

Machine Direction Transition Optimization

Uncover costly issues and quantify the financial benefit of optimum grade change

Typical issues hindering machine direction (MD) transition performance

- Time spent on grade change exceeds the industry standard
- PID control loop performance doesn't meet grade change requirements
- Scanner-based MD control loops don't meet grade change requirements
- PID setpoint predictions (e.g. stock flow and steam pressure) don't meet new product targets
- Headbox contributes to significant fiber and moisture upsets during grade change
- Current grade change procedures are not consistent for all operators
- Overlooked limiting process measurements slow down grade changes

Solutions to boost performance

ABB Machine Direction (MD) Transition Optimization follows a proven three-step methodology to Diagnose, Implement and Sustain improved paper machine performance. The diagnostic step is an industry proven assessment that provides a unique performance benchmark and implementation plan with associated ROI.

Diagnose

The diagnostic step is the first step to reducing product variability and improving paper machine transition, or grade change performance. It is a platform-independent, non-invasive service that can be applied to machines with frequent grade changes. Most machines that average one to two grade changes a day can benefit from this fingerprint.

The benchmark can be used as a standard to compare product transition performance from year to year. While the implementation plan provides detailed ROI based solutions designed to insure improved process quality and production. Typically, mills that take advantage of the implementation plan have benefited with a six month or better payback, and a return of 4 to 5 times the cost of the service.

Key performance indicators

The following key performance indicators (KPI) are measured to analyze variability information unique to your process. These show how the machine is performing relative to itself and others over time, and where the best improvement opportunities are.

- **Transition:** The time from the start of the grade change to the point at which all process measurements are within the new product specification. Process specification limits are defined for this KPI, and the corresponding process measurements are quantified for each grade change. In addition, the weight ramp rate, moisture deviation, and the level 1 setpoint prediction error are all included.
- **Moisture response:** A key factor to a successful grade change. Includes the maximum and minimum moisture measurement during and after grade change. It also identifies to what level headbox pressure upsets affect the upstream moisture and dry weight measurements during grade change. Headbox pressure (total head) PID actuator bump tests are performed with the MD control loops in manual mode. This testing is especially important for airpad and dilution headbox types.
- **Control response:** Closed loop response for each level 1 PID control loop and level 2 MD scanning based control is used during grade change. To

Transition KPI	Moisture response	Control response	Setpoint prediction
Information on quality measurements during grade change and limiting process measurements	Information on upstream and reel moisture response during grade change, upstream and reel moisture response to headbox changes	Information on level 1 PID response, and level 2 control response	Information on level 1 steam pressure setpoint prediction, and level 1 stock flow prediction
Quantifies grade change time for 30 to 60 grade changes	Evaluates moisture response during grade changes	Evaluates control response during and after grade change	Evaluates grade change level 1 setpoint prediction

achieve the best grade change possible the setpoint response time for each level 1 PID and scan level loop must be in an acceptable range.

- **Setpoint prediction:** The grade change auto package uses a prediction model based on MD control modeling parameters, normally not a good fit for grade transitions. Previously benchmarked data will be used to identify a more suitable model.

Analysis is performed using ABB's Transition Analyzer software, to quickly visualize at least 30 to 60 grade changes over a period of one to two months. The visualization includes plots with identified transition start and stop times for each process measurement, high and low process specification limits, and start and stop values for each process measurement.

Implementation plan

The results of the grade change diagnosis are described in a comprehensive report that includes an implementation plan. This plan provides recommendations for corrective actions, prioritized by severity and effort required to achieve solutions. In addition, the estimated financial benefits are provided.

Based upon the findings, recommendations may include but are not limited to level 1 PID control, level 2 MD control, optimizing or adding control logic, updating operator procedures for grade change, or re-tuning transition setup.

Implement

Once improvement recommendations have been defined, steps to improve performance, while creating a foundation for continuous improvement, can begin. Services to implement improvement recommenda-

tions are in addition to the diagnose service and priced separately.

Approved improvement recommendations can be implemented all at one time, or scheduled to be completed incrementally over time; beginning with improvements that provide the greatest financial return. ABB is available to implement the improvements, work with site engineers, or work along with site personnel to achieve the desired performance level. What sets this solution apart

- **Trusted process:** The Machine Direction Transition diagnostic consists of well defined service modules that 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, employ ABB's Advanced Services team to implement recommendations, or some combination of both.
- **Exclusive tools:** Only ABB has the diagnostic and troubleshooting tools for data collection, and platform and process analysis that allows all ABB service engineers to deliver the assessment and additional implementation services consistently.
- **Return on investment:** The findings quantify the newly discovered performance gap in terms of dollars, showing you the financial benefit from implementing the improvement recommendations.