FOSTER WHEELER

Foundation Fieldbus - Foster Wheeler Experiences

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Foundation Fieldbus – Foster Wheeler Experiences

- Introduction
- Front end engineering and design
- Field instrumentation
- Wiring
- Control system
- Site installation and loop testing
- Documentation
- Any Questions?

Introduction

- Foster Wheeler's background using Foundation Fieldbus
- Sharing of Foster Wheeler experiences
- Assume a basic understanding of Foundation Fieldbus

Front end engineering and design

- Client/end-user requirements
  - What is the perceived benefit of Foundation Fieldbus?
  - Are cost studies required?
  - Impact / Limitations on DCS and Instrument selection?
  - Basic design philosophy
  - Asset management requirements
- Pre-selection of DCS and/or Field Instruments?
- Impact on FEED specifications
  - Early involvement of DCS supplier?
  - Cost and execution impact on EPC bids
  - Any novated packages as part of the FEED
  - P&ID symbology
- Schedule implications

Field instrumentation

- Specification
- Device set-up / data
- Control valve positioners
- Package vendor instrumentation
- Device testing with DCS

Field instrumentation

Specification

- Hazardous area classification
- Limited suppliers for some types of instrument
  - Use of HART devices where FF not available (or approved)
- FF parameters
  - These are very important
  - Need to be the same as loaded in the DCS
- Device configuration
  - Flash memory
  - Function blocks

Field instrumentation

Device set-up / data

- Where is the master configuration data held?
- Are some field instruments treated as bulks?
- Minimum data set-up requirements
  - FF Tick marked
  - DCS ‘own brand’ instrumentation
- Device data exchange with DCS supplier
  - Early requirement
  - Rework following device configuration changes
  - Devices under continuing development by suppliers
  - EPC is data owner/co-ordinator

Field instrumentation

Control valve positioners

- Diagnostic information
- Links and software patches for the Asset Management / Maintenance System
- Approved smart positioners
  - Likely to be from a different supplier than valves in some cases

Field instrumentation

Package vendors

- Lack of understanding of requirements
- Timing of information
- Device basics and FF configuration different

Field instrumentation

Device testing with DCS

- Host interoperability and stability testing
- Need to include in field instrument/DCS purchase orders
  - Schedule of field instruments needs to tie to DCS schedule
  - Additional items and costs for multi centre delivery
- Devices needed for DCS FAT to prove FF H1 cards in DCS
  - Minimum requirement is DCS ‘own brand’ devices
- FF configuration consistency between device and DCS can be checked
- Increases engineer / technician understanding of FF
  - Useful during site installation and loop check

Wiring

- Segment design
- Cable termination
- Cable reduction

Wiring

Segment Design (1)

- Cable type
- Specification versus calculation
  - Specification takes into account worst case, or
  - Calculation of each typical segment
- Number of devices on each segment
- Device allocation rules
  - Maximum number of critical devices per segment
  - Control valve and associated transmitter on same segment?
  - Lower loading than expected?
  - Communication update times

Wiring

Segment Design (2)

- Junction box / segment allocation
  - More involved than conventional I/O
  - Required earlier than conventional cable allocation
  - Impacts DCS configuration
  - Device moves to another segment or changes address on segment
    - Impact on DCS configuration (Very High for complex loops)
    - Recheck of allocation criteria
    - Allocated to another DCS processor?
- Plant commissioning system impact
  - Loop check on partial segments messy

Wiring

Cable Terminations

- Cable terminations need to consider the following
  - Cable testing during construction
  - Partial segment ‘loop test’ at site
  - On-line maintenance of devices once plant is operating
  - Hazardous area requirement
  - Future expansion of segment?

Wiring

Cable Reduction

- Number of cables run to the instrument room is significantly less than conventional
- However, the average number of devices per segment can be less than expected
- Number of terminations and cross wiring in the instrument room significantly less
- What was cross wiring is now in software
  - More thinking is needed up front
  - Less wiring changes, but more software ones likely

Control System

- Control configuration
- Host Interoperability and Stability Testing
- Asset Management and Maintenance systems
- Marshalling cabinet design
- Factory acceptance testing

Control System

Control Configuration

- LAS in DCS
- Typical control configuration blocks
- Control conducted in the DCS rather than the device
- Update times on segment
- Download of data to field devices
- Opens up potential of more diagnostic information / alarms

Control System

Host Interoperability and Stability Tests (HIST)

- FF Tick mark is not enough
  - HIST essential to obtain full interoperability with DCS
- Needs forward planning at an early stage
  - Many more 'Third party interfaces' added to DCS
  - Testing facility for full HIST is scarce
  - Arrangement of sample devices at DCS supplier for testing
- EPC acts as mediator between DCS supplier and device supplier
  - Joint responsibility for resolving interoperability problems
  - Secrecy surrounding testing
- Need to be aware of instrument supplier FF software and hardware developments during project

Control System

Asset Management and Maintenance systems

- Diagnostic information is more than HART
- Patches for valve diagnostic software
- Alarm management and handling of faults
- Reactive to developments in FF
- Design dependant on End User high level applications also
  - Interfaces to SAP system or equivalent
  - Maintenance work order generation

Control System

Marshalling cabinet design

- Significantly less field cable terminations
- What does spare mean?
  - Spare segments or segment capacity
- Redundancy and power supply design
- Increase in power requirements
  - Power supplies sized for worst case
  - Larger UPS?
  - More heat dissipation in the instrument room
- Surge protection?

Control System

Factory acceptance testing

- FAT procedure
  - Needs to include ‘new’ methods for FF testing
- Hardware testing
  - Typical devices needed to check FF hardware
  - Proving of typical segments
  - Opportunity to ‘prove’ sample field devices for compatibility
  - Learning curve for new technology (time savings in future?)
- Software testing
  - Need to emulate device via engineering station
  - More complicated than conventional
  - Hardware has larger impact on software (e.g. segment reassignment)

Site installation and testing

- Foundation Fieldbus training
- Pre-installation configuration cross checks
- Site acceptance testing
- Special tools
- Loop check
- Impact of configuration data mismatch

Site installation and testing

Foundation Fieldbus training

- Learning curve due to new technology
  - Supplier support (DCS and field instrument)
  - EPC site personnel / E&I subcontractors
  - Client technicians / engineers
- Debugging and problems different to conventional
- DCS FAT involvement

Site installation and testing

Pre-installation configuration cross checks

- Additional hardware required for installation contractors
- Check of field device setup versus DCS setup
  - Device, DCS and instrument list should match
    i.e. Manufacturer, model number, FF information etc same as HIST test
  - Mismatches to be corrected
- Minimum dataset configured and matching BEFORE installation
  - Device type
  - Device revision
  - Device description revision
  - Device tag
  - Node address
  - Device class

Site installation and testing

Site acceptance testing

- Repeat of DCS FAT in part?
- Sample devices required
- Does not include full segment
  - Only up to FF termination cabinet in instrument room
- Check of any ‘device related’ parameters not updated at FAT?
- Relatively straight forward

Site installation and testing

Special tools

- Required by installation contractor and client
- Emergent technology – new tools being developed
- Device configuration tools
- Segment checking tools
- DCS engineering workstation required more than on conventional

Site installation and testing

Loop check

- Learning curve
  - New procedures and learning as you go
- More planning required to streamline
- More engineer involvement than conventional
- Partial segment ‘loop checks’ time consuming
- Software rework impact on segment reallocation
- Segment not fully tested until all devices connected
- Cable tests for spurs

Site installation and testing

Impact of configuration data mismatch at loop check

- Typical times per device (for information only)
  - Times will depend on system, segment, problem, device, configuration

Problem	Impact	Typical time to fix each
PD Tag	Can't communicate	1.5 minutes
Node address	Can't communicate	1.5 minutes
Device class	Can't communicate	1.5 minutes
Device revision	Can't communicate	> 7 minutes
Device type	Can't communicate	>8 mins (complex >15 mins)

- This is all before any other information is downloaded from the DCS to the device e.g. range or other data.

Documentation

- Project Foundation Fieldbus specification
- Field instrument data-sheets
- Instrument index / Data exchange
- Segment calculations
- Segment drawings
- Loop test procedures

Any Questions?