

Profit Suite for Bleaching

Solution Note

Profit Suite™ for Bleaching is a complete bleach plant control solution that includes optimization controls, bleaching business tools, sensors and field instruments. The package economically controls bleach plant operations while optimizing quality control parameters.

Honeywell's Profit Suite for Bleaching consists of dedicated modules providing superior control of the bleaching process. The package architecture supports levels of control ranging from simple valve positioning to the latest in advanced control concepts and optimization. Profit Suite for Bleaching is designed to allow complete integration of new technologies, including analytical sensors and multivariable predictive control.

Powered by Profit Suite, a comprehensive collection of advanced process control and optimization offerings, these innovative applications address increasing business complexity and profitability pressures by effectively managing all aspects of control and optimization. From improving regulatory loop control to optimizing the entire bleaching process, Profit Suite improves pulp quality, reduces chemical usage and maximizes production while integrating the entire bleaching process to drive mill-wide optimization.

Profit Suite for the Bleach Plant supervises the existing regulatory loops and is DCS-independent, although integrating this Honeywell's Experion® Process Knowledge System can control and optimize the entire pulp mill.

Solution Benefits

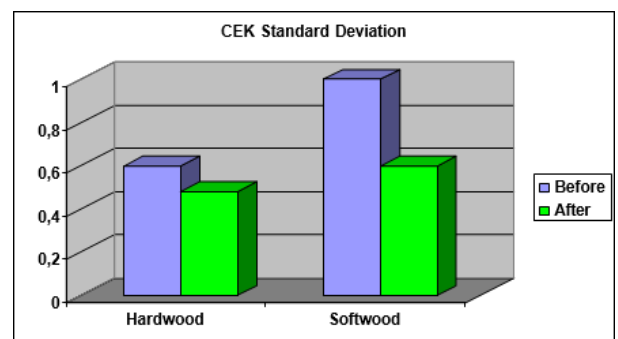
- Reduced bleaching chemical cost by 5 to 7%
- Reduced Caustic Extracted Kappa (CEK) variation by 50%
- Reduced final brightness variation by 50%
- Increased throughput by 3 to 5%
- Stabilized unit operations to minimize environmental impact
- Improved operator productivity
- Reduced operating cost

The solution offers a complete range of modules to enhance your bleaching operation. These modules include:

- Multivariable Predictive Stage Controls
 - Delignification
 - Brightening
- Grade Change Control
- Production Rate Control
- Sensor Correction
- Statistical Process Control Lab Update

Multivariable Predictive Stage Controls

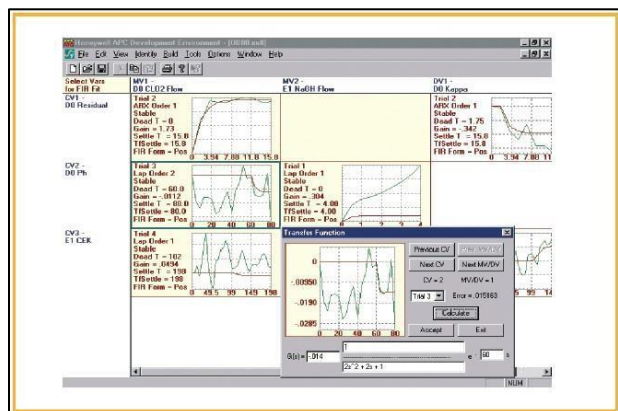
The configurable bleach plant stage controls are based on Honeywell's Profit Suite, a robust multivariable predictive control technology. This technology represents the next generation of control and incorporates true robust design. Better technology leads to lower project implementation costs and greater benefits. Profit Controller provides control and economic optimization of processes that have significant interaction between variables.



CEK Standard Deviation

The controller incorporates a model of the bleach plant process and determines how to adjust the controller's output in order to bring all process variables to the desired setpoints within process constraints. Then, if there are any degrees of freedom remaining, the controller adjusts the process to optimize operations. For example, reducing overall chemical costs while maintaining quality targets.

Bleaching is a highly interactive, multi-input, multi-output (MIMO) process. The real value of this approach to control is that it allows you to envelop the entire bleaching process as a single entity rather than a collection of independent and isolated control loops. Profit Controller thus becomes a tool to keep the process within operational constraints while optimizing performance measures, such as the cost per ton. For example, control of a DO-Eop-D1 bleach plant would include the following:



Profit Suite Development Environment

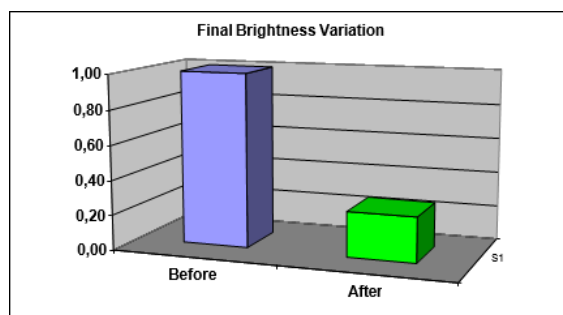
Delignification (DO) –The primary control objective for the first stage of the bleach plant is delignification through oxidation of lignin in the pulp. This stage works in close association with the alkaline extraction stage, where the chlorinated organic compounds produced in the first stage are dissolved, made soluble, and removed in the extraction- stage washer. The control strategy for this stage uses both feedforward and feedback control. The inlet kappa number is used as the primary feedforward variable, and the caustic extracted kappa (CEK) number or brightness reading after the extraction stage is used as the primary feedback variable. The controlled variable (setpoint) may be either degree of delignification or an actual brightness target.

Based on the operator-entered target, the control program will adjust the total equivalent chlorine (TEC) setpoint to maintain a constant CEK or degree of delignification.

Extraction (Eop) –The primary control objective for this stage is to solubilize lignin made susceptible to alkali by the delignification stage. In addition, oxygen and peroxide may be added to provide further delignification and to provide some additional brightening of the pulp. Stock Tracking is used to provide accurate feedforward application of sodium hydroxide based upon applied total equivalent chlorine. However, the key control variable for this stage should actually be the terminal pH in the extraction tower.

This is often a difficult measurement, but through the use of Honeywell's sensor correction module, both in-line direct measurements and lab analysis are used to provide a usable signal.

Brightening (D1) –The most successful method of controlling final brightness is to place an optical sensor after the E stage washer and prior to any chlorine dioxide injection. The measurements from this sensor are used in the Honeywell algorithm to determine the real-time brightness value, expressed as a function of the measured CEK value. Chlorine dioxide addition is based on the developed relationship between this measured CEK and the desired final brightness setpoint. This relationship varies from mill to mill and can be tuned from the engineering schematic on line. This stage is extremely important in the bleaching of shives. Tight final stage pH control of the stock is also maintained due to its strong impact on the efficiency of chlorine dioxide bleaching.



Final Brightness Variation

Automatic Grade Change Reduces Off-Specification Pulp

The Grade Director feature stores the starting values of controller settings for multiple grades in a recipe fashion. When the grade change is initiated, the Stock Tracking function of Grade Director predicts the progression of the new grade through the modeled stages of the plant. At prescribed timing (or on demand), Grade Director sets mill-selected low limit and high limit values for controller variables. Limits can be ramped to their new values at specified rates. Grade-specific controller models and tuning parameters also can be loaded at prescribed times. The timing adapts to changing production rate and vessel inventories to reduce transitions times and produce consistent grade qualities.

Production Rate Control

The Production Rate Control changes the stock flow according to a new desired production rate setpoint. During the ramping of production rate, all critical control loops in the bleach plant are monitored. When applicable, the production rate control changes can be coordinated with the upstream and downstream process units. The target value for the production rate is then dependent on the overall desired inventories capacity. Control of the high-density inventories balance will improve the operation of the Fiberline by continuously monitoring and modulating the production rate to and from each process units using the large inventory storage to smooth production rate changes and mitigate product qualities variation.

Statistical Process Control: Lab Update

Any inferential model has error due to either random variance or systematic causes. Random variance sources include lab variability, process variability at sample time, uncertainty of sample time, etc. Updating models with lab values whose variance is random can lead to increased variability in product qualities. Such updating should not be performed. Systematic causes of model error, such as model assumptions, unmeasured process disturbances, or changes in lab technicians, can cause a shift in the bias between the process and model. Lab values indicating such a shift should be used to update models.

Improve Mill Performance

Profit Suite for Bleaching is a key element of Honeywell's Pulping Solutions. These solutions are designed to improve quality and operational flexibility, reduce operating costs, maximize production and minimize environmental impact.

Profit Optimizer

Profit Suite for Bleaching can incorporate an application that provide a cost effective and user-friendly solutions to real-time optimization (RTO) problems. It solves multi-stage optimization at minute-by-minute basis. By using an overall economic model, and accounting for constraints within and between operating units, Profit Optimizer can determine setpoint that are both optimal and feasible across the process.

Profit Optimizer provides an additional level of optimization and control benefits by enabling the shifting of the bleach load across the more efficient bleaching stages.

Profit Suite Support Services

Profit Suite comes with premium support services through our Benefits Guardianship Program (BGP). BGP is designed to help our customers improve and extend the usage of their applications and the benefits they deliver, ultimately maintaining and safeguarding their advanced applications.

For More Information

Learn more about how Honeywell's Profit Suite can improve your plant operation by visiting our website www.honeywellprocess.com or contact your Honeywell account manager.

Honeywell Process Solutions

1250 West Sam Houston Parkway South Houston,
TX 77042

Honeywell House, Skimped Hill Lane
Bracknell, Berkshire, England RG12 1EB UK

Building #1, 555 Huanke Road, Zhangjiang Hi-Tech
Park,
Pudong New Area, Shanghai, China 201203

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