



Integrating E+H Flowmeters with ControlLogix via EtherNet/IP



Steve Orth

General Session and
15th Annual Meeting of Members

www.odva.org

- ▶ Company background
- ▶ Project requirements
- ▶ Hardware architecture
- ▶ Software solution
- ▶ Results
- ▶ Questions/Comments

Overview



Company Background

PREMIER



- ▶ Founded 1991
- ▶ 150 employees
- ▶ Regional presence in Midwest & Southeast
 - Smyrna, TN / Decatur, AL / Cincinnati, OH / Jackson, MS
- ▶ Rockwell Automation Solution Partner
 - Control / Process / Information
- ▶ CSIA certified system integrator



Company Background

General Mills



- ▶ 39,000 employees
- ▶ Sales \$16.7 billion
- ▶ Focused on healthy, quality products
- ▶ Globally-recognized food manufacturer
 - Cheerios
 - Nature Valley
 - Pillsbury
 - Yoplait
 - Green Giant



Project Requirements

Choice of manufacturers

- ▶ Established partnerships
- ▶ History of successful installations
- ▶ Customer service
- ▶ Plant standard



Endress+Hauser

Rockwell
Automation

Project Requirements

Application

- ▶ New production equipment
- ▶ Mass flow control
 - Ratio mixing
 - Batching
- ▶ Distributed controls with multiple PLCs
- ▶ Other devices on Ethernet field bus
 - Remote I/O chassis
 - VFDs

Project Requirements

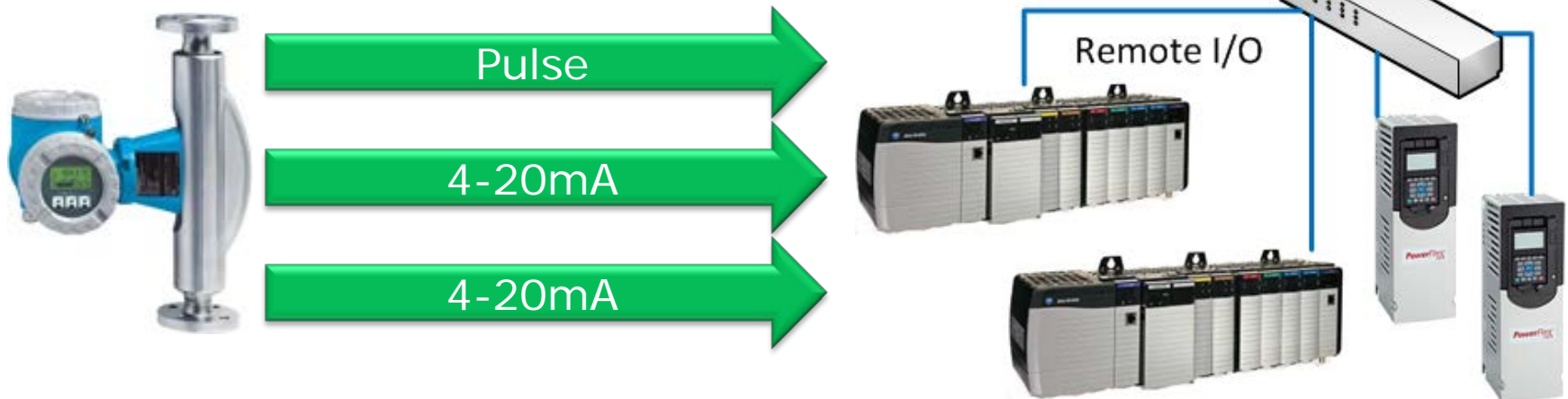
Concerns/Drivers

- ▶ Cost
 - Justify additional cost for Ethernet option
- ▶ Schedule
 - Very aggressive commissioning schedule
- ▶ Complexity
 - Desire for maintainable solution

Traditional Architecture

Three twisted-pair cables

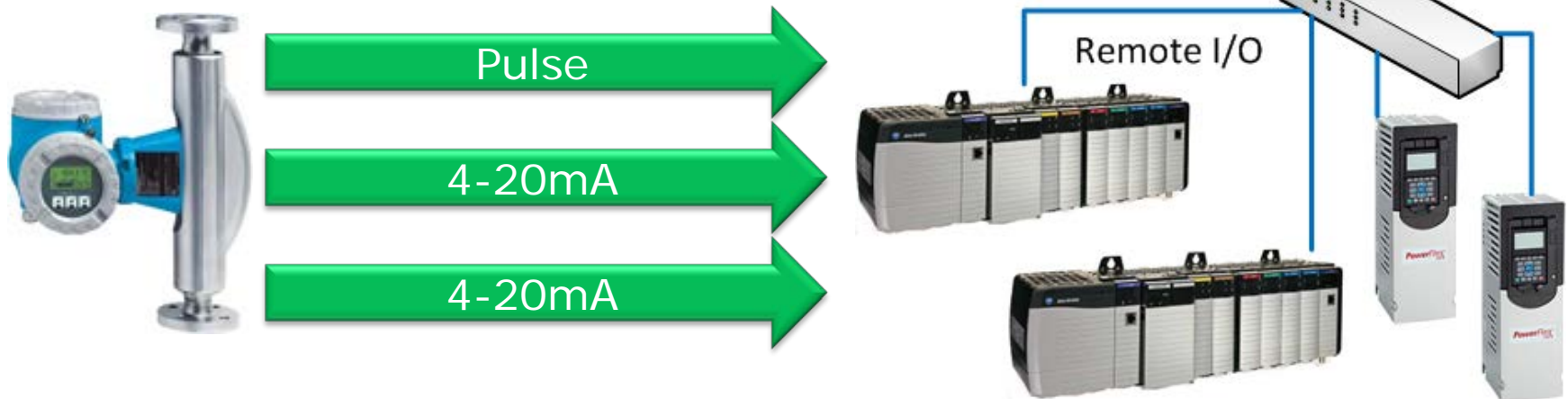
- ▶ One pulse signal to CFM module
- ▶ Two 4-20mA signals to analog inputs
 - HART option



Traditional Architecture

Benefits

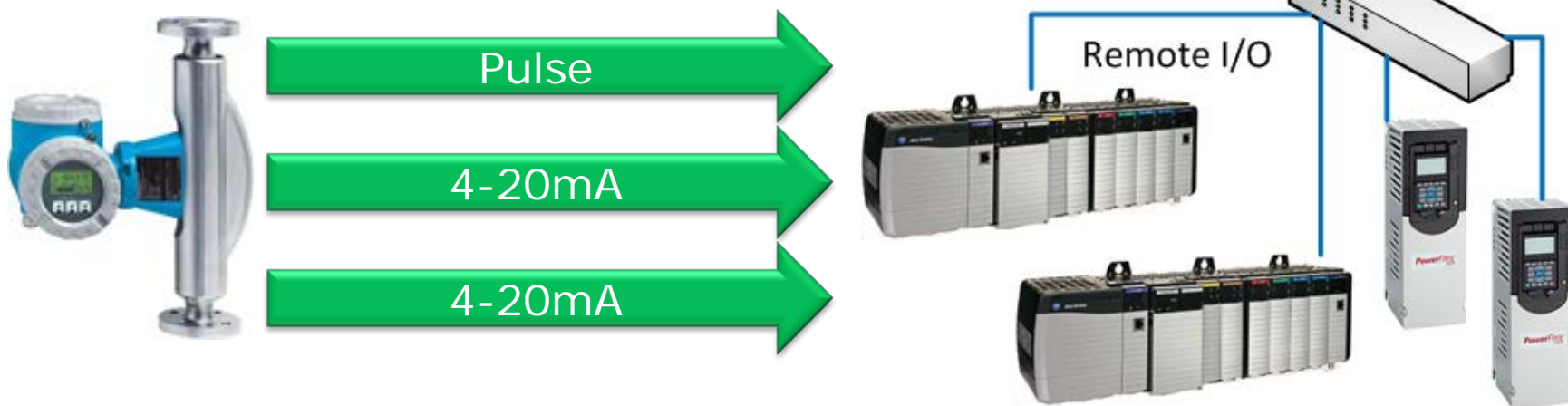
- ▶ Known technology
- ▶ Can be diagnosed using existing techniques



Traditional Architecture

Disadvantages

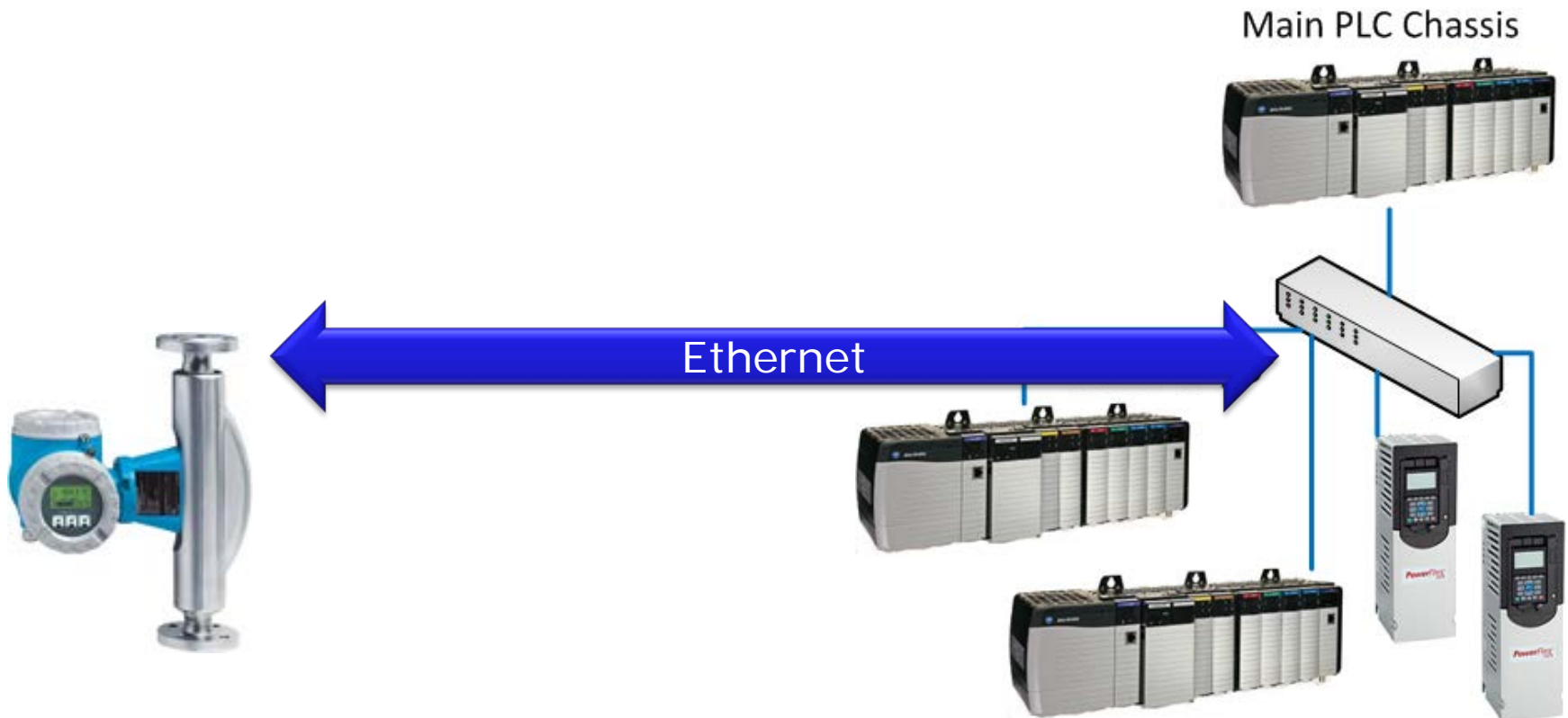
- ▶ Installation errors
- ▶ Many I/O modules
- ▶ All configuration done at meters
- ▶ One-way communication



New Architecture

One Ethernet cable

- ▶ Connected to same fieldbus switch as other devices



New Architecture

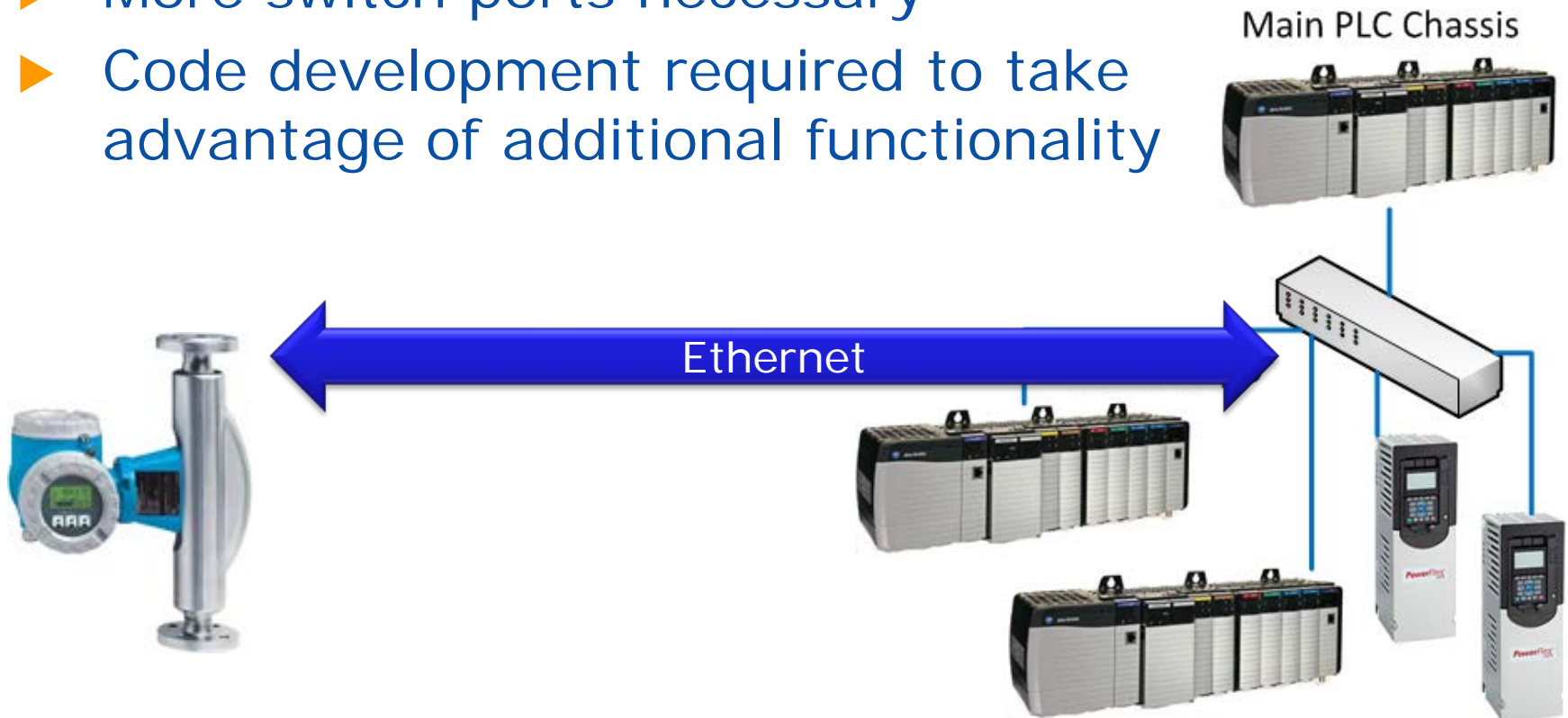
Benefits

- ▶ Only one cable to connect = faster install
- ▶ Simplified electrical schematics
- ▶ No k-factor calculations
- ▶ No additional CLX modules needed
- ▶ Two-way communication



Disadvantages

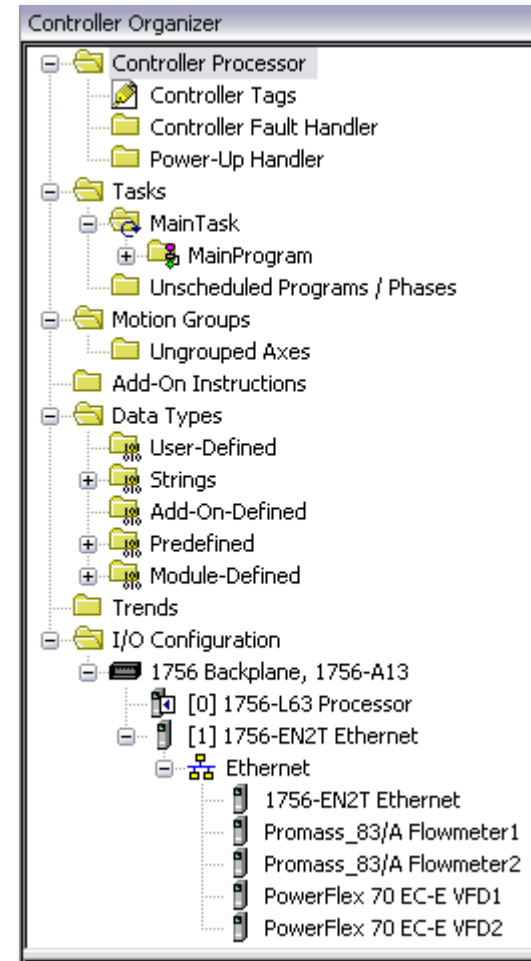
- ▶ New parts required for maintenance stores
- ▶ More switch ports necessary
- ▶ Code development required to take advantage of additional functionality



Software solution

PLC code

- ▶ Appears in I/O tree view
 - Helps maintenance locate
 - Consistent with other devices
 - Easy to configure



PLC code

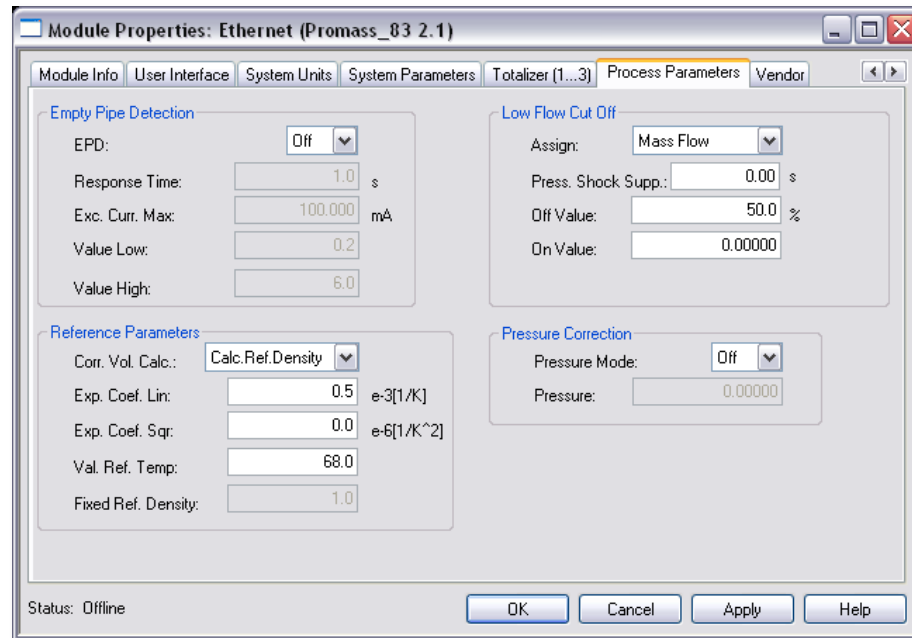
► Meaningful tag names

Name	Value	Force Ma	Style	Data Type	Const
⊕ Flowmeter1:C	{...}	{...}		EH:Promass_83_Rev2:C:0	<input type="checkbox"/>
⊖ Flowmeter1:I	{...}	{...}		EH:Promass_83:I:0	<input type="checkbox"/>
Flowmeter1:I.Mass_Flow	0.0		Float	REAL	
Flowmeter1:I.Volume_Flow	0.0		Float	REAL	
Flowmeter1:I.Corrected_Volume_Flow	0.0		Float	REAL	
Flowmeter1:I.Density	0.0		Float	REAL	
Flowmeter1:I.Corrected_Density	0.0		Float	REAL	
Flowmeter1:I.Temperature	0.0		Float	REAL	
Flowmeter1:I.Totalizer1	0.0		Float	REAL	
Flowmeter1:I.Totalizer2	0.0		Float	REAL	
Flowmeter1:I.Totalizer3	0.0		Float	REAL	
⊕ Flowmeter1:I.Actual_System_Condition	0		Decimal	INT	
⊖ Flowmeter1:O	{...}	{...}		EH:Promass_83:O:0	<input type="checkbox"/>
⊕ Flowmeter1:O.Reset_Totalizer1	0		Decimal	DINT	
⊕ Flowmeter1:O.Reset_Totalizer2	0		Decimal	DINT	
⊕ Flowmeter1:O.Reset_Totalizer3	0		Decimal	DINT	
⊕ Flowmeter2:C	{...}	{...}		EH:Promass_83_Rev2:C:0	<input type="checkbox"/>
⊕ Flowmeter2:I	{...}	{...}		EH:Promass_83:I:0	<input type="checkbox"/>
⊕ Flowmeter2:O	{...}	{...}		EH:Promass_83:O:0	<input type="checkbox"/>
⊕ VFD1:I	{...}	{...}		AB:PowerFlex70EC_Drive_Parameters:1:0	<input type="checkbox"/>
⊕ VFD1:O	{...}	{...}		AB:PowerFlex70EC_Drive_Parameters:0:0	<input type="checkbox"/>
⊕ VFD2:I	{...}	{...}		AB:PowerFlex70EC_Drive_Parameters:1:0	<input type="checkbox"/>
⊕ VFD2:O	{...}	{...}		AB:PowerFlex70EC_Drive_Parameters:0:0	<input type="checkbox"/>

PLC code

► Configuration tabs

- Potential to download parameters to replacement instrument

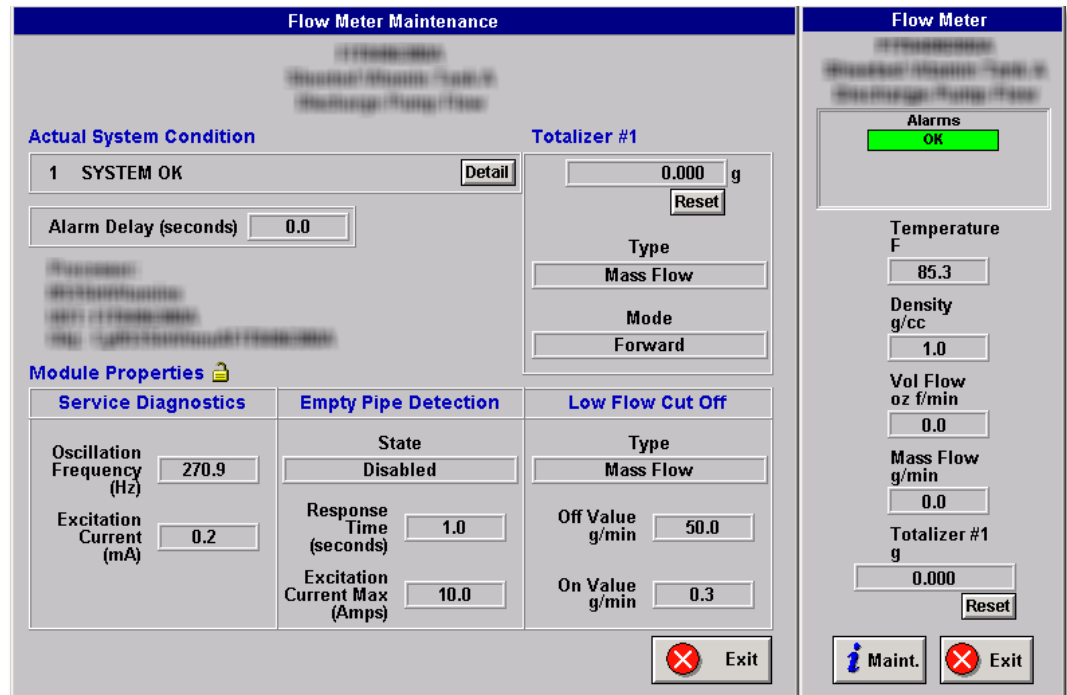


PLC code

- ▶ Methods for communicating to meter
 - I/O configuration
 - Explicit messaging

HMI faceplates

- ▶ Provides visibility into useful features
 - Units
 - Totalizer
 - Alarm conditions
 - Maintenance troubleshooting



Flow Meter Maintenance

Actual System Condition

1 SYSTEM OK Detail

Alarm Delay (seconds)

Module Properties

Service Diagnostics	Empty Pipe Detection	Low Flow Cut Off
Oscillation Frequency (Hz) <input type="text" value="270.9"/>	State <input type="text" value="Disabled"/>	Type <input type="text" value="Mass Flow"/>
Excitation Current (mA) <input type="text" value="0.2"/>	Response Time (seconds) <input type="text" value="1.0"/>	Off Value g/min <input type="text" value="50.0"/>
	Excitation Current Max (Amps) <input type="text" value="10.0"/>	On Value g/min <input type="text" value="0.3"/>

Exit

Flow Meter

Alarms OK

Temperature F

Density g/cc

Vol Flow oz f/min

Mass Flow g/min

Totalizer #1 g Reset

Maint. Exit

What went well

- ▶ Fast installation, configuration, & checkout
- ▶ Same meter interface as other installations
 - Benefit for maintenance
- ▶ Entering parameters through browser was more user-friendly than through meter interface

Issues

- ▶ Required setup via secondary port
 - Still had to be at meter to configure
 - Wish this could be done through meter interface
- ▶ Units did not ship with latest firmware
 - E+H emailed updated firmware
- ▶ Baud/duplex settings not configurable
 - Must set switch to auto-negotiate
 - Newer firmware may fix this
- ▶ Configuration at meter not replicated back to PLC

What will we do next time?

- ▶ Update to latest firmware
- ▶ Configure parameters through ControlLogix
- ▶ Use DHCP (default)
 - Assign IP address through managed switch

Conclusion

- ▶ Beneficial solution for:
 - Designs with multiple meters
 - Minimizing PLC modules
 - Simplified electrical schematics
 - Faster installation schedules
 - Providing more data to users
 - Reducing replacement effort



What do we love about EtherNet/IP?

- ▶ Standard connectors
 - Fewer wiring issues
- ▶ Speed
- ▶ Web interface
 - Configuration
 - Diagnostic info
 - Standard browser, not custom software

What more do we want from EtherNet/IP?

- ▶ Add-on profiles for Logix
 - Meaningful tag names (versus generic arrays)
 - Use abbreviations to avoid lengthy tag names
 - Configuration tabs
- ▶ Uploadable EDS files
- ▶ Navigate through backplane to isolated fieldbus
- ▶ Troubleshooting tools
 - Speed/duplex mismatches
- ▶ Coordinated hardware/software revisions
 - Minimize releases

Questions/Comments

Conclusion

