

# Intelligent scanning

Minimizing ever-present upset or transition losses can improve efficiency, reduce paper waste and lower costs

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A paper machine's quality control system (QCS) can play a major role in making incremental improvements that can add up to a significant end result. In fact, control of the papermaking process during upsets and transition periods provides a very attractive potential for a return on investment.

Control system engineers have recently questioned whether the traditional single speed, back and forth traversing of a scanner really suits the needs of all paper machine control situations, especially during unsteady-state operation. During a start-up, grade change or after a web break, a QCS literally must go into "overdrive" to manage upsets or transitions precisely with as little wasted time and paper as possible.

Metso Automation engineers have significantly redesigned and improved the scanning control function to provide more precise control during these unsteady situations. Moreover, the new intelligent scanning control function, combined with high-speed quality sensors, has opened opportunities for many online diagnostic functions that can be used to improve paper quality, machine stability and process efficiency.

## ACHIEVING STABILITY, LOWERING WASTE

The new PaperIQ Select QCS introduces a totally new concept for the scanning of paper quality measurements. The new intelligent scanning function is selectable and adaptive to suit the control situation and the process state; it is a major improvement to traditional scanning methods.

The typical tireless scanning of paper sensors back and forth across the sheet at a fixed speed is

often taken for granted. Scan speed has been chosen to move the sensors across the sheet quickly, with an optimum CD resolution for good controls and a relatively fast response to MD upsets. This traditional fixed speed scanning has served its purpose as a one-size-fits-all solution.

In contrast, QCS scanning speeds and scan widths can now change in response to the differing control responses required for steady state operation, and transition or upset conditions like grade changes, coating blade changes, start-ups and break recovery periods (Figure 1).



Figure 1. The PaperIQ Select system's new intelligent scanning function is selectable and adaptive to suit the control situation and the process state; a major improvement to traditional scanning methods.

Many new intelligent scanning capabilities are built into the new QCS. First, in the steady state condition, the forward and reverse scanning speeds can be considerably different. The different frequency response characteristics improve the separation of MD and CD variations. Specifically, varying scanning speeds, accelerating and decelerating near the sheet edges, and increasing the edge dwell time significantly reduce any false information from MD variations when using a single-speed scanning pattern. The result is better profiles for improved CD controls.

When planned transitions or unexpected process upsets occur, controls must respond quickly and paper quality measurements must be updated more frequently in response to the upset condition. This is where the new intelligent scanning function is used effectively.

MD update times are improved with the Intrascan feature (Figure 2), which decomposes the scanning measurements into MD and CD components through a combination of sophisticated estimation techniques, thereby improving the MD control response. Moreover, during planned transition periods like machine start-ups, production rate changes, grade changes and blade changes, the scan speeds and scan widths can be adapted to suit the MD and CD control needs. Using multi-variable control models for MD and CD, paper quality is thereby stabilized more quickly. Similarly, after unplanned disturbances like web breaks, corrections to sheet quality are made quickly and surely, shortening the break recovery period.

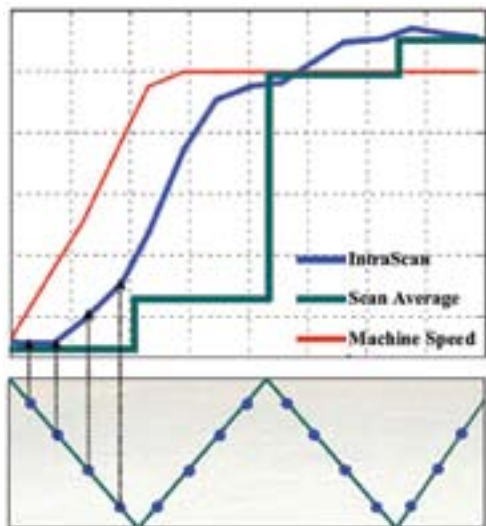


Figure 2. MD update times are improved with the Intrascan feature, thereby improving the MD control response. In this example, Intrascan, which decomposes the scanning measurements into MD and CD components through a combination of sophisticated estimation techniques, generates frequent MD updates during a machine speed change.

## ONLINE ANALYSES

With intelligent scanning, fixed point MD analysis is an everyday online tool available to be activated on demand for troubleshooting or selectively scheduled to evaluate machine stability. Special MD or CD analyses also can be triggered. To activate these modes during normal steady state scanning, ongoing calculations of MD and CD variations can be compared to machine benchmarks. If larger than normal varia-

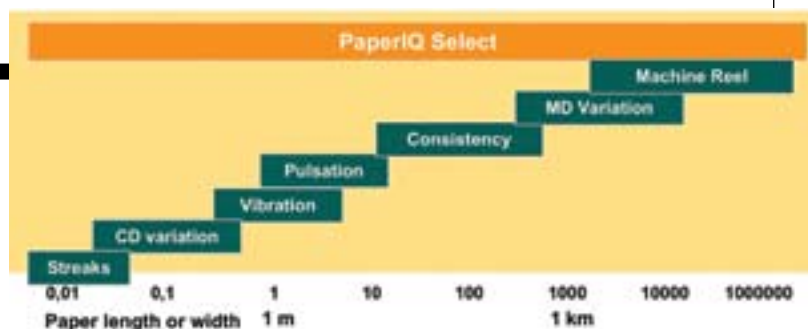


Figure 3. The multi-band spectrum analysis can be compared to typical disturbing elements, MD pulsations and CD streaks in the papermaking process.

tion is seen at certain frequencies, the fixed point analysis mode is activated for MD analysis or a special short scan or “mini-scan” is initiated for a detailed MD and CD analysis in an isolated problem area of the paper web.

The rapid response of PaperIQ Select paper quality measurements and the data analysis provided by built-in Fourier analysis, is a powerful combination that can help isolate and correct the sources of machine instabilities. The multi-band spectrum analysis provided by the system can be compared with typical disturbing elements in the papermaking process (Figure 3).

Regular online variability analyses can be used to evaluate machine stability and compare it to industry benchmarks. In the long term, these diagnostics can be used to make regular improvements to the process for better machine efficiency and product quality.

## IMPROVED EDGE QUALITY

As part of the normal scanning routine, PaperIQ Select measurements can focus on the web edges to give a more detailed view of the MD and CD variability. This is not like the zoom of previous years; the edge-focused analysis is made possible by MD-aligned sensor configuration, measurement geometry, precise edge detection and a tailor-made control of the scanning function.

A slower scan speed across the area of interest, coupled with the high speed of measurement response, will reveal much more detail about the critical edge areas. This detailed information about the web edges can be used to fine-tune operating procedures and process design to improve edge quality and stability (Figure 4). <sup>360</sup>

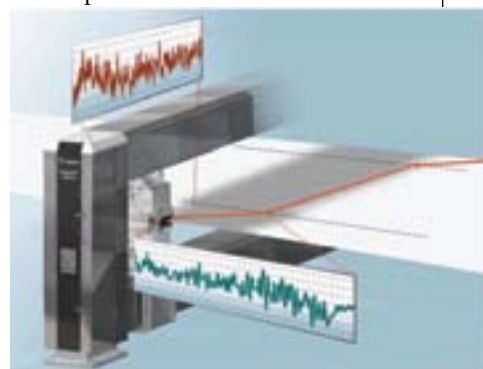


Figure 4. PaperIQ Select measurements can focus on the web edges—or the edge rolls—to give a more detailed view of the MD and CD variability.

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