Package Software for Optimizing the Cooperative Control of Stock Preparation and Paper Making

The package software for optimizing the cooperative control of stock preparation and paper making reduces substantially the amount of time required for grade changes by automating the grade change operations in paper mills.

The paper grade is determined by the blending of raw materials and dyes (ash ratio and color) in the stock preparation process and by the forming and drying (basis weight and moisture) in the paper making process. Although the controls in the two processes interfere with each other, both processes have been controlled independently without synchronization between them in the field. By coordinating the operations in both processes, this package software provides a new control strategy that enables the control variables such as ash ratio and basis weight to reach the target values automatically in the shortest time.

Faster grade changes help save resources and energy, and thus contribute to the sustainable development goals (SDGs).

MAJOR FEATURES

- Coordination between operation timings of stock preparation and paper making processes
- Multivariable feedforward control by finite settling-time response method
- Automatic calculation function of recommended values for set variables (SVs) based on big data analyses using past accumulated grade change data
- Grade change data analysis function (such as historical analysis of grade change time)

SYSTEM CONFIGURATION

This package runs on an independent PC (coordinated control PC) that is connected to the DCS system of the stock preparation process and the quality control system (QCS) of the paper making process through OPC (Figure 1).

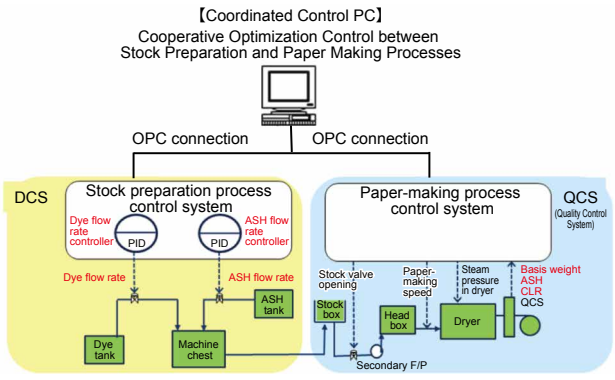

Figure 1 System configuration

SYSTEM REQUIREMENTS

DCS	CENTUM CS3000 R3.07 or later version
QCS	B/M9000CS R5.03.01 or later version

OUTLINE OF CONTROL OPERATIONS

- The operation timings of stock preparation and papermaking processes are coordinated with each other taking the time constants and dead times of each final control device/element into account, which enables the control variables to reach the target values in the shortest time. The sequence from start to completion of a grade change is completely automated (Figure 2).
- The finite settling-time response method is applied for controlling each final control device/element to make the controlled variables converge without any deviations from the target values within a finite time (Figure 3).

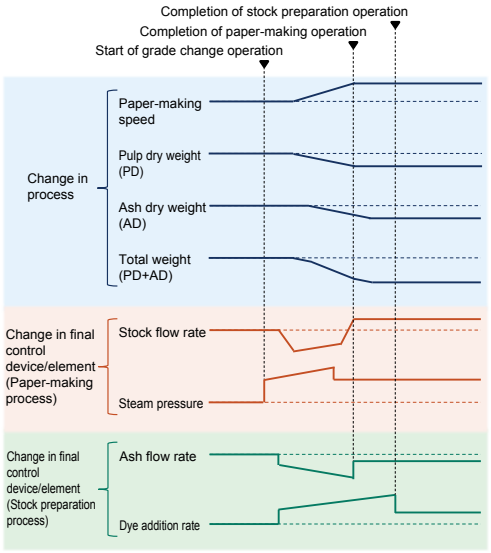

Figure 2 Example of operation trend in coordinated control

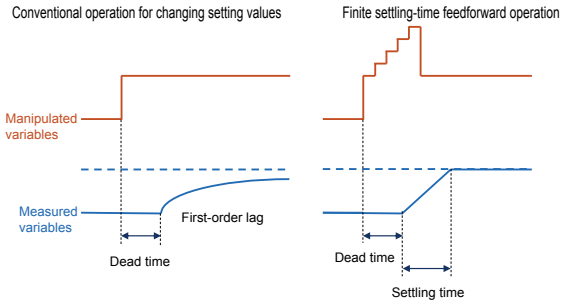

Figure 3 Finite setting-time response method

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