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PERFORMANCE IMPROVEMENTS AND SUSTAINABILITY THROUGH ADVANCE PROCESS CONTROLS AND REMOTE MONITORING SERVICES

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Abstract :

Operating a plant with traditionally known methods may deliver the output, but we need to spend lot of time, energy, and expensiveyet harmful chemicals which will also cause harm to nature. In this paper we will mainly focus on the new technologies that provide ***clean and green best practices*** *for process improvements and enhanced sustainability.*

Advance Process Controls (APC) *involves estimation of process performance by capturing current process data. Then it is studied by the team of process experts and improvement areas identified. After identifying the target process area to improve, the estimation of savings is made. This saving is either by reduced chemical / energy consumptions or improved production or ease of operation.*

In Most of the cases it has been observed that we use "higher than needed" to be safer, be it chemicals, energy or any other raw material. Advance controls will ensure that we are not using anything extra in gaining the desired results. On implementing APC solution, it need to be monitored periodically for the better utilization. The same can be done using ***Industrial IT solutions*** *by a team a process experts from their offices itself. This will save delay in response, transportation costs and improves better utilization of systems.*

This paper describes the methodology, the software solution that deals with performance estimation, improvements through Advance process controls and maintaining it through a remote monitoring system for a clean and green process optimization.

Key words : *Remote performance monitoring, trouble-shooting, advance process controls, process optimization, Industrial IT*

INTRODUCTION

Traditionally we are habitual to operate the process with well-known control methods which are not complete to achieve the modern era goals like maximum production with less chemical and Natural resources utilization. Best performance of the plant comes out when we operate it with best available operational and control method.

In the coming parts, we will go through the available Advance Process Controls for different process areas and their implementation methods. We also see how they are maintained remotely to continue providing best results with proven Industrial IT remote service solutions.

Advance Process Control Applications

Valmet has developed Advance process controls to provide optimized controls for various processessin Pulp & Paper industry. These optimization solutions can be split into five key areas

1. Debottlenecking
2. Fiber line optimization
3. Chemical recovery
4. Power and mechanical pulping
5. Recycled fiber.

Within each process we offer one or more optimization solutions.

Debottlenecking Identifies process bottlenecks which have a cascading impact on the next process and sometimes the whole unit. Identifying and solving these bottlenecks defines the operational economics of the whole mill.

Fiber line optimization has three control applications such as

1. Continuous / batch cooking optimization
2. Brown stock washing optimization
3. Oxygen stage Optimizer
4. Bleaching Optimization

Continuous/batch cooking optimization Reduces kappa variability and optimizes the sub-process toachieve the following benefits:

• increased production

• Improved yield

• reduced chemical usage

Brown stock washing optimization maintains the desired weak black liquor solids and minimizes chemical losses in the process to achieve the following benefits

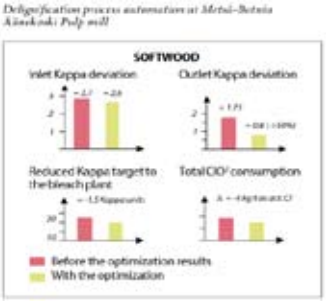
• reduced chemical usage

• reduced water usage

• improved black liquor solids

Oxygen stage optimizer reduces the outlet kappa variation and COD to Bleach plant resulting lower chemical consumption at bleaching stage and less load to Effluent Pant. Also it reduces the chemical consumptions at ODL stage and provides targeted Kappa by ensuring maximum reduction of Kappa in ODL without damaging fiber properties.

• Lower and more even Kappa to the bleaching process
• More uniform pulp quality
• Less losses in pulp strength
• Chemical savings in the bleaching process
• Decrease in the environmental load



Bleaching optimizationReduces final pulp brightness variability and ensures the efficient use of bleaching chemicals to achieve the following benefits:

• reduced chemical usage

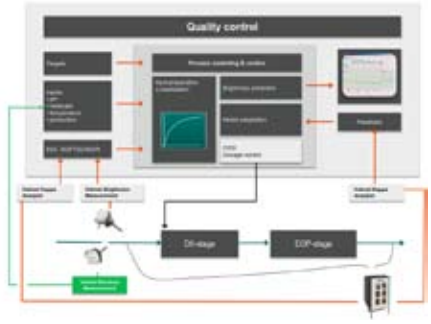
• reduced brightness variability

Bleaching Optimizer Overview

Chemical recovery area has totally 6 Advance Process controls.

1. Evaporator Optimization

Base calculations and controls to stabilize the process:
• Chemical dosage controls (if not in base automation)
• Washing water flow controls
• Production rate control
• Retention time calculations
Model based quality control (all bleaching stages):
• Kappa and/or brightness control
• pH controls
• Temperature controls
Management of changes:
• Production rate, pulp grade, and wood species
Management of disturbances:
• Process event tracking
• Retention time estimator
• D2C (Smart continuous measurement)



2. Recovery boiler optimization
3. Reduction rate and dissolving tank TTA Optimizer
4. Sootblowing optimization
5. Causticizing optimization
6. Lime kiln optimization

Evaporator Optimization application maintains desired dry solids content Profile over the evaporation train by coordinating the feed-, medium-, and strong-liquor dry solids controls to achieve the following benefits:

• reduced steam usage

• increased steam production (in recovery boiler)

Recovery boiler optimization manages the combustion processboth the firing of black liquorthe combustion air to achievefollowing benefits:

• increased plant capacity

• increased steam generation

• reduced boiler plugging

Reduction rate and dissolving tank TTA Optimizer will give Maximized energy efficiency, clean ability and availability of Power plant and Chemical reactor, resulting

- Low flue gas losses
- Efficient sootblowing, high cleanability at low steam consumtion
- Minimized carryover and emissions
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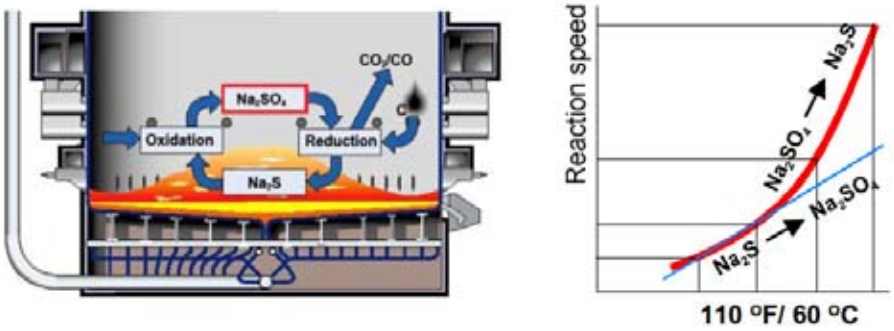
- High and steady superheated steam temperature
- Minimized scaling of the green liquor system
- Chemical recovery
- Controlled bed area conditions to ensure steady smelt flow
- High and steady char bed reduction efficiency
- High TTA concentration from the dissolving tank

Reduction efficiency exothermic Sulfate-Sulfide Cycle

Reduction reaction is strongly depending of the bed temperature, so high enough temperature keeps the reaction on the Na2S side withminor reoxidation

When bed temperature increases by 60°C, the reduction reaction speed ~doubles

Adaptive combustion air distribution control has a key role in reduction efficiencyoptimization



Reduction efficiency exothermic Sulfate-Sulfide Cycle

Sootblowing optimization Intelligent sootblowing optimizes theprocess to clean only the areas where

it is needed to deliver the following benefits:

- reduced energy consumption
- reduced boiler plugging
- increased power generation

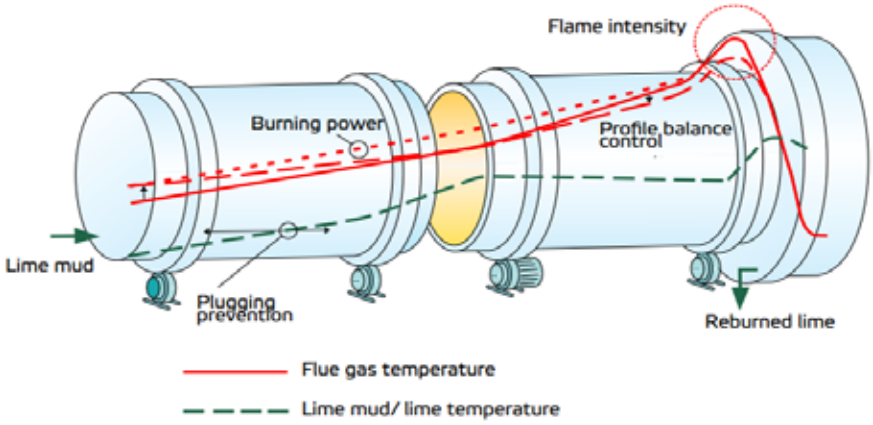
Causticizing optimization Increases quality and strength of white liquor, enhances lime mud solids to the lime kiln, and reduces process plugging by 'overliming' to achieve the following benefits:

- reduced steam usage in digester and evaporators
- increased plant capacity
- increased white liquor strength and stability
- Lower fresh lime usage
- Longer intervals between white liquor filter cleaning

Lime kiln optimization as is well known, lime mud washing is the basis for stable kiln operation. The single most important process variable in lime kiln control is the temperature profile – this has a direct effect on production quality, process availability, and the service life of the process equipment.

It optimizes lime kiln process in order to reduce lime quality variability and implement a target shift to achieve the following benefits

- reduced energy consumption
- Lower CO2 emissions
- increased lime kiln capacity



Power and Mechanical Pulping has three Applications as

1. Valmet DNA Fuel Power compensator
2. Steam network management
3. Mill wide Brightness Optimization

Fuel power compensator balances the entire combustion process to achieve the following benefits:

- reduced over all fuel consumption
- increased steam generation
- reduced environmental impact due to variations in fuel feeding

Variations in solid fuel quality and its mass flow are a significant disturbance source for a stable and an efficient combustion process. Multiple fuels and lacking measurements for those disturbances make it even more complicated. In addition to that, fuel feeding system malfunctions are a potential issue as well. Therefore, a high-class DNA Fuel Power Compensator is inevitably needed for tackling the issues and stabilizing the combustion.

Steam network management optimizes the plant's steam header systems and

Patented

Overview

DNA Fuel Power Compensator compensates the disturbances due to fuel quality and amount variations by regulating fuel feeding respectively. It is based on estimation of fuel power, that is, fuel energy input to the boiler. No additional sensors or transmitters are introduced. DNA Fuel Power Compensator simply calculates the fuel power on-line and compensates it by regulating the fuel flow accordingly. DNA Fuel Power Compensator is a patented solution by Valmet.

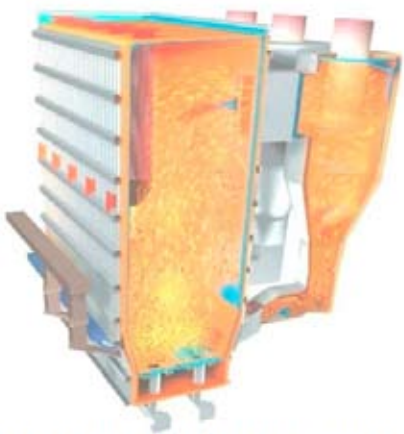
adjusts steam distribution and generation to minimize steam venting and achieve the following benefits:

- reduced fuel consumption
- increased electricity generation

Mill-wide brightness optimization Coordinates brightness agents and unites the pulp and paper making

Process to ensure the following benefits:

- reduced chemical usage
- improved final product quality



DNA Fuel Power Compensator relies on two separate and independent calculation principles by making it a fast and a reliable method: boiler balance and oxygen consumption calculations.

Mechanical pulping optimization Optimizes pulp quality and process production rate to achieve the following benefits:

• decreased energy usage per ton

• increased production

• reduced quality variability

Recycled fiber optimization coordinates the pulping, bleaching and flotation processes, decreases

Brightness and ash variability and improves the deinking process to achieve the following benefits

• reduced chemical usage

• improved product quality

• Increased site yield

Improve and sustain through Industrial IT – An initiative to respond and control issues with effective solutions, resulting a better process stability and environmental friendly approach.

Valmet's process optimization solutions provide an immediate step change in performanceHowever, if we take chemical pulping line as an example, the pulp production process itself has many variables, such as in raw materials, process connections, process equipment, and fuel. The Valmet Performance Solutions for each pulp production process need to be tuned accordingly. Tuning raises the process performance to the guaranteed level, but due to continuous changes in the production conditions, the effect may not be permanent. These Improvements are sustained by continuous monitoring of each individual process by a team of experts either by a physical visit or using latest technologies like Industrial IT concept which involves a secure firewall connection to the mill site from Valmet Service office and expert services are rendered through the secure link to site which allows us to implement new solutions if production targets or parameters change.

There are mainly two ways to make Valmet Remote Connection Solution, they are

- Valmet SCS (Secure Connection Solution)
- Solution for Valmet personnel to provide secure remote services via Internet to end customers
- Valmet Secomea based remote connection
- Secomea products have been tested and are supported with Valmet DNA and Valmet IQ products
- It is always a 100% Valmet delivery and is supported by Valmet
- After that SiteManager establishes automatically encrypted secure connection to the GateManager in Valmet.

In this paper, we report on recent developments from the continuation of the systematic approach for process analysis.

The target of continuing the research and development was to transform the sometimes routine and offline work of a capable process analyst into a system that can produce reliable views of the current control performance in an "almost real-time" manner and compare it to other periods in its history. A remote monitoring, analysis, and warning system has now been developed for this purpose and has been in operation in a few selected pulp and paper processes. This system can identify slowly developing process problems and their root-causes in an "online" manner (normally difficult for operations personnel to recognize without thorough analysis by a process expert or analyst using sophisticated tools). This system can also warn of sudden disturbances of severe nature that require more insight for the operators to handle them effectively. In this latter case, valuable information and the root causes are given quickly to operators by the remote service provider after a quick analysis of the views generated and the associated background data collected by the remote system.