Industrial Internet – Big data

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Concept and evolution to Industrial Internet
The concept of Industrial Internet

- By industrial internet we mean the integration of physical machinery with networked sensors and software.
- This enables gathering and analyzing data from machines and processes, and utilizing it to adjust operations and plan predictive maintenance to positively affect the value chain.

The topic has many names:
- Industrial Internet
- Internet of Things
- Industry 4.0
- Internet of Services
- Big Data
Evolution to Industrial Internet

Components
- Mechanical function

Monitoring and Control

Smart components
- Connectivity and intelligence

Industrial Internet
- Impact on work
- Impact on industry
- Impact on society

Remote control and operations

Product systems
- Plant-wide data collection and control

System of systems
- Data sharing and analytics between systems

Cross-system optimization

Network of systems
- Internet wide, deep analytics and business processes

Cross system impact
Valmet as a frontrunner
Valmet has a long history in the digitalization of process industries

1960
The Airmatic, a pneumatic measurement and control system

1970
Elmatic-100 system, electronic instrumentation

1980’s
Damatic, the first Distributed Control System (DCS)
Sensodec Condition Monitoring System
Damatic XD, modular second generation DCS

1990’s
PaperIQ, QCS
metsoDNA, Dynamic Network of Applications

2000’s
Multivariable Model Predictive Controls (MPC)
24/7 ProCenter for DCS/QCS
PaperIQ Select

2010’s
Metso PQV web inspection system

2015
Valmet DNA

2015
Valmet IQ

Advantages to customer industries:

- Distributing controls & gathering performance data
- Embedded intelligence & advanced information
- Increasing availability
- Increasing productivity through information services
- Benchmarking and best practice sharing capability
Today, customers are extensively utilizing our Industrial Internet capabilities.

- **740** Valmet-supplied lines with Valmet DCS
- **350** Condition Monitoring (CM) references with over 70,000 I/O tags
- **320** Advanced process control installations
- **480** Online connections
- **80** Performance agreements with remote connections
- **Ongoing** Co-creation of advanced analytics with customers
We have moved our customers’ performance forward with Industrial Internet – Case examples

- **Reduced energy consumption 8%**
  - Metsä Board Joutseno Mill, Finland

- **Raw material savings (0.45%) USD 1.55 million**
  - Celulose Nipo-Brasileira AB Cenibra, Brazil

- **Chemical savings 8.7%**
  - Burgo Ardennes, Belgium

- **Production increase of 2.8%**
  - Zellstoff- und Papierfabrik Rosenthal, Germany
16% energy savings with data analysis

Case: Siam Kraft Industry PM16, Thailand

Recycled fluting machine
- Basis weight 90-150 g/m²
- Design speed 1200 m/min
- Trim width 6660 mm
- Start-up 2014
Energy efficiency improvement right from start-up

Case: Siam Kraft Industry PM16, Thailand

- Electricity consumption reduction from 230 kWh/t to 200 kWh/t
- Steam consumption reduction from 1.55 t/t to 1.25 t/t

Total Saving (eur/a) 3 M€
Big data in Industrial Internet
Local factory site:
- Over 20000 measurements
- Many thousands of motors
- Typical execution 200-1000ms

Paper quality vision:
- Video stream 40GB/s

All data stored local databases.
Big data @Cloud

Cloud storage:
- Aggregated min/max & average
- Compressed transfer
- ~ 1GB/day/factory site

Data needed in analytics collected & stored.
Some practical numbers

Small, standalone devices:
- Few hundred bytes of data/min
- 100 MB/month

Paper machine analytics:
- 1.3 GB/day
- 40 GB/month
Today, we serve our customers with intelligent technology, automation and services locally and remotely

- Fully automated, intelligent machines with connectivity for Industrial Internet
- The Valmet DNA automation platform connects instruments, analyzers, vision systems and process controls
- Advanced Process Control enables real time optimization of core processes
- Expert support locally and through remote services
- Performance optimization and support agreements
2016-2018 we enhance mobility and introduce even more advanced automation technologies and embedded diagnostics

- Growing fleet of intelligent machines and mills leveraged
- More diagnostics embedded into processes
- Next generation analytics introduced to selected processes
- Valmet DNA evolves to include virtual and cloud-based applications and services
- Integrated customer portal and mobility enable secure access to all information and expertise anytime and anywhere
- Advanced benchmarking and best practice sharing tools
Food for thought
- case examples
Path analysis of paper machine events

Problem fingerprint
Using tree-event paths (sequence of three events)

First time occurrence
Event A, Event B, Event C

Second time occurrence
Event A, Event B, Event C

Top 200 “three-event-paths” leading to unplanned shutdown

And 200 predicting no-shutdown (normal operation)

5:35 AM
Guide roll 4 torque from low to normal

5:35 AM
Guide roll 5 torque from low to normal

5:40 AM
Nip 2 edge temp DS from normal to high

~6:15 AM
"Triplet" reoccurrence 5 times

~7:00 AM
"Triplet" reoccurrence 15 times

3 h 20 min

9:35 AM
Unplanned shutdown

© Valmet
Valmet’s on-call services relating to Valmet DNA automation system

- Calls routed through call center 24/7
- Remote connection utilized for troubleshooting
- 92% of the calls are solved without site visit
Valmet’s predictive roll-cover analysis

- Roll cover lifetime modelled using big data and predicting future behaviour
- Operational parameters can be optimized to minimize roll-cover costs
Valmet’s remote diagnostic, reporting and alarming of analyzers

**Challenge**
- Geographically distributed in large area
- One person is responsible of a large fleet

**Our Solution**
- Analyzer data replicated in a central location.
- Remote diagnostics on demand
- Software updates and configuration remotely.
- Fleet performance can be compared and analyzed with one set of tools

**Results**
- Helps maintenance personnel prioritize work
- Faster reaction time on unexpected disturbance cases
- Improves the service level and availability
Summary
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Valmet is a frontrunner in Industrial Internet

• Our intelligent production technologies, long experience in the digitalization of the process industry through our automation business and services expertise create a solid foundation for the industrial internet.

• Today, our customers are extensively utilizing our industrial internet capabilities and achieved significant performance improvements.

• We are further strengthening the utilization of industrial internet by:
  – Providing expertise globally using remote technologies
  – Utilizing and developing our unique automation technology and innovations
  – Developing the next generation of analytics and services