas include, tank farms, columns, jetties etc. and any areas where instrumentation is not significantly shielded by the plant steelwork and pipe racks.
Engineering Methodology adopted by Reliance:

- Segment design Considerations:

  Level 1 Definition
  Failure of level 1 loop will result in a shutdown of an entire unit, or damage to non-spared vital or essential equipment.

  Level 1 valves and their associated measurement device should reside on a segment that are only used for Level 1 control. The segment will have one (1) Level 1 valve and associated Transmitter or maximum of two valves and associated transmitter if they are part of the same loop. Necessary considerations shall be given to assign the valves to different barriers in the junction box.
Engineering Methodology adopted by Reliance:

- Segment design Considerations:

  Level 2
  Definition
  Failure of a level 2 loop will result in entire unit shutdown but process dynamics allow for quick unit recovery.

  Level 2 valves are only used for Level 2 control. The segment will have one (1) Level 2 valve and associated Transmitter or maximum of three valves (split range valves of a single loop) and associated transmitters if they are part of the same loop. Necessary considerations shall be given to assign the valves to different barriers in the junction box.
Engineering Methodology adopted by Reliance:

- Segment design Considerations:

  Level 3
  Definition
  Failure of a level 3 loop will not result in any short-term risk of total unit shutdown.

  Level 3 valves can reside on segments with up to two other level 3 valves and not on a segment with a level 1 or level 2 valve.
  Reasonable reliability can be achieved with backfilling, particularly level 3 segments, with miscellaneous monitoring loops and local indicators.

  Level 4 (No Control)
  Level 4 (monitoring only) segment contains monitoring devices are not to be used for control across segments.
Where FF Technology is not considered by Reliance:

- Emergency Shutdown Systems.
- Fire & gas Control systems.
- Fast loops like Compressor Controls. (Anti Surge)
- Various packages like Heaters, Compressors.
- Loops with execution time faster than 300 ms.
- Burner Management system.
- Analyser Systems
Developments made by Solution Providers for FF:

- FF Junction Boxes with 3 Field barriers & One Field Barrier developed by MTL using P & F Field Barriers.

- Temperature Multiplexer Box developed by P & F.
  - 8 Way base plate development for interface with Host system by MTL & Invensys.
  - Advance Diagnostic Module development for Segment Diagnostics by MTL.

- Router DTM development by EPM & Invensys for Valve link.

- Single Power supply kit by MTL for testing FF Segment.

- Template development in Host system for all selected field devices by Invensys.
FF Junction Box with 3 Field barriers:

- ABB- Isolator
- Stahl JB
- P & F- Field Barrier
- MTL – Surge protector
- Spur Terminals
FF Junction Box with one field Barrier:
FF Temperature Multiplexer:

Two Temperature Multiplexers per Junction Box
Represents Two devices on a Segment.
Maximum of 4 Temperature Multiplexers per Segment.
All temperature Multiplexer segments are exclusive in JERP.
FF Power supply arrangement:

- Surge Protector
- Power Supply
- Advance Diagnostic Module
- FF FBM
8 Way Base plate consists of:

- 8 redundant power supplies for 8 segments
- 1 Advance Diagnostic module (ADM) to monitor 8 segments
- Physical properties.
- Two redundant set of FBM 228
- Two Alarm module for hardwire alarm for segments connected.
Wiring Concept of FF system:
FF Power Supply Module by MTL:
FF and HART Router DTMs development by EPM & Invensys:
I/A Series Architecture

**Version 6.x**
- **Carrier Band LAN**
- **Nodebus**
  - CP40B
  - GW30B
  - Modbus AB DH+

**Version 8.x**
- **Mesh Control Network**
- **Nodebus**
  - CBLI

**FBM100 Series I/O**

**FBM200 Series I/O**

**ICCC = I/A Series Configuration Component**
**ICC = Integrated Control Configurator**
**FDSI = Field Device System Integrator**
**CBLI = Carrier Band LAN Interface**
**DNBI = Dual Node Bus Interface**

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### Technology Advancements since V6.0

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Fieldbus Overview - India
Alarm Points on the Project:

- How to Get faster Commissioning of FF Loops at site.
- Mismatches in Device files tested at Lab versus devices supplied.
- Untested device type delivered to site.
- Alarm management implementation.
- How to get Maximum out of Asset Management.
- OPC Stability of many connected systems to DCS.
- Training of Staff members in commissioning of FF system.
How to make FF Technology as Technology of Choice:

Educate end users on FF technology in India.
Assist end users in identifying the benefits of FF technology.
Provide a Forum for the exchange of information among solution providers, consultants and end users.
Assist end users in implementation of the technology.
Encourage the adoption of FF technology in various sectors.
PROMOTE & SUPPORT the FF technology and FF members on Vendor Neutral basis.
Establish Communication between various FF country users.
Co-ordinate activities among local members.
Technical Seminars.
End user meets.
Training.
Access to articles, applications, case studies from other countries.
FF Technology V/S Legacy Systems:

The signals are digital therefore more immune to noise. The requirement for damping to filter out noise is eliminated. FF automatically detects all connected devices, and includes them on a live list. Addresses are automatically assigned, eliminating any possibility of duplicate addressing. Traditional I/O use 16 or 32 channel cards, these are costly and a weak point. Module failure can generally cause all associated loops to crash. Accidental removal during faultfinding will effect all 16 or 32 I/O. Minimise the components thus reduced failure probability. No requirement to manually configure alarms to detect transmitter failure or broken signal cable. Foundation Field bus builds in this automatic safety function. FF uses engineering units not scaled ranges, therefore you are measuring actual process variable not scaled or a % of 4-20mA. This eliminates the need for range configuration. Conflict in ranges is not possible. Analog to digital conversion removed, improving accuracy and reliability. Dual Measurement of parameters is possible from a single instrument. Failure Prediction is possible, due to the data available.
Thank You