

Experion MX Color Control



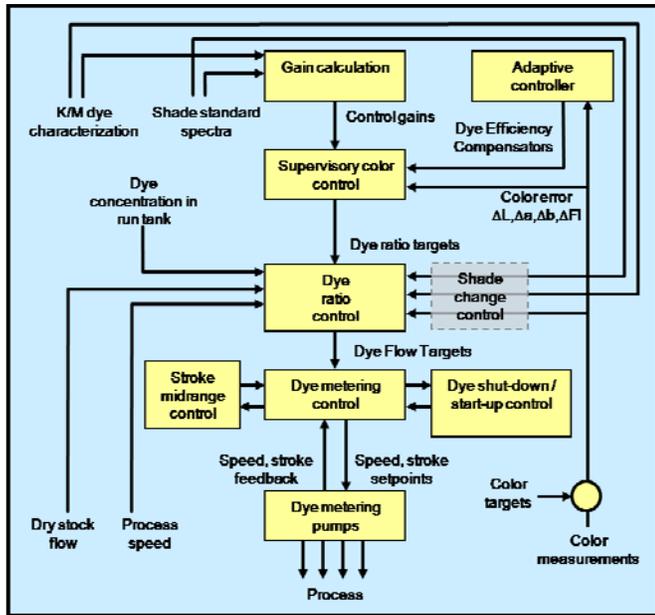
Experion MX will help improve your business performance in today's challenging economic environment. This fully integrated quality control and process knowledge system provides superior visibility into the papermaking process while it simplifies your operational efforts and is easy and cost effective to maintain and service. Improve paper quality, reduce raw material, energy, services and maintenance costs, and increase production efficiency with a package of solutions that provides the lowest total lifecycle cost available – Experion MX.

Color Control Models Q5976-51, -52 and -53

Experion MX Color & Fluorescence Control uses on-line color measurements, a mathematical model of process dynamics, Kubelka-Munk dye characterization, and a multivariable controller to control up to three color-coordinates (typically L,a,b, or L*, a*, b*), and fluorescence index, to target values. The control package manipulates up to six dyes and fluorescent whitening agent for each color-grade. With better control of color, your business performance will be enhanced by improving product quality and uniformity, and increasing production efficiency.

Features and benefits

- Designed to interface directly to dye metering pump controllers or send dye ratio setpoints and receive dye metering feedback and control status information via OPC or other communications protocol with independent DCS or other system.
- Supports metering of neat (as-received) or dilute dyes.
- Includes pump-stroke-midrange control to correct a stroke-limit condition in multiple-head pumps.
- Provides dye shutdown / startup feature to prevent stock overdyeing during extended sheet breaks.
- Control based on dye ratio units (weightdry dye / weightdry stock) is independent of production rate, enabling feedforward compensation for production rate changes in dye metering outputs.
- Dead-time compensated controller compensates each control action for earlier actions still in the process, enables a control action at the end of every scan, and is automatically adjusted for machine speed changes.
- Alpha-tuned controller provides easy control tuning - a single variable adjusts control response.
- Multivariable controller is critical for highly interactive processes such as color control, compensating all color variables for a control action to one color variable
- Gain matrices for the color control are calculated automatically for each color-grade, eliminating the need for manual control tuning.
- Includes an Automated Dye-Efficiency-Compensator fine-tuning feature to match control characteristics to changing dye efficiencies resulting from changes in such process variables as ash content or pH.
- Master & slave dyes feature treats two dyes as a single supervisory dye to remedy color two-sidedness, metamerism or other color-control problems.
- Color coordinate weighting feature allows the operator to assign a weight to each color coordinate, indicating to the control how tightly that coordinate must track the setpoint when less-than-optimum control conditions occur.
- Fluorescence index control can optionally be integrated into the color control.



Color control overview

Color control foundation

The control's foundation is dye ratio units, or weight of as-received dye to weight of dry stock, typically expressed as ppm, oz./ton, lbs./ton, or kg/ton. Dye ratio units are, by definition, independent of production rate, enabling feedforward compensation in dye metering outputs for production rate changes. From dye ratio units, the control uses the concentration of each dye as it is metered, to calculate dye flow setpoints. The control then calculates metering pump stroke and speed setpoints, based on pump-head diameters, for output directly to the metering pump stroke and speed controllers. This software module includes a stroke-midrange feature to re-range bank speed and all affected pumps' strokes, if one pump stroke reaches a limit. In addition, a dye shutdown / startup feature is provided to prevent stock overdyeing during recirculation at sheet breaks.

Supervisory color control and gains determination

Because dyes typically impact more than one color coordinate, Experion MX Color Control uses an intrinsically multivariable approach to calculate dye ratio setpoints to correct color coordinate errors. Control gain matrices for the color control are calculated automatically for each color-grade, based on the spectrum of the target color and Kubelka-Munk characterization of dyes selected for control, eliminating the need for manual control tuning for each color grade. Color Control commissioning consists of dye library and color-grade file creation in the system, and brief process tests to determine

dead time and time constant, and to optimize a single control tuning constant that defines aggressiveness of control response.

Color control fine-tuning

Experion MX Color Control includes an Automated Dye-Efficiency-Compensator fine-tuning feature to match control characteristics to changing dye efficiencies resulting from changes in such process variables as ash content or pH. Use of this feature consists of one button-push for operator initiation, and a second button-push for operator acceptance or rejection of the recommended control modifiers at the completion of the process. This easy-to-use feature ensures optimum control performance under a wide range of process conditions.

Dead-time compensation

To provide tight color control to targets, control outputs are made at the end of each color sensor scan across the sheet, through use of process dead-time compensation. The sum of previous control moves that are still in-process are subtracted from the current control move, enabling control outputs every scan and preventing oscillatory or unstable control. Dead time compensation is automatically retuned for process speed changes, to ensure optimum control under all dynamic conditions.

Master & slave dyes

To remedy color two-sidedness, metamerism or certain other color-control problems, the master & slave dyes feature in the Experion MX Color Control can treat two dyes as a single supervisory dye. The two dyes are applied in an operator-entered ratio and metered through separate dye metering pumps. This feature is available for all three supervisory dyes, resulting in support for a total of 6 supervisory dyes for each color grade.

Color-coordinate weighting

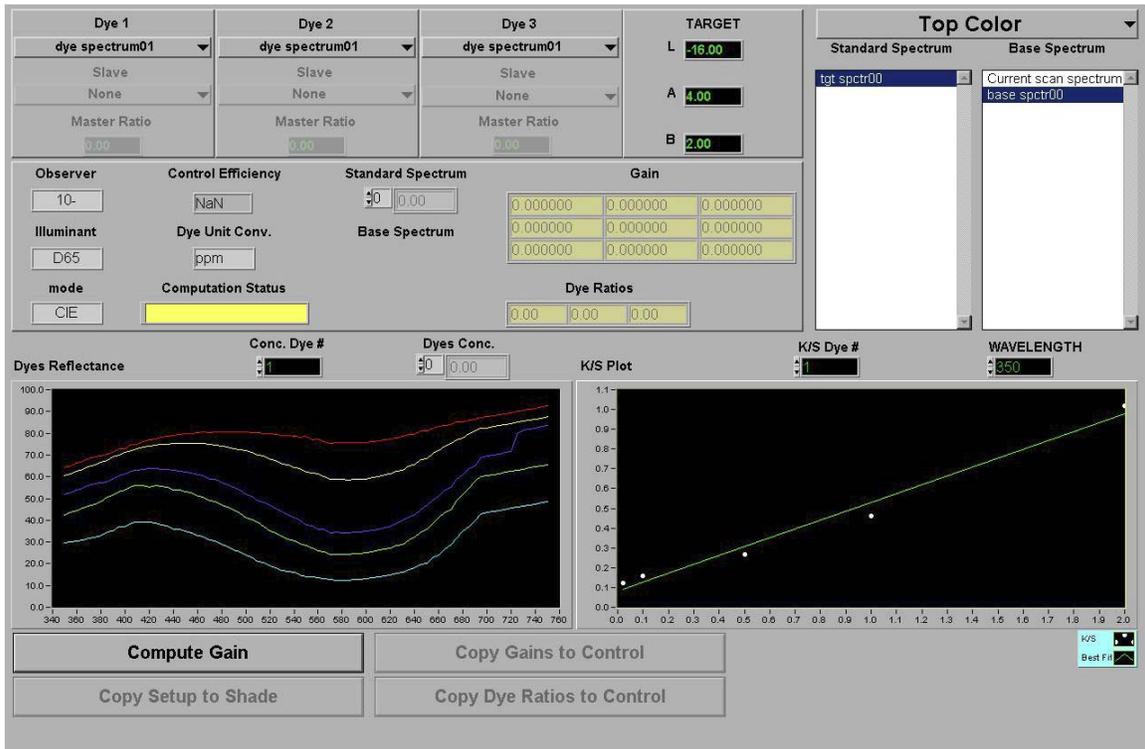
In the event that a dull or over-colored furnish forces the color control to drive one or more supervisory dye ratios to zero, it becomes impossible to provide optimum control for all three color coordinates in some conditions. The color coordinate weighting feature in the Experion MX Color Control allows the operator to assign a weight to each color coordinate, indicating to the control how tightly that coordinate must track the setpoint when less-than-optimum or constrained control conditions occur.



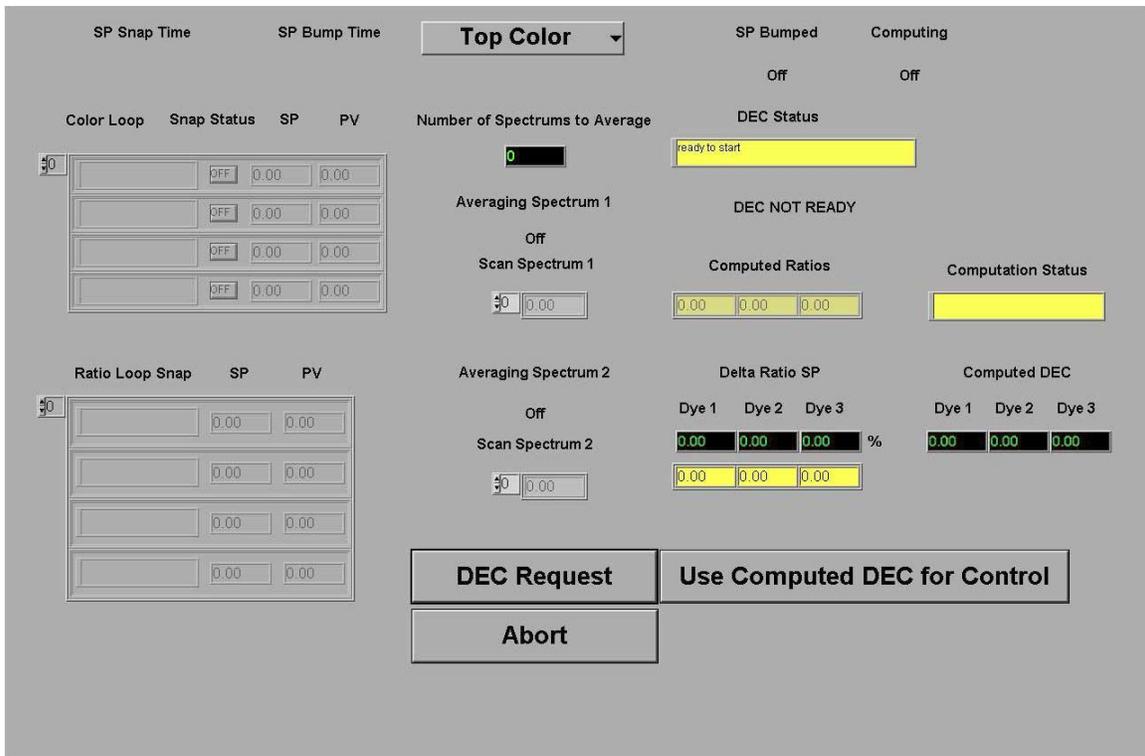
Control display with color space window

Diagnostics and Tools

For the control commissioning and diagnosis, a suite of maintenance and help displays supports the control configuration, tuning and maintenance

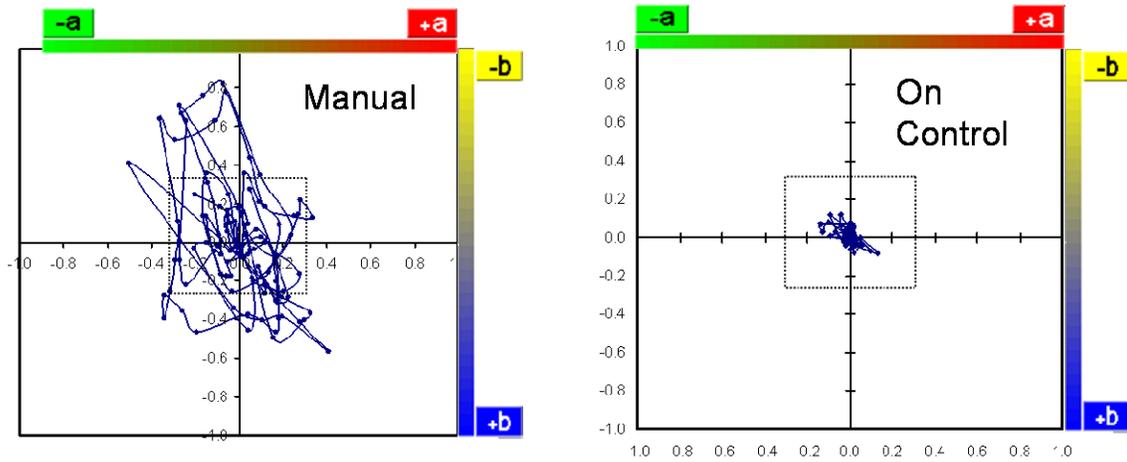


Gains calculation display



Automated dye efficiency compensator display

Results



Color control in manual vs. on-control shown in color space window

Specifications

- Model Q5976-51 is color control for 1 supervisory dye
- Model Q5976-52 is color control for 2 supervisory dyes
- Model Q5976-53 is color control for 3 supervisory dyes

Prerequisites:

Color measurement, Model Q4215-50

More Information

For more information on Experion MX, visit www.honeywell.com/ps or contact your Honeywell account manager or field service leader.

Automation & Control Solutions

Process Solutions
Honeywell

1250 West Sam Houston Parkway South
Houston, TX 77042

Lovelace Road, Southern Industrial Estate
Bracknell, Berkshire, England RG12 8WD

Shanghai City Centre, 100 Junyi Road
Shanghai, China 20051
www.honeywell.com/ps

PN-11-10-ENG
May 2011
© 2011 Honeywell International Inc.

Honeywell