General Session & 18th Annual Meeting of Members

February 23, 2017
The Ascent of EtherNet/IP™
Ascent of EtherNet/IP

The aim of NAMUR’s investigation into Ethernet is to extend its application to traditional process field devices. NAMUR believes that effective and easy-to-use Ethernet communication systems between the field level and the higher system levels, such as EtherNet/IP, is a key factor for future applications with modern IoT and Industrie 4.0 solutions in the process industry.

Mr. Michael Pelz, head of NAMUR Working Area 2 Automation Systems for Processes and Plants.

What are users saying?
What are users saying?

“NAMUR is formulating its strategy and requirements to adopt industrial Ethernet in process automation where possible. NAMUR and its fieldbus working group welcome the opportunity to partner with ODVA, as the organization that develops and manages the EtherNet/IP technology and standards, to help accelerate adoption of industrial Ethernet in the process industry.”

Mr. Sven Seintsch, chairman of NAMUR Working Group 2.6.

1. An activity to continue the refinement of formal requirements for an Ethernet communication system for the process industry through joint collaboration between the Working Group 2.6 Fieldbus (WG) and the ODVA Strategic Market Requirements Team for its Process Initiative (SMRt).

2017 Scope of Cooperation between NAMUR and ODVA
“An Ethernet Communication System for the Process Industry”
Ascent of EtherNet/IP

2. The installation of an EtherNet/IP system in the process automation lab at Industriepark Höchst. This system will be a conduit for shared learning between NAMUR and ODVA stakeholders on approaches to optimize the application of industrial Ethernet for the unique requirements of the process industry.

IndustriePark Höchst
A center of the European process industry located in Frankfurt am Main, Germany

2017 Scope of Cooperation between NAMUR and ODVA
"An Ethernet Communication System for the Process Industry"
Lessons Learned - A Day in the Life of Field Device Users

Sven Seintsch
Bilfinger Maintenance, NAMUR WG 2.6 Fieldbus

February 23, 2017
Introduction to NAMUR

International User Association of Automation Technology in Process Industries

• Founded 1949
• 146 Member Companies
  – operating process plants
  – offering engineering services
  – represent the interests of operators in the process industry
• NAMUR conducts an open and fair dialogue with manufacturers

NAMUR is a leading international association of automation technology users
Introduction to NAMUR

- Exchange of experience, communication of know-how
- Involvement in standardization, representing the interests of users
- User-oriented standardization and communication of best practice
- Supervision of the introduction of new technologies

110+ NAMUR Recommendations and Worksheets are available

http://www.namur.net/
Introduction to NAMUR

- Exchange of experience, communication of know-how
- Involvement in standardization, representing the interests of users
- User-oriented standardization and communication of best practice
- Supervision of the introduction of new technologies

110+ NAMUR Recommendations and Worksheets are available

http://www.namur.net/
Test Laboratory Bilfinger Maintenance

– Test of devices, type approvals, EMC-Tests
– Test of interoperability and device Integration
– Practical and theoretical training in fieldbus technology
– Troubleshooting and on-side support
– Test of new technologies for process automation
Topics

• Conditions and Recommendations in Process Industry
• Functionality of Field devices
• Device Integration
• Device Exchange
• Needs for Ethernet
• Namur Open Architecture (NOA)
Process Automation

Signal exchange

Control and supervisory

Process plant
Piping
Tanks
Sensors and Actuators
Process Automation

- Process plant
- Piping
- Tanks
- Sensors and Actuators
- Control and supervisory
- Signal exchange

Easy to handle?
Process Conditions

High availability
- Production 24 hours a day, 365 days a year
- Changes and extensions during the running plant

Complex Actuators and Sensors
- Transmitters for Pressure, Flow, Temperature, Levels
- Analytical Devices
- Valve positioners
- Pumps and engines

- Outdoor installations
- Signal speed 100 msec
- Redundant Systems

- Corrosion
- Vibration
- EMC
- Humidity
- Explosion Proof
- Dust
- Hazardous-Substances
- Special Materials
- Robust Housings
- Wide Temperature Range
Hazardous Area

- Explosion proof protection
  - Flammable liquids, solvents
  - Special permits for working
  - Special tools
  - No sparks allowed

- Flameproof enclosure
  - Heavy
  - Special cable gland

- Intrinsically safe
  - Low Energy
Plant Lifetime

- Economic goods in process industry are persistent:
- Average plant live time approx. 35 Years
- Change of technical components approx. every 20 Years
- Change of Control equipment approx. 10 – 15 Years
- Strategic investment decisions based on economic calculation over a long period
- Difficult authority approval
  - Legal regulations
  - Environmental protection
  - Safety regulations
- Production over 30 Years the same product with continues improvement
- Production is validated e.g. FDA for pharmaceuticals
Installations

Advantages with Fieldbus

- Measured Value with unit, Status, no scaling
- Higher accuracy,
- Several values of one transmitter
- Several devices at one line

Today both technologies are used, but analogue installations are still the most.
Device Connection (4-20mA)

Control Room

Infrastructure is complex, high required space, inverted signal lines

Plant
Fieldbus Installation

Cabinet

Field installation
Signal transmission

- Analogue Signal for control
- On-Modulated signal for device configuration
- Point to Point connection to one device
- HART Modem or Handheld necessary

- Digital Signal for control (cyclic) and for configuration (acyclic)
- Connection to multiple devices

Sensor

12,146 mA Analogue 4-20 mA

Controller

1,53 mbar Fieldbus

Sensor

Controller
Basic Requirements and practical experience:

- Device functionality is easy to use
- Device integration is independent from communication and manufacture
- Device exchange is easy and version independent
- Device information is a source for Asset management
Field interface

- Pneumatic: 0.2 – 1 bar
- Electric: 4-20mA, 2-10V
- "Smart": HART Brain
- Digital: Profibus Foundation Fieldbus

Timeline:
- 1976 NE 06: Standardized Electrical Signals
- 1985: Microprocessor
- 1993: Start of HART
- 1996 NE 53: Software of Field Devices with Digital Electronics
- 1997 NE 74: Fieldbus Requirements
Field device as information source

Field device

Operator

Technician, Engineer

Maintenance-personal
Information flood
Complexity of Field devices

Today devices with more than 1000 parameters are normal!
Configuration over device display is not possible!

– Operation Interfaces
  • Different Software Tools
  • On Site Push Buttons, different menus structure

Application specific settings are necessary, e.g.:
• Actuator, Valve specific tuning
• Adjustment of Process conditions
• Classification of Diagnostics

Tomorrow’s device communication should present a stable base for modern maintenance strategies, device diagnostics, Asset Management without higher effort and with long term investment safety!
Differences in device integration

Point to Point connection e.g. HART

Problems on a single place, e.g. with a notebook

Device integration is the problem!

Central device management fieldbus

Problems with the complete system!
Benefit: Flexible Device configuration

Configuration on the display!

Configuration on the device!

Which display?

No secure workplace!

Do it in the control room!
Benefit: Central Device Management

- The complete functionality of the devices can be used centrally
- Minimization of the up to now required ways to the field devices in the plant

Effective maintenance strategies are possible!
Device integration

**Situation today**

One device several options

- Fieldbus Foundation Device Description (DD)
- 375/475 Field Communicator
- DTM / PACT ware
- ABB Fieldbus Builder
- Emerson AMS / DeltaV
- Yokogawa PRM – Device Viewer

**Tomorrow…**

One single device integration such as…

- Clearly minimized effort to use and care of the device integration
- One device integration for all devices of process industry, independent of communication and manufacturer
Software Cycles of Intelligent Devices

Start UP

Bug fix

New Language added

Point-Indicator added

„Functionality“ of field devices changes, that courses also a change of the device description
New installation of device descriptions is necessary
Search for the suitable device description
Download in the DCS → Production stop
Increasing versions during the plant lifetime

Change of host system versions
Change of device management tool versions
Devices with different revisions/SW

- Start up and change of devices must be possible independent of the device revision/SW
- Definition of Standard-Parameters for devices that ensure the start up and the work of devices (NE131)
Needs of information

Asset management system
- historical Data
- Plant Health Status
- ERP connection

Not possible today!
Device information today

Asset management, Vendor B
Device information tomorrow

DCS Manufacturer A

Asset management, Vendor B

Device information via
• FDI if the Host Manufacture implements FDI as an open interface
• Parallel to the existing infrastructure, effort in Hardware and engineering

Engineering-Client

Data-Server

Maintenance-Client

Bus

Fieldbus

Gateway
Industrial Ethernet . . .
Next Generation Technology for Process Field Devices
Ethernet in the field

Future challenges
- Rising amount of data
- Higher data rates
- Information and must be available everywhere

The handling of field devices must become much easier!
- Device integration
- Interchangeability
- Data access
Bound to other fieldbus systems, focusing on the process industry

Expectations on a fieldbus system
- Economic benefits, better diagnostic
- Environmental conditions, hazardous areas, EMC
- Topology
- Safety equipment
- Interchangeability

Existing requirements persist, even for Ethernet
- modular concept
- Topology and cable lengths
- Data rates
- Ex-protection
- Safety equipment
- Integration of installed field bus systems

http://www.namur.net/index.php?id=123&L=1
Example interconnection technology

1. Teile auslegen
2. Kabel durchführen
3. Kabel abisolieren
4. Drähte einführen
5. Leiter festschrauben
6. Schirm einklemmen
7. Gehäuse schliessen
Next Generation Physical Layer for Ethernet

- Single twisted pair for signal and power transmission
- Installation in hazardous areas Zone0 / Class1
- Support of intrinsically safe wiring concept
- Connection technology via terminals
- Sufficient cable length
Ethernet for Process industry

2 wire field devices with EtherNet/IP interface
One protocol for all devices in the plant
Ethernet as an enabler

Multi Protocol Devices
- Process Control
- Diagnostic / Monitoring
- Faster data transfer
- Device integration on board

IIOT Use cases
- Asset management
- Machinery Health
- Mobile Maintenance
- Data Analyses
Namur Approach (Namur Open Architecture)

Enhancement of existing approaches as a baseline for the efficient and flexible utilization of Industry 4.0 with the process industry

– Additive to existing structures
– Open for new approaches within Industry 4.0
– Simple integration of fast changing IT components from field level up to enterprise level
– Significant improvements of cost per sensor due to open and integrative approaches
– No risk of availability and safety of installed base

Abb. Aus Präsentation Tauchnitz/Klettner, NAMUR HS 2016
Namur Approach (Namur Open Architecture)

Enhancement of existing approaches as a baseline for the efficient and flexible utilization of Industry 4.0 with the process industry

- Additive to existing structures
- Open for new approaches within Industry 4.0
- Simple integration of fast changing IT components from field level up to enterprise level
- Significant improvements of cost per sensor due to open and integrative approaches
- No risk of availability and safety of installed base

Abb. Aus Präsentation Tauchnitz/Klettner, NAMUR HS 2016
NOA Inside

Monitoring and Optimization Independent from Process Control

Central M+O
- Further 4.0 Use Case
- Advanced Analytics
- Historian
- Central HMI
- Production Network Simulation
- Reliability Center
- Scheduling

Plant Specific M+O
- Advanced Process Control
- Alarm Management
- 4.0 Device Management
- Dispatching
- Low-Cost Multi-Sensor
- Vibration

Core Process Control
- OPC UA
- Engineering
- HMI
- DCS / PLC
- EtherNet/IP
- 4.0 Out
- TC 4711
- FC 4713
(4-20mA / Remote IO / Fieldbus / Wireless / Ethernet in the field)

Verification of Request

Production Plant

Abb. Aus Präsentation Tauchnitz/Klettner, NAMUR HS 2016
EtherNet/IP for Process Industry

Devices, easy to handle!

One Single Device integration

Next Gen Physical Layer

A Solid Cornerstone for Process Industry

Diagnosis + ASM

- Asset management system
  - historical Data
  - Plant Health Status
  - ERP connection
THANK YOU