DOCUMENTING SPECIAL SYSTEMS USING SMARTPLANT INSTRUMENTATION

John Dressel, FLUOR Applications Specialist

Special Control and Wiring Systems

- Special Systems Require Special treatment of Index, Specs and Wiring

- Special Control Systems beyond Basic Process Control Systems (BPCS)
  - Safety Instrumented Systems (SIS) in SmartPlant Instrumentation
  - Emergency Shutdown Systems (ESD) in SmartPlant Instrumentation
  - Burner Management Systems (BMS) in SmartPlant Instrumentation
  - Asset management systems (AMS) in SmartPlant Instrumentation
  - Fire and Gas Systems (F&G) in SmartPlant Instrumentation
- Special Wiring Systems beyond Conventional 4-20 ma Instruments
  - Smart HART and other Digital wiring systems
  - Communications Wiring Systems
  - Foundation Fieldbus and other Bus wiring systems
  - Wireless Instrument Systems
- Other Special Systems documented in SmartPlant Instrumentation

Safety Instrumented Systems in SPI

Tag Number	IO SYSTEM	MAINT CYCLE	INTERLOCK
101-FT -2211	DCS		
101-FV -2211	DCS		
101-FT -2212	DCS		
101-FV -2212	DCS		
101-FT -2213	SIS	1 Year	I-23
101-FV -2213	SIS	6 Months	I-23
101-FT -2214	SIS	1 Year	I-23
101-FV -2214	SIS	6 Months	I-23
101-FT -2215	SIS	1 Year	I-23
101-FV -2215	SIS	6 Months	I-23

- Additional Index User Defined Fields and Tables for Safety Data
  - SIL Ratings
  - Interlock Numbers
  - Maintenance Cycles
  - Instrument System Identifiers
  - Special Notes for Design Engineering

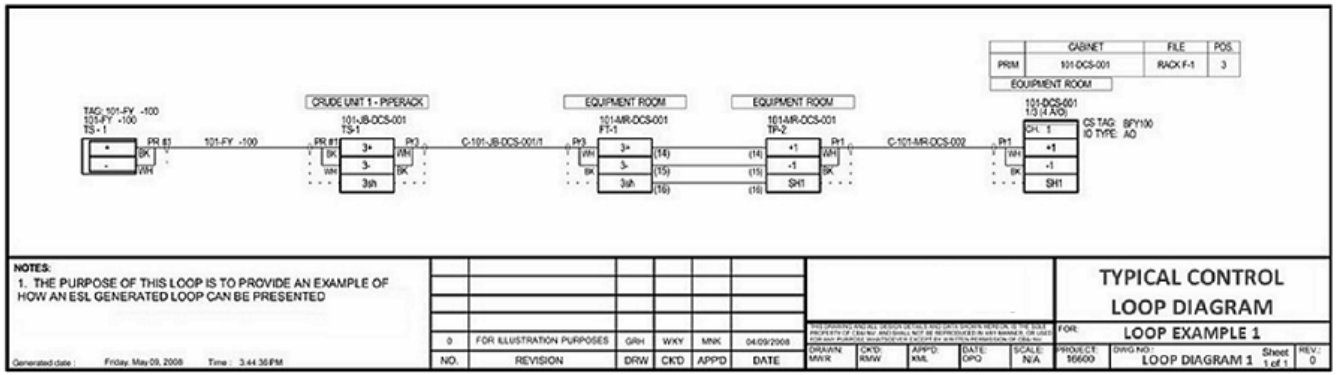
Safety Instrumented Systems in SPI

1	Tag Number		SEE LIST	
2	Fire Protection Plan DWG No.			
3	Service	Area Name	SEE LIST	SEE LIST
4	Detector Type	EMI Shielding Hz	Infrared Point HC Gas Detector	Yes
5	Safety Integrity Level	Approvals	IEC 61508 (SIL Level 2)	ATEX
6	Area Classification		Zone 2 CENELEC	
7	Output	Range	4-20 mA	0 - 100% LEL
8	Gas to be Detected - LPG		BUTANE/PROPANE	
9				
10				

- Additional Spec Sheet Data for Safety Instrumented Systems:
  - Safety Integrity Level Ratings
  - Approvals and Testing Requirements
  - Certifications and Approvals
  - Redundancy or Conditioning Requirements
  - Special Notes for Design Engineering
  - Partial Stroke Testing Requirements (for Valves)

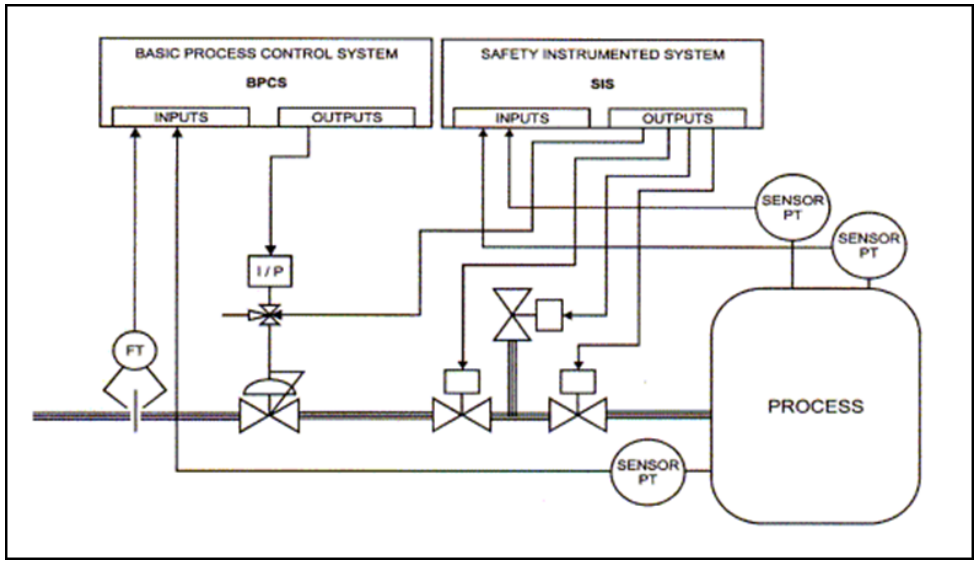
- New Spec Sheets May Need to be Added for Safety Devices

Safety Instrumented Systems in SPI



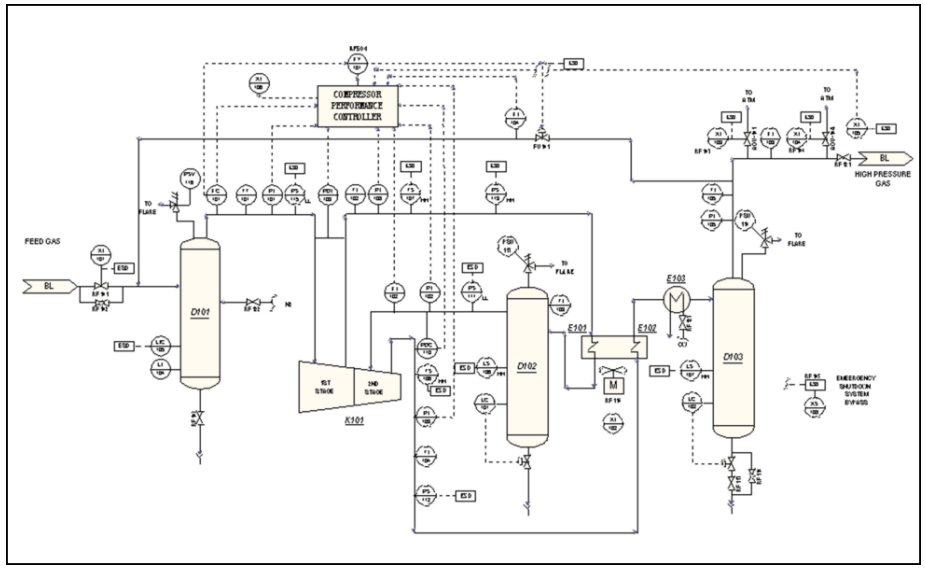
- Issues When Wiring Safety Instrumented Systems:
  - PLC I/O Redundant Power Distribution uses common bus
  - Maintain Physical Separation between SIS and BPCS wiring
  - Minimize terminals and connections as points of failure
  - Special Colors, Markings and Labels for Safety Systems
- May Need to Create Ladder Wiring instead of Loop Diagrams

Safety Instrumented Systems in SPI



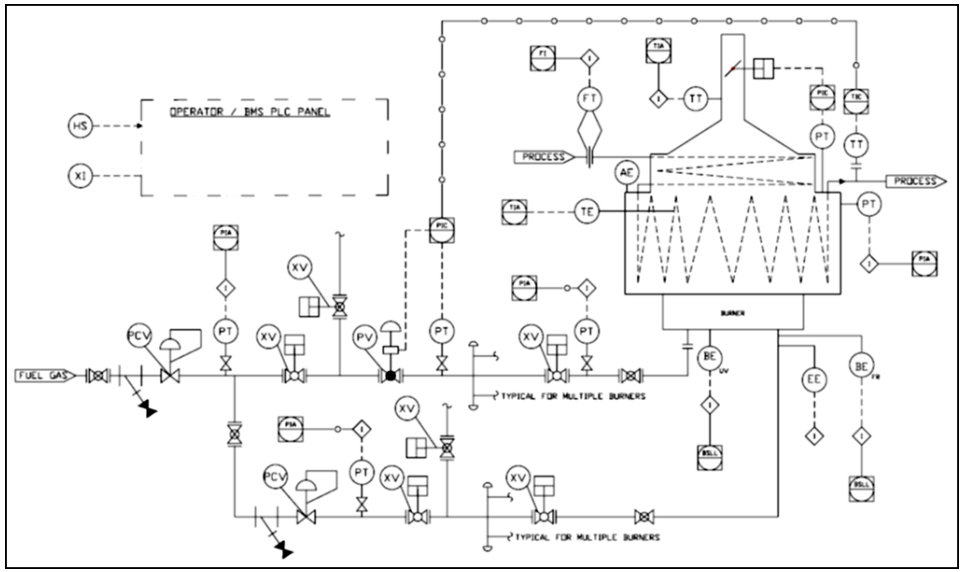
- Value added to SIS by documenting with SPI
  - Integrity of a Data Centric Environment for SIS Information
  - Management of Change meets Regulatory Requirements
  - Controlled Access and Records Keeping Needed for SIS
  - Real Time Access to Data for Quick Disaster Response
  - SPI System remains in place for the lifecycle of the plant

Emergency Shutdown Systems in SPI



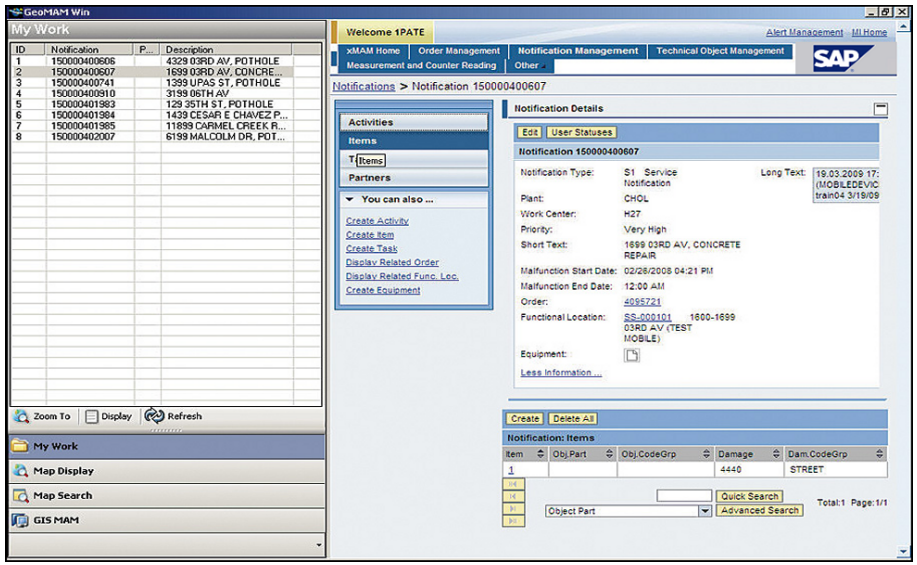
- Additional Index Data for Emergency Shutdown Systems:
  - Interlock Numbers
  - Instrument System Identifiers
- Issues When Wiring Emergency Shutdown Systems:
  - Triple Redundant Control Logic and I/O
  - Special Colors, Markings and Labels for Safety Systems

Burner Management Systems in SPI



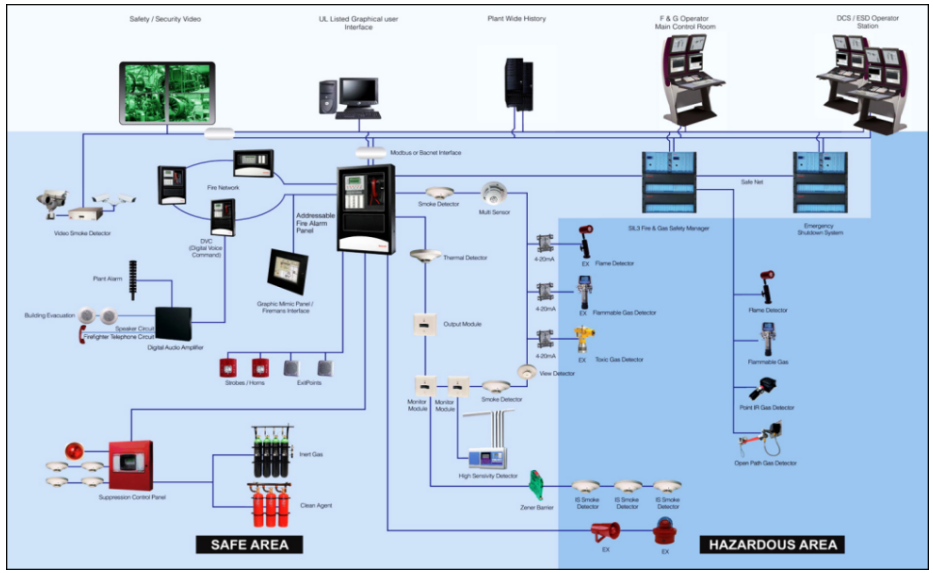
- Additional Index Data for Burner Management Systems:
  - Interlock Numbers
  - Instrument System Identifiers
- Additional Spec Sheets for Burner Management Instruments
- Issues When Wiring Burner Management Instruments:
  - Furnished controllers and instruments with isolated system
  - Special Colors, Markings and Labels for Burner Management System

Asset Management Systems in SPI



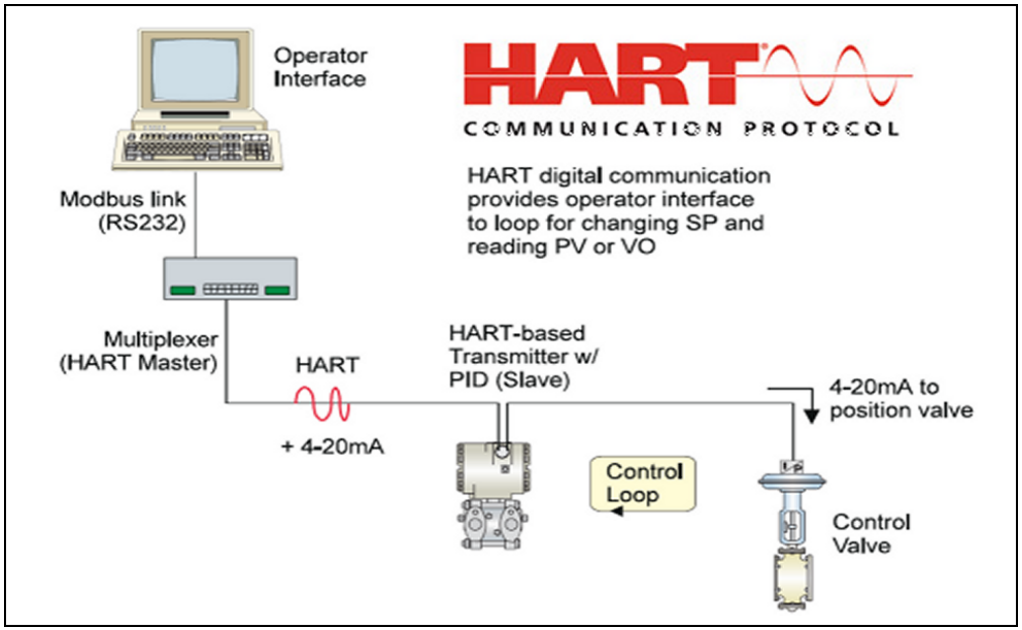
- Additional Index Data for Asset Management Systems:
  - Functional Location for SAP Unique Identifier
  - Asset Management System Identifiers
- May use the SmartPlant Instrumentation SAP Interface for Data Transfer
- Asset Management Instruments Data requirements:
  - Interface with HART Data, DCS Configuration and Field Calibration Databases
  - Generally defined by Owner Operator requirements

Fire and Gas Systems in SPI



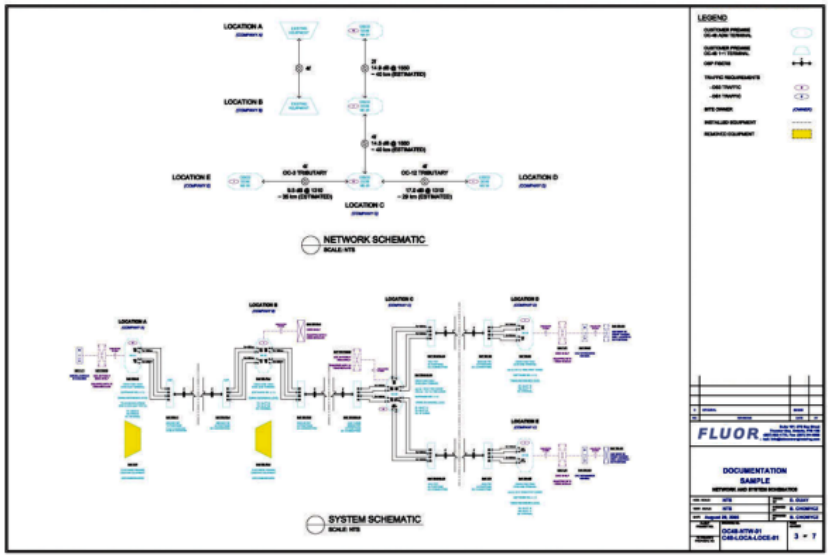
- Additional Index Data for Fire & Gas Systems:
  - Additional Instrument Types for Fire and Gas Instruments
  - Instrument System Identifiers
  - Instrument Location drawing or zone definitions
  - Additional Spec Sheets for Fire and Gas Instruments
- Issues When Wiring Fire and Gas Instruments :
  - Different and Mixed wiring topographies generally prohibit using SPI for wiring

Smart HART Digital wiring systems



- Additional Index Data for HART Digital wiring systems:
  - It is not just 4-20 mA anymore
  - Process, Alarm and Trip data now reside in the Off Line Instruments
- May require HART Enabled I/O, Multiplexer and Interface devices
- Wiring HART Digital wiring systems:
  - Wires much like conventional 4-20 mA instrument systems

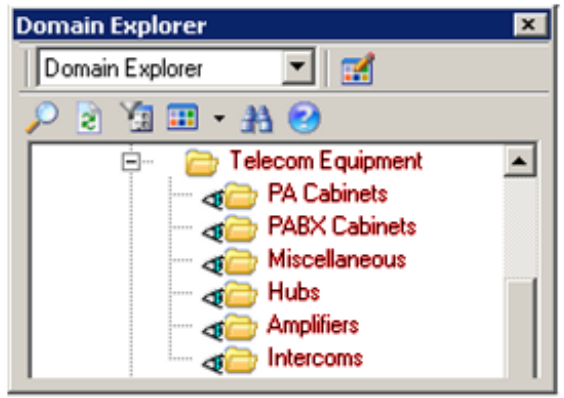
Communications Wiring Systems in SPI

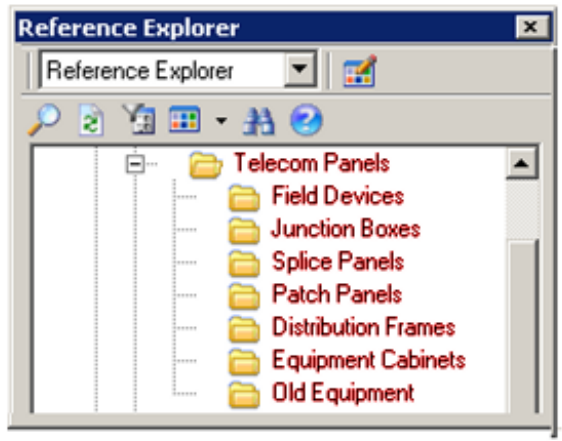


- SmartPlant Instrumentation Telecom Module:
  - Build and Index all Communication Devices
  - Fiber Optic and Network wiring definitions
- Need Specification Library for Communication Devices
- Communications Wiring Systems:
  - Uses Block Diagrams or Point to Point Diagrams
  - SmartPlant Instrumentations Cable Block Diagram needs enhancement

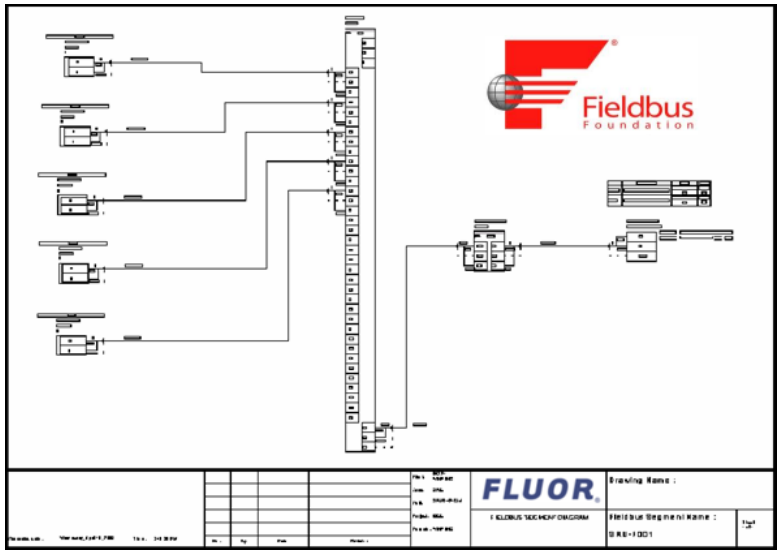
Telecommunications Systems SPI Data

- Index Data for Telecom Devices:
  - Telecom Tag Class is Required
  - Show up in standard Index to be Filtered
  - No P&ID, Line or Equipment Data
  - Special Telecom Supporting Tables
    - Telecom Device Types
    - Telecom Line Numbers (Not Pipe)
    - Telecom Field Equipment
    - Telecom Signal Levels
    - Etc...
- Telecom Device Type Profile allows Spec Sheets
- Telecom Panels, Cabinets and Equipment are created in the Reference Explorer
- Telecom Reports
  - Load Lists
  - Device and Field Equipment Reports
  - Signal Level and Wiring Block Diagrams





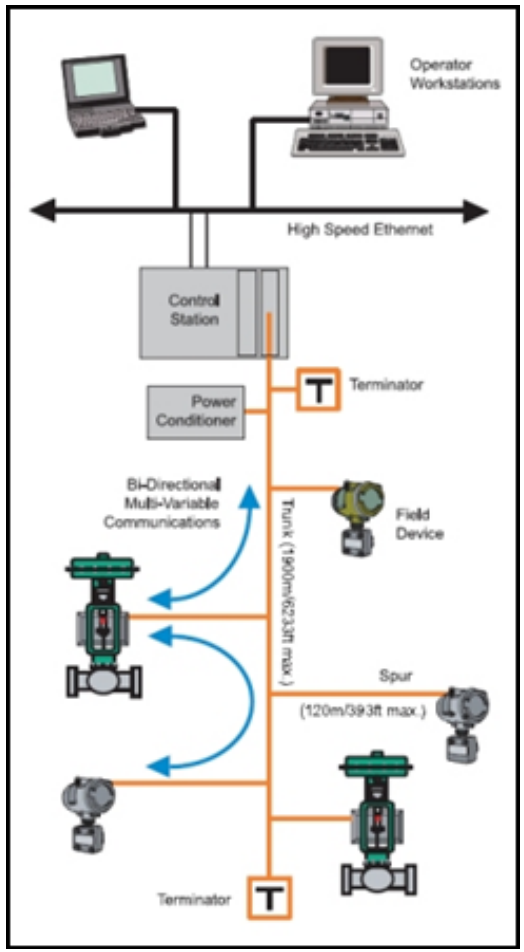
Foundation and other Fieldbus wiring systems



- Some Issues with Bus systems in SPI
  - Virtual Field Devices (Function Blocks) add records to the Index
  - Fieldbus Page for Spec Forms is not cost effective
  - Left and right wiring on bricks makes segment diagrams awkward
  - Conservative Global Parameters are more effective than Validation reports
  - No AutoCAD or Microstation Segment Diagrams available in SPI

Foundation and other Fieldbus wiring systems

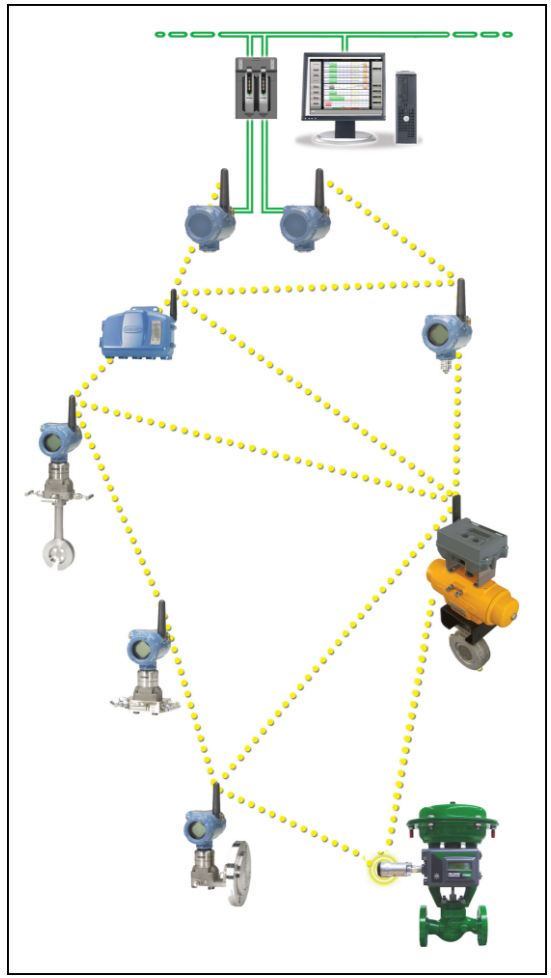
- Steps when developing a Fieldbus System in SmartPlant Instrumentation
  1. Define the Segment-Wide Parameters for the project
  2. Define Foundation Fieldbus instrument type profiles
  3. Add a new browser view for Fieldbus Manager
  4. Create user-defined function blocks (if required)
  5. Associate function blocks with instrument types
  6. Create Foundation Fieldbus instruments in Index
  7. Generate Fieldbus Device Specifications
  8. Associate unique Function Blocks with Fieldbus Tags
  9. Create Fieldbus Segments in the Fieldbus Manager
  10. Associate Fieldbus Instruments with Segments
  11. Design your wiring and termination equipment
  12. Add your Fieldbus home-run cables and spurs
  13. Make required cable connections and associations
  14. Connect the Fieldbus I/O H1 assignments
  15. Generate Fieldbus validation reports (if required)
  16. Generate segment diagrams and wiring reports



Wireless Instrument Systems in SPI

- Steps when developing a Wireless System in SmartPlant Instrumentation
  1. Create User Defined Fields in The Index
     - Scan rate
     - Gateway
     - Wireless adapter
     - Plan Drawing
  2. Define Wireless Device instrument type profiles
  3. Add a browser view for Wireless devices
  4. Develop Spec Sheets for Wireless Transmitters
  5. Create custom symbols for Wireless Transmitters
  6. Develop Spec Sheets for Wireless Gateways
  7. Create custom symbols for Wireless Gateways
  8. Create Wireless Gateway Diagrams
     - May be Block Diagrams

     or
     - Gateway Loop Diagrams



Other Special Systems Documented in SPI

- Emerging Technology
  - CHARMS and Electronic Marshaling with remote I/O are becoming more popular
- Ethernet and other Networks
  - Many Instruments have Ethernet connectors and will configure as Plug and Play
- Motor Control and Smart Electrical Switchgear
  - Electrical Motor Control Centers and Switchgear are getting more programmable and compatible with Instrument Control Systems

QUESTIONS

SmartPlant® Instrumentation
Powered by INtools®