Mill of the future -
Data driven solutions building the way forward

RISI European Conference, Wien 13.3.2019

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Mill of the future
Facilitated by Valmet Industrial Internet

**Advanced applications**

Combine physics-based analytics, predictive algorithms, automation and deep domain expertise. Advanced process controls and data-driven applications for assisted decision making.

**Valmet Performance Center**

Provides remote support, monitoring and data analysis by Valmet’s expert network. Autonomous centers monitor installed base and alerts on upcoming disturbances.

**Valmet Customer Portal**

A leading, personalized digital collaboration space provides unified, but customized service experience throughout the customer journey.

**Intelligent, autonomous machines**

Connect Valmet machinery, systems and fleets with advanced sensors, controls and software applications. Leverage the embedded intelligence in main process equipment for predictable and autonomous operations.

**Solution ecosystem**

Brings leading industry players and innovative start-ups together to co-create new value-adding data driven services.

We empower our customers to move towards autonomous plants through data driven solutions and by collaborating across the value chain.
Mill of the future
Facilitated by Industrial Internet

Assisted decision making

Existing advanced process controls

Advanced control optimization

Local & VPC service

Closed loop optimization of KPIs

Process optimization

Local & VPC service

Mill wide optimization applications and services

Mill wide optimization

Savings

Monitor and report

Advise

Control

Optimize

*VPC=Valmet Performance Center i.e. remote expert support
**Mill of the future – actionable insight**

**Paper strength prediction combined with advanced process controls**

**Challenge:** In the paper production process, operators control paper strength and other quality variables based on laboratory measurements (time delay).

**Solution:**
- A decision support application for the operator to control paper strength level to minimize raw material cost.
- VPC in key role to maintain the application.

**Example results from magazine paper:**
- Real time information on paper strength to operators gave 1-2% savings in raw material consumption (~1M€ per year).

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Kraft amount difference inside the target window (max and min): 3 – 4% → 3.1 – 4.1 MEUR / Year
Real time quality prediction for raw material savings

Sensor Data & model based strength prediction

Strenght is predicted real time and visualized for operators in control room
Optimizing controls are reducing need for manual operation
Advanced process controls for optimizing paper strength

Automatic control runs paper strength closer to minimum accepted limit for minimizing overquality and raw material cost.

Additional annual raw material saving potential equals to ~1 M€ (in addition to manually controlled paper strength)
Shift from reactive to negative latency operations

Leading companies will operate in "future"

Challenge:
• Web breaks are causing a lot of unplanned operational downtime in the paper industry
• Web breaks are often seen as random events without clear root cause and can not be easily avoided

The solution is an analytical application that:
• predicts upcoming sheet breaks in the process
• communicates contributing measurements for health score dropping for operator advisory

Results:
Mill 1: 50% web break capture rate
Mill 2: 62% web break capture rate
Forget your industry as a new paradigm…how far you can get without industry knowledge?

Success of predicting and avoiding web breaks

Level of analytical intelligence

Expertise

The problem was solved by making a simple change to the broke chest level control logic. A repeating web break due to broke chest level variation was never seen again.

Analytics

Broke chest level lowered to 15% repeatedly signaling upcoming web break by analytical application

Example:
A tissue machine suffering from repeated web breaks

Deviations:
- Web moisture got up suddenly by 4–5%, causing a sheet break
- Fines concentrated at the bottom of the broke chest
- The rich broke blended with virgin fiber caused a freeness drop

Expertise

- Pre dictive
- Prescriptive
- Analytical application + expertise
- Cognitive analytics & artificial intelligence

Descriptive

- Operator / expert

Analytical application

Valmet Customer Days 2018
Traditional optimization of integrated paper mill

Benefits of APC and analyzers cascade forward

+ Steam production
  - Plugging and washing stops
+ Stronger/stable white liquor
  - Water in system
+ Chip quality
+ Optimum/stable Kappa
+ Optimum/stable residual alkali
+ Production/yield

- Basis weight
- Installation of equipment
- Steam production
- Washing sequences
+ Production/yield
+ Throughput
+ Optimum/stable black liquor solids
+ Higher/stable black liquor solids
+ Higher/stable strength
+ Machine runnability
+ On target/stable brightness

+ Higher/stable dry solids
+ Higher/stable pulp strength
+ Stable pulp properties
+ Fiber fibrillation
+ Stable brightness
+ Lower final brightness
Mill of the future
High level process coordination and optimization

Recent mill analysis proved annual profit improvement potential of 19 M€ in an integrated board mill!

Optimization of:
- Pulp property targets
- Pulp blending targets
- Chemicals, PM variables
- LCR spec energy targets

Fiber line real time optimization
Advanced planning and scheduling

Optimization of:
- Final Brightness target
- Kappa target

Mill-wide mass balance

Production planning
(planned/unplanned shutdowns)

Make-Up chemicals
De-bottlenecking
Energy production

Wood Handling

Optimization of:
- Chip furnish ratios

Kappa models

Causticizing Plant and Lime Kiln

Recovery Boiler

Evaporation Plant

Paper Machine

Board quality models

Pulp quality models

Stock Preparation

Bleaching

Fiberline

Cooking

Washing
Control room of the future

Change management and mill wide optimization must happen in central nerve center

- Operating decisions are based on the total mill balance and forecast
- Process area decisions are coordinated to maximize profit subject to product quality and process stability

Operator display of the future - high level view of mill performance from central control room