Foundation Fieldbus: “The Digital Revolution in Automation”

12th July 2013

ARC Forum – Hyderabad, India

Thampy Mathew
Chairman - FFIC
Why Foundation Fieldbus?

- Extensive Block Model
- Common Data
- Common Time
- Deterministic Control
- Publish and Subscribe
- High availability
- Standards Based Control Network
- Network Management

FOUNDATION technology incorporates key aspects of what ARC calls the Collaborative Process Automation System.
Why Foundation Fieldbus?

Process Integrity

- Robust design
- Redundant beyond any other technology
- Control in the Field (CIF)
- Safety Protocol FOUNDATION™ for “SIF”
Why Foundation Fieldbus?

Open Scalable Integration:

- Easily Scalable
- Standards based
- Inter - Operable
- Globally Accepted
- Vendor Neutral
- It is more than a Protocol, it is an Automation Infrastructure
Why Foundation Fieldbus?

Business Intelligence

♦ Extensive

♦ Structured

♦ Usable Diagnostics!
Why Foundation Fieldbus

• The global process industry losses $20 billion, or five percent of annual production, due to unscheduled downtime and poor quality.

• ARC estimates that almost 80 percent of these losses are preventable, with 40 percent largely due to operator error.

Source ARC Insight June 10, 2010
Typical FF Physical Layer
Strategies to Minimize unplanned shutdowns

- **Equipment health**
  - 100%

- **Time to respond**

- **Warning Level**

- **Minimum Device Health**

- **Failure**

- **Time**
The effect of Advanced Diagnostics

- Segment Checker: design of the physical layer
- Verify against original design
- Automated checkout procedures
- Longer plant uptime
- Know before you act
- Actionable information in clear text

Plan and purchase
Install and commission
Operate and maintain

Cash Flow

SEE
-know
-act
With Diagnostics of Physical Layer We Can....

- Commission Segments
- Monitor Segments Online
- Predictive Fault finding of Segments

◊ SEE what's going on in your physical layer
◊ KNOW when and how to act
◊ ACT in your Asset Management tool
Fieldbus Diagnostic Capabilities Have Evolved – ARC Report

<table>
<thead>
<tr>
<th>Network Lifecycle</th>
<th>Diagnostic Features</th>
<th>Advanced Online Diagnostics</th>
<th>Typical Online Diagnostics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No need to track down terminals or interfere with cable</td>
<td>Yes</td>
<td>Limited</td>
</tr>
<tr>
<td></td>
<td>Trunk current measurement</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Jitter measurement</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Data signal amplitude</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Shield to pole AC and DC unbalance</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Direct pole to pole short circuit</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Full spectral frequency analysis</td>
<td>Yes</td>
<td>Some</td>
</tr>
<tr>
<td></td>
<td>High frequency noise measurement</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Digital storage oscilloscope</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Trunk voltage</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Advanced software analysis and hardcopy printout</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>‘Signal inverted’ warning</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Separate diagnostic information bus- operation not affected by any segment failure</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Draws zero current from the bus</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Trending and logging provide early warning</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Simultaneous monitoring of all segments</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**ADM Reduces Cost Throughout Network Lifecycle**

Advanced Diagnostic Module for Fieldbus enhances the communication and data-gathering capabilities of Fieldbus by allowing users to comprehensively monitor the health of Fieldbus networks efficiently in real-time while reducing the cost of ownership.
Fieldbus Foundation

IP development

Promote

500 members/affiliates

Digital
Interoperable

Vendor Neutral
Automation Focused
By the Numbers

- 675+ registered products
- 11 registered hosts
- 6,000 control systems
- 1,000,000+ devices in service
Registered Devices

439 Unique Registered Devices
236 Re-Registrations
675 Total Registrations

Registrations

Jan '98  Jan '00  Jan '02  Jan '04  Jan '06  Jan '08  Jan '10

New

Renewed
FOUNDATION Technology’s Growing Installed Base

• FOUNDATION Technology is controlling the world’s largest plants and refineries
• Many Large Grassroots Projects in the Heavy Process Industries Incorporating FOUNDATION Technology
• Many project opportunities in Pharma, Metals & Minerals applications
• FOUNDATION Technology Increasingly Incorporated into Migration & Modernization Projects
• Almost all new projects happened in India from 2007 had FF specified.
References in India...

- Reliance Jamnagar II
- BORL Refinery, Bina
- Reliance PET
- MRPL Phase 3
- Essar Refinery
- HMEL, Bhatinda
- BPCL - FCCU, Kochi
- HPCL - FCCU, Mumbai
- BPCL – CCR, Mumbai
- IOC MSQI, Panippatt
- CPCL DHDT, Chennai
- BCPL – Assam
- GAIL – PATA / Viajaypur.
- Reliance Butene
- NTPC Aravalli (Temp loops )
- IOC Baroauni MSQI
- BPCL – Assam
- IOC Paradeep
- ONGC – OPAL 1 & 2
- Reliance PET
- Reliance PTA 4 & 5
Fieldbus for New Projects and Modernization

• According to ARC, the installed base of process automation systems reaching the end of their useful life is $65 billion. Most of these are 20 years old or older.

• FOUNDATION Fieldbus is being chosen by more major end users as they begin to modernize their installed base.

• Users want to avoid a functional replacement.

Nobody Wants to Replace this with “More of the Same”
FOUNDATION Fieldbus leads the process fieldbus market, accounting for close to 74 percent of digital fieldbus solutions for the process industries.
Signing Ceremony FDI Cooperation LLC
Karlsruhe, September 26th, 2011
Collaboration with NAMUR

Using the power of FOUNDATION Fieldbus, and considering NAMUR requirements, the new standard diagnostic profile aim to:

- Standardize the integration of diagnostic information
- Guarantee valuable information to the user
Diagnosis results must be reliable

Diagnosis results must always be viewed in the context of the application.

Internal diagnosis must be categorized into 4 standard "status signals"

Configuration must be free, as reactions will depend on the user's requirements.

Detailed information can be read out by the device specialist.
## Diagnostic Categories

<table>
<thead>
<tr>
<th>Status signal</th>
<th>Examples of detailed information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failure</td>
<td>Cause of failure device-internal</td>
</tr>
<tr>
<td></td>
<td>Cause of failure process-related</td>
</tr>
<tr>
<td>Function check</td>
<td>Change of configuration</td>
</tr>
<tr>
<td></td>
<td>Local operation,</td>
</tr>
<tr>
<td></td>
<td>Substitute value entered</td>
</tr>
<tr>
<td>Out of specification</td>
<td>Device being operated out of</td>
</tr>
<tr>
<td></td>
<td>spec;</td>
</tr>
<tr>
<td></td>
<td>Uncertain value due to process</td>
</tr>
<tr>
<td></td>
<td>and environment influence</td>
</tr>
<tr>
<td>Maintenance required</td>
<td>Maintenance needed short-term</td>
</tr>
<tr>
<td></td>
<td>Maintenance needed mid-term</td>
</tr>
</tbody>
</table>

**Diagram:**
- Failure
- Function Check
- Out of Specification
- Maintenance Required
FOUNDATION™ for Safety Instrumented Functions (SIF)
Development History

Detailed SIF Application Example
Column Overpressure

Non-safety related information from the SIS devices is available to the BPCS and operator.

TÜV reviewed.
Demand by End Users to gain benefits of H1 in Safety Instrumented Functions

Technical Specification Development Project Approved by BOD in October 2002

TÜV Protocol Type Approval including SIL 3 in December 2005

Marketing Demonstration Approved by BOD in October 2005

Marketing Demonstration Press Day completed May 2008

SIF_AI and Interoperability Test System released in 2008

SIF_DO and Interoperability Test System released in Q1 2010

Pilot projects underway at Shell and Saudi Aramco 2009 – 2012

SIF Registered Products Expected 2013
FOUNDATION for Remote Operations Management
FOUNDATION for ROM Development Teams

- HSE Remote I/O
- HSE-RIO Team

- Large Point Count Device
  - Multi-channel I/O
  - Wired HART Block

- Fieldbus Foundation – ISA Cooperation
  - ISA100.15 Working Group

- Wireless HSE Backhaul

- Conventional I/O
  - H1

- Wired HART

- Wireless Sensor Integration Team
  - WirelessHART
  - ISA100.11a
Application Example

Control Room

Remote Process

HSE Wired and Wireless Backhaul

FOUNDATION for ROM Device

I/O

H1

HART

Wireless Backhaul Enables Access To Remote Sensors Using Standard Wireless Technologies
Live Field Demos Being Planned Starting in 2013

- Petrobras
- Reliance Refining
- Saudi Aramco
- Two more sites to be identified
System Engineering Guide AG-181

Compliments of:
The Fieldbus Foundation

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EUAC: End User Advisory Council

• EUAC Composition

- Wes Meger, Canada
- Rong Gul, EMEA
- B.R. Mehta, India
- Herman Storey, US
- Luay Al-Awami, Middle East
- Satoru Nunokawa, Japan
- Duncan Turner, Australia
- Board Liaison: Tim Madden
- Staff Support: Stephen Mitschke
- Advisor: Rich Timoney
- Chair: John Rezabek
Foundation Certified Training & End User Resources

- Eight Certified Centers Around the World with More on the Way
- Numerous and free user resources: forums.fieldbus.org, AG-181
First ever FCTP center in India is kicked-off by Rich Timoney at UL Group in Pune on 6th Sept, 2012. UL will develop Training programs according to FF guidelines and start offering FF certified trainings to Indian customers by April 2013.

FF General Assembly 2013, Shanghai
Fieldbus Foundation Social Media Strategy

On Line Today

http://www.youtube.com/user/FieldbusFoundation

http://twitter.com/#!/FOUNDATIONField

http://www.linkedin.com/group/Fieldbus-Foundation

http://foundationfieldbus.blogs.blogspot.com/
Available for Free Download

www.fieldbus.org >> End User Resources >> Technical References

Technical References

White Papers
The Fieldbus Foundation provides a variety of technical white papers explaining the design, installation and operation of Foundation-based plant automation systems. These documents were prepared by leading experts on Foundation technology, and include a wealth of valuable information for process industry end users.

Available white papers include:
- NEW The Business Value Proposition of Control in the Field
- NEW Fieldbus Diagnostics: Latest Advancements Optimize Plant Asset Management

Design Tools
Design tools allow engineering firms, system integrators, plant control engineers and technicians to design and preview specific Foundation™ fieldbus plant implementations before commissioning a job on site. In particular, our DesignMATE segment verification tool allows plant automation professionals to audit segment layouts in a user-friendly environment.

The tool helps assure end users their fieldbus infrastructure will work with desired parameters such as cable length, number and type of installed devices, and selected power supplies. DesignMATE allows users to perform rapid calculations, eliminate human error, improve efficiency, and minimize the amount of paperwork required during the segment design phase.

DesignMATE for Foundation Fieldbus:
- DesignMATE

Fieldbus Foundation
- Map, Directions, and Company Information
- Privacy Policy

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Fieldbus Forums
http://forums.fieldbus.org/

<table>
<thead>
<tr>
<th>Forum</th>
<th>Last Post</th>
<th>Threads</th>
<th>Posts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Public Forums</strong> (Public Forums open to all users of Fieldbus Online.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Presentations</strong> (1 Viewing)</td>
<td>General Assembly 2011... by Talon Petty March 21st, 2011 11:52 AM</td>
<td>20</td>
<td>22</td>
</tr>
<tr>
<td>Sub-Forums:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fieldbus User's Network [FUN]</strong></td>
<td>Post your fieldbus related questions here.</td>
<td></td>
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</tr>
<tr>
<td><strong>Events</strong></td>
<td></td>
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</tr>
<tr>
<td>Upcoming trade shows, seminars and other Fieldbus related activities</td>
<td></td>
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<tr>
<td><strong>Membership Information</strong></td>
<td>Learn more about becoming a member of the Fieldbus Foundation</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fieldbus Forums User Support</strong></td>
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</tbody>
</table>
In the Asia/Pacific region, FOUNDATION technology is recognized as the de-facto industry standard among major oil & gas and petrochemical producers.

China is one of the two fastest growing markets in the world. China has several of the largest FOUNDATION installations to date, including multiple sites with over 15,000 registered devices in service.

To read the latest news from the global FOUNDATION fieldbus community, download the Fieldbus Foundation’s monthly e-newsletter, "Fieldbus Facts Online."

Download Current Fieldbus Facts Online - Newsletter

For additional information please feel free to contact us at asia_info@fieldbus.org.

Download the Current Volume of the Fieldbus Report

Fieldbus Report - Spring Volume 2007 (Chinese)
Welcome To The India Pages:

Welcome to the section of the Fieldbus Foundation website that is dedicated to the news, activities and events being conducted by the Fieldbus Foundation India Marketing Committee (FFIMC) in India. Use the tabs above to access the latest news and events program in the region.

The FFIMC was launched on 23rd May 2007 in Bangalore, India, with a goal to educate and promote Foundation fieldbus technology to Indian industries through the organisation of a wide range of marketing and training activities, including seminars, trade shows / exhibitions and end user demonstrations.

This committee and its members will play an important role in promoting the primary value propositions of Foundation fieldbus technology, which provides process integrity, business intelligence, and open and scalable integration of information across process manufacturing plants.

The Fieldbus Foundation India End User Council was established during the ISA Expo Exhibition and Conference in Delhi in December 2007. FFIEUC is a subset of the regional Asia-Pacific End User Council.

Members of the Fieldbus Foundation India Marketing Committee:
Members – India Marketing Committee

FFIC Members:

- ABB
- azbil
- Belden
- Moore Industries
- softing
- Masoneilan
- Emerson
- Endress+Hauser
- Fisher

- Forbes Marshall
- Honeywell
- Invensys
- Joseph Leslie Dräger
- LAPP INDIA
- HIMA
- Smar
- Laxsons
- Leoni
- Magnetrol

- Cooper Crouse-Hinds
- Pepperl+Fuchs
- Rockwell Automation
- Samson
- Siemens
- Turck
- Beamex
- Waaree
- Yokogawa
Event In Bangalore

- HOSTED BY PEPPERL+FUCHS
- SPONSORS (YIL, ABB, SAMSON, LAPP & SOFTING) PRESENTED TECHNOLOGY PAPERS
- MRPL & SRF SHARED END USER EXPERIENCES
- FULL DAY EVENT ATTENDED BY 55 END USERS IN SOUTHERN INDIA
- EVENT FOLLOWED BY LIVE DEMO BY SPONSOR COMPANIES
Event in Mumbai

- Participated on invitation from IED as part of Automation 2012 from Sept 7th to 10th in Mumbai
- FF Technology booth with live display of FF products & systems from sponsors
- Sponsors (P+F, Phoenix, Invensys, Honeywell, RSTahl & Azbil) presented technology papers
- Aker Solutions presented EPC experience
- Conference attended by 180 end users
- Received the best technology booth award
Event in Mumbai
Event in Delhi

- EXHIBITION & FF CONFERENCE ORGANISED AT IA HANNOVER MILANO FAIRS FROM 21ST TO 24TH NOV, 2012 IN DELHI
- SPONSORS (E+H, PEPPERL+FUCHS, ROCKWELL, PHOENIX) PRESENTED TECHNOLOGY PAPERS
- ENGINEERS INDIA LTD & IOCL PRESENTED EXPERIENCE FROM CONSULTANT & END USER PERSPECTIVE
- 75 END USERS ATTENDED FROM NORTHERN INDIA
THANKS FOR ADOPTING FF TECHNOLOGY !!