ADVANCED DIGITAL SERVICES

Paper Machine Color Optimization

Identify opportunities to improve color system performance and product quality

ABB Paper Machine Color Optimization follows a three-step methodology—Diagnose, Implement and Sustain—to audit, improve and maintain the improved efficiency of paper machines producing colored or optically brightened paper grades.

Typical issues affecting color system performance

- On-line and off-line color sensors do not match
- Dye delivery system not providing optimal good color control
- Dye usage is more than necessary
- Color control system needs re-tuning
- Color product quality responds poorly to shade changes, startups and sheet breaks
- Color change times can be reduced with improvements to shade change procedure
- Color variation is uncontrollable

Diagnose

The Diagnose step analyzes color measurement variability, dye delivery, color response, and utilization to establish a 'fingerprint', a unique performance benchmark of overall color performance. The resulting diagnostic report provides efficiency improvement recommendations and associated estimated return on investment. It is a platform-independent, non-invasive service.

Uncover high impact opportunities to improve color process with a proven data analysis methodology, applied by knowledgeable optimization engineers experienced in helping mills and plants achieve world class operational efficiency. The subsequent report, with solutions prioritized by financial benefit, will help you to quickly address and bridge performance gaps, and set a foundation to sustain continuous improvement.

Performance Indicators

To arrive at the performance benchmark, comprehensive surveys and analyses are performed to audit five key Performance Indicators and assess color performance. Data collection for the surveys requires three to five days.

- **Color Variability:** Measures sheet color product quality from a variability perspective. This index provides insight to product quality, lab tests, controllable and uncontrollable disturbances, and sensor accuracy. Key machine direction process measurements (e.g. dry sheet weight, moisture) are also collected to identify correlation to observed color measurement variability.
- **Color Response:** Measures how the machine responds to step inputs during automatic and manual operation. Up to five shade changes are observed during data collection, and analyzed to determine general performance and typical time to reach the new shade. Additionally, it provides information that related to speed of response, reel to reel color variability (reel 2-sigma), sheet break recovery, start-up time, and grade change recovery.
- **Utilization:** The large number of options in the color control configuration are examined to determine if operator interaction or color control performance

can be improved. Operator interface display graphics used for color control will also be analyzed.
- **Dye Delivery:** Color control response time after sheet breaks, shade changes, and grade changes can be directly influenced by the dye delivery system. The dye delivery system configuration and operation will be documented, including pump types, addition points on the paper machine, dye changes during shade changes, and operation during sheet breaks.
- **Historical Analysis:** The past 3 – 6 months of color reel reports are analyzed in order to determine the long term color variability and dye usage, and identify measurement variability step changes or increasing / decreasing trends. If historical off-line and on-line color sensor target data is available the ability to achieve on-line sensor offsets can be evaluated.

Reporting

The diagnostic report includes an implementation plan with practical solutions to resolve performance bottlenecks and raise the performance level of the system to its mechanical constraints. Supporting data collected during the color process diagnosis is presented, along with associated financial impact for each recommendation. Recommended solutions may include:

- Improving dye delivery
- Isolating color product variability related to process interactions
- Optimizing or adding control logic
- Updating operator procedures for shade change, startup, and sheet break recovery
- Re-tuning color control loops

Implement

Once improvement recommendations have been defined, steps to increase performance, while creating a foundation for continuous improvement, can begin. Services to implement improvement recommendations are in addition to the diagnose service and priced separately.

Improvement recommendations may be implemented all at one time, or scheduled to be completed incrementally over time; beginning with improvements that provide the greatest financial return. is available to implement the improvements, or work along with site personnel to achieve the desired optimization level.

What sets this solution apart

- **Trusted process:** The diagnostic service modules are delivered consistently, provide an accurate assessment, and ensure a practical corrective action plan can be identified.
- **Proven method:** Trial and error methods to achieve results are eliminated, or greatly reduced, when this diagnostic method is used to arrive at targeted corrective actions.
- **Your choice:** The included implementation plan gives you the options to make improvements yourself or employ ABB to implement recommendations.
- **Exclusive tools:** ABB Service engineers have the diagnostic and troubleshooting tools for data collection and platform and process analysis allowing them to deliver the assessment and additional implementation services consistently.
- **Return on investment:** The findings quantify performance gaps in terms of dollars, showing you the financial benefit from implementing the improvement recommendations.

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