Performance Improvement and sustainability through Advance Process Controls and Remote Monitoring

Green and Clean Best Practices and Technologies in Paper Manufacturing
# Technologies for a Sustainable Tomorrow

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- **Aux. process**
- **Fiberline**
- **Recovery line**
- **Drying line**

- **DCS**
- **Drive controls**

- **Green and white liquor properties**
- **Reduction degree**
- **Conductivity**
- **Freeness**
- **Fibres properties**
- **External fibrillation**

- **Fiber quality**
- **Brightness**
- **Conductivity**
- **Kappa**
- **Residuals**

- **Dirt count**
- **Web cameras**
- **Scanners**
- **Fiber quality**

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APC solutions

Key benefits

➢ Better fuel and chemical management
➢ Improved quality of final product
➢ Less process variations and smooth operation of the process
➢ Less environmental chemical load and hence lower pollution
➢ Well utilization of installed assets and increased production and profitability

Industrial IT

Key benefits

➢ Rapid response on needed situations
➢ Complete process analysis and expert advice on routine basis
➢ Healthy utilization of installed assets
➢ No waiting for experts’ visit when needed situation arises
➢ Full time monitoring of system performance and loop performance and improvement solutions
Advanced Controls for the Entire Process

Debarking Optimizer
Less wood losses, 0.5 – 2 %-units

Continuous Cooking Optimizer
Kappa variation decrease 20 – 50 %
Production increase of same fibre 0.5 - 3 %

Batch Cooking Optimizer
Kappa variation decrease 10 – 50 %
Production increase of same wood 0.5 - 5 %

Washing Line Optimizer
Washing loss decrease 3 - 10 %
Dry solids content increase 0.3 - 1 % to evaporation

Oxygen Stage Optimizer
Kappa variation decrease 10 – 50 %
Bleaching chemicals savings 3 – 5 %

Bleaching Optimizer
Final Brightness at desired level
Final Brightness variation decrease 10 – 50 %
Bleaching chemicals savings 5 – 15 %

Causticizing Optimizer
Increased production rate 1 – 3 %

Lime Kiln Optimizer
Decreased energy consumption 3 – 7%

Evaporation Optimizer
Increased burning liquor
Dry solids 1 - 3%

Recovery Boiler Optimizer
Increased production rate 1 – 3 %
Increased electric production 1 – 4%

RCF Optimizer
Reduced bleaching chemicals 10-40%
Improved plant yield 1-3%

TMP/BCTMP Optimizer
Reduced specific energy 3-10%
Increased production 3-7%

Brightness Optimizer
Chemical Reduction 10-30%

Pulp to Paper and Blending Optimizer
Paper strength variability reduction up to 35%

Fiber Line Management
30% less unplanned shutdowns

Recovery Line Management
30% less unplanned shutdowns
Batch Cooking Optimizer

Solution components

**Batch Cooking Optimizer**

**Production & Scheduling**
- Production Control
  - interval control
  - cooking temperature minimization
  - line synchronization
- Estimated times start of phases
- Schedulers:
  - Chip Filling
  - Liquor Filling
  - Heating
  - Displacement
  - Discharge

**Quality Control**
- H-factor calculation
- Kappa estimation
- Kappa / Viscosity Feedback Control
  - liquor/wood target

**Tank Farm Management**
- Level Predictors:
  - Acid tank
  - Filtrate tanks
  - Displ. tank
  - Discharge tank
- Tank farm controls:
  - Volume control(s)
  - Flow control(s)

**Steam Leveling**
- * Selection of leveling digester
- *Total steam flow target control(s)
- Average calculations
  - phase times
  - liquor volumes
- Other calculations:
  - spent phase times
  - pumping volumes
- Cross connection:
  - recipe
  - measurements
  - Sequences

Sequences & Basic Automation

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Bleaching Optimizer

- Stabilizing controls
- Kappa and brightness control
- pH control
- Change management

Final brightness variation (std) decrease
Final brightness at desired level
Bleaching chemical savings

ISO brightness

Target brightness

Optimized curve

Existing curve

Chemical consumption

Chemical savings

Reduced final brightness variability
- Exact and frequent kappa / brightness
- Advanced model-based control strategy

Chemical optimization between stages

Stabilization of bleaching conditions by pH control

Brightness target shift to optimum

Prevention of control saturation
Optimal conditions for bleachability development

Bleaching chemical savings
Recovery Boiler sootblowing system

- Monitoring of the Cleaning efficiency of the sootblower
- SOOTBLOWER EFFICIENCY INDEX CALCUL. IN EACH SECTION
- SELF TUNING
- SOOTBLOWING INTERVALS
- Each sootblower has the calculated operating frequency based on the cleaning efficiency and the fouling degree of the boiler section

SOOTBLOWING BASED ON FOULING STATUS
FOCUS ON THE MOST EFFICIENT SOOTBLOWER
SAVES SOOTBLOWING STEAM
ENHANCES BOILER EFFICIENCY

FOULING CRITERIAS
- dP
- heat transfer coefficient
- time

FOULING degree & Fouling development

Boiler load normalized SOOTBLOWING NEED

Sootblowers are divided in groups according to the boiler construction (economizers, boiler bank, superheaters)
Dissolving tank TTA and density control

Na₂CO₃ solubility

Na₂CO₃ concentration in GL

GL TTA
GL Na₂CO₃
GL Na₂SO₄
GL Temp

Optimized TTA-target

Model from TTA to density

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Implementation Methodology

- Study (audit) is done to assess:
  - current performance level
  - bottlenecks (Process/ Automation)
  - achievable performance improvement potential

- Audit focuses on Performance of Process & controls

- Duration of audit
  - Depends on area to be covered and targets to be achieved.
Remote Maintenance Services

What information is available?

• Advance Process Controls monitoring
  – Equipment healthiness
  – Loop performances monitoring and fine tuning
  – Optimizing the advance control to current process situations

• Automation monitoring (Equipment healthiness)
  – Process Monitoring
  – Quality Monitoring
  – Control loops
  – CD Profilers
  – Automation networks
  – Information systems

• Asset monitoring
  – Field devices (instruments, valves, motors, etc.)
Process Monitoring Background

The process itself is the best reference on how it can perform

Basis
A few reasons (20%) are the cause for 80% of the significant upsets in the process.

Our mission
Locate and eliminate the most significant reasons for the process upset.

Significant savings based on experts’ experience.

That’s the 80-20 Rule!
Remote Monitoring Services - Benefits

- Maintain and Improve the existing advanced controls
  - Locating and eliminating the causes of process disturbances

- Eliminating Process Disturbances mean
  - Less process upsets which cause excess raw material / chemical consumption and unplanned shutdowns
  - Less variability in final quality
  - Higher energy efficiency
  - Decreased unplanned shutdowns

- RMS Enhances Process Troubleshooting Capabilities
  - Real time data to maintenance, engineering, and operations in the mill
  - Remote interpretation of results and process analysis assistance by Valmet
Remote Connections

Secure Connection Solutions

• Remote Operation Environment
  – DNA Operate Remote display server
  – Remote troubleshooting
  – Remote system operations after authorization by the mill
  – Data gathering and analysis
Remote Solution Architecture (Secomea)

One of SiteManagers is installed in Valmet DNA/IQ system

User management in Valmet premises

Valmet specialist
Valmet Secure Connection Solution (SCS)

Conventional remote connection
Operational principles overview

1) End user opens connection with VPN Client to Business HUB.

2) User is authenticated and authorized. Traffic is filtered and logged.

3) SCS VPN tunnel to customer site is always active.

4) VPN tunnel is terminated to a VPN device at customer site.

5) Traffic can be filtered on customer firewall.

6) Accessing target server (Customer site)

Encrypted VPN tunnel
Decrypted traffic
Remote Monitoring Services

Project Steps

- Establish full process data collection
- Configure desired automated data handling
  - Calculations to remove data from shut down periods
  - Variability calculations for key variables for performance monitoring
- Set up automated reporting and trending tools
- Performance should be reviewed several days per week by
  - Mill personnel
  - Valmet Automation Experts
- Findings are reported to the mill
- Provide suggestions for corrective action
- Follow-up completed in the next analysis
- Monthly reporting of the issues and actions, Bi-Annual Mill Review
Remote Monitoring Services

Summary

Benefits

• Improved Process Stability
• Less upsets, breakdowns and quality problems
• More Uptime with better equipment efficiency
• Rapid response on needed situations and faster problem diagnostics and solution identification

Main Features

• Continuous process data collection
• Daily performance monitoring
• Daily process upset info with suggestions for corrective actions
• Extensive monthly report
• Bi-Annual follow-up meeting at the customer site