OPTIX™ Applied Intelligence – The only real-time quality measurement for tissue production

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*Improving mill operator and production efficiency via artificial intelligence (AI) and machine learning*

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Real-time finished quality measurements (i.e., dry tensile, wet tensile, bulk, etc.) can significantly improve tissue mill operations and decision making. However, real-time physical sensors do not exist for these quality parameters. The only way to achieve real-time insights is through mathematical predictions generated using artificial intelligence and machine learning. Solenis’ OPTIX™ Applied Intelligence is leading the industry by providing enhanced process visibility with an analytics platform that uncovers mill improvement opportunities not previously possible.

With increasing availability of instrumentation and use of centralized data historians, mills are collecting vast amounts of data that provide them with ever-increasing visibility into their processes. Tissue manufacturing can have as many as 10,000 data historian tags that are associated through highly complex, multi-dimensional relationships. Traditional data analytic tools are largely reflective, time-consuming, and have specific limitations in highly variable, continuous-process manufacturing like the tissue industry.

These tools simply cannot handle the computations required to evaluate this level of complexity and nonlinearity in real time.

Predictive analytics supported by machine learning can provide real-time quality measures that remain robust and accurate in the face of changing machine conditions. These adaptive quality “soft sensors” allow for more informed, on-the-fly decision making, rapid change detection, and process control optimization without requiring periodic model tuning.

*Figure 1.* (a) Comprehensible relationships between bulk, tensile, and basis weight; (b) Causal network showing multidimensional relationships between bulk, tensile, and basis weight, and numerous other predictors.
**THE SOLENI SOLUTION**

OPTIX Applied Intelligence is a novel adaptive analytics platform built with the latest artificial intelligence (AI) and machine learning capabilities available today. OPTIX was developed to provide an advanced digital service for the mill of the future. It incorporates Solenis’ customer- and quality-first philosophy, which means it can be tailored to every mill’s unique processes. Using process data, laboratory measurements and tissue making process knowledge, Solenis applies robust data science to provide an adaptive soft sensor. Unlike other data analytic tools, OPTIX does not require time-consuming data interpretation but rather provides a real-time, calculated value for critical quality parameters.

Solenis’ data scientists carefully evaluate mill process data using sophisticated data collection, cleaning and mining techniques. Advanced data mining practices, such as multiple regression and causal networks, reveal multi-dimensional relationships between the response variable and predictors that are not easily identified other ways. Figure 1 illustrates the data relationship awareness without OPTIX as compared to the complex relationships that can be identified using OPTIX. Solenis employs a proprietary screening methodology that allows OPTIX to focus on the most important tags needed to drive the machine-learning, predictive platform.

It is crucial for analytics platforms to adapt to the ever-changing environment of the tissue making process. Solenis’ predictive models incorporating machine learning adapt to changes in the process by learning from observations and interactions. This information drives shifts in the predictive model aimed at maintaining prediction accuracy. This level of machine learning is built into the platform, which is why OPTIX measurements remain robust and accurate in the face of changing machine conditions. Figure 2 shows how a static predictive model can lose prediction accuracy over time, whereas the machine learning algorithms built into OPTIX constantly tune predictive models and preserve prediction accuracy in real time. Each OPTIX model is also reinforced with a self-diagnostic prediction accuracy monitor, which calculates the difference between the prediction and value of the actual lab measurement.

**INFORMED DECISION-MAKING**

The real-time, data-driven, quality measures delivered by OPTIX allow for more informed, on-the-fly decision making and enable a step change improvement in mill optimization not previously feasible. Operators can confidently make more refined, economical, and timely process adjustments that are less prone to error or reactive to outliers. Improved process visibility and informed decision making provided by OPTIX enables mills to change...

![Figure 2](image-url) *(a) Predictive model using poor prediction techniques that oversimplify the process; (b) Predictive model with the same data utilizing OPTIX, which is capable of handling tissue machine process data using machine learning techniques.*
Figure 3. Real-time prediction trend. Green and yellow points indicate predictions and black points indicate actual lab measurements.

Figure 4. (a) Real-time prediction of basis weight; (b) Real-time prediction of MD strength.
their manufacturing approach from reactive to proactive.

Until now, machine control decisions managed using periodic lab tests have presented numerous inherent limitations, such as low frequency of data, lack of machine direction (MD) data, and the existence of both measurement error and human error in lab tests. Quality data received after the reel production, roughly 45 minutes or longer, is too infrequent for tissue makers to proactively make process changes. This leads to increased off-quality product, material and energy waste. Now, OPTIX provides high-frequency data every 30 seconds. As Figure 3 shows, OPTIX real-time prediction provides significantly more insight into the primary quality parameter than physical lab measurements alone. For the first time, tissue makers can have a real-time, machine-direction quality profile for the entire length of the reel.

**SIGNIFICANT RETURN ON INVESTMENT**

Implementation of OPTIX also presents value-creating opportunities not previously available. In real time, operators can see the immediate impact of process adjustments to the finished quality parameters allowing for optimization of key process variables. As shown in Figure 4, a customer was able to reduce basis weight by approximately 2% while driving the primary strength quality parameter to an optimized state. The basis weight adjustment unlocked an annualized fiber savings potential of approximately $500K.

Real-time predictions become invaluable during critical process changes such as grade changes. By closely monitoring the impact of process adjustments on the finished quality parameter, rapid grade change is possible. Figure 5 illustrates the swift grade change possible when the operator utilizes tissue making process knowledge and the process visibility provided by OPTIX. Additionally, operators can utilize OPTIX real-time predictions to proactively make process changes to avoid off-grade tissue production and optimize target adherence. Ultimately OPTIX enables improved quality consistency resulting in less downgraded or re-pulped products.

**CONCLUSION**

OPTIX Applied Intelligence is the most comprehensive predictive analytics tool available for the Pulp and Paper industry. By utilizing machine-learning, the platform remains accurate and robust in continuous process manufacturing. The real-time, actionable quality measures generated by the soft sensors allow operators to make informed, on-the-fly decisions resulting in optimize tissue production.

Let Solenis be your guide through advanced analytics. For additional information, visit www.solenis.com/OPTIX.

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**Figure 5.** Real-time predictions of strength as visible during grade change.