

Standardized pulp and paper quality testing for process optimization and control

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In all types of mature production, constant improvements are required for a company to stay competitive. Today it is more important than ever. Search for cost reductions and improved efficiency is always on the agenda. In the pulp and paper industry the goal is to produce a product within given specification at the lowest possible cost – quality testing and monitoring of the process is one way getting there.



Monitoring and control of production targets in the process

Real time data directly from the process line makes it possible to monitor and optimize the process over time – to stay within specification. Real time data can reveal where in the process the quality changes take place and what has an influence on what. Real time data can be integrated in the DCS and QCS systems for monitoring together with other process data. Integrated data is an excellent base for application of modelling and prediction tools, which can further improve the information to the operators. Without accurate and reliable process data, operators and other staff cannot optimize the process and thereby not utilise the full potential of the process.

Integrated quality testing along the process line

Lorentzen & Wettre provides automatic quality testing systems close to the process (both on pulp and paper) for control and optimization, based directly on relevant and accessible data, in the operator systems. This means that skilled personnel no longer need to perform repetitive routine work, giving them more time to improve the quality and process. Integrated quality testing along the process line makes it possible to change the production target over time and thus save money. Return on investment is often less than a year.

Table 1: Typical savings according to customer survey:

	Average	High
Production increase	0.17%	1.5%
Additive usage reduction	2.2%	5%
Claims reduction	9.12%	20%
Fibre usage reduction	0.23%	1.5%
Breaks reduction	7.21%	30%
Cull reduction	8.24%	20%
Manpower reduction	1.24 per shift	3 per shift

Constant small improvements lead to huge improvements in the long run. Many disturbances origins in the wet end and these can be measured online to predict the final paper product from wet pulp properties, which is the main purpose of pulp quality testing. Further, if we know the impact from the pulp properties on the final product, we can optimize and control the process for best economy.

Following properties and methods can be used to characterize the pulp quality:

- Freeness (CSF/SR)
- Fibre properties (length, deformations, width, coarseness, fines)
- Strength potential (burst index, soft-sensors from fibre properties and freeness)
- Chemical composition (soft-sensor from NIR spectra)
- Optical properties (brightness, whiteness, colour, fluorescence, estimated residual ink)
- Cleanliness (vessel cells, shives)

L&W Pulp Tester is an online automatic wet laboratory for pulp quality and stock preparation. It operates according to established standards for specified properties and uses the latest technique for optical measurements. It is designed to cover pulp quality for different pulps and it combines different techniques in order to get a solid base for modelling of sheet properties.

L&W Autoline 400 is an automated paper testing laboratory that has become a vital part of the production control in many mills. Data from the automated quality systems in these mills are the foundation on which the operators build their control of product quality. The main

advantage from introducing automatic laboratories is not cutting staff costs, but the fact that moving laboratory testing closer to the production does improve both quality control and production efficiency. Further the compliance with international standards facilitates comparing results from different equipment.



L&W Pulp Tester – for automatic pulp testing according to industry standards..

Automatic wet laboratory testing

A comprehensive online pulp quality testing system needs to be stable and reliable, present data from repeatable testing, and be available at all times. To maintain high uptime, maintenance work and cost must be limited. This is achieved by using proven components of high quality and an automatic cleaning system. Further the pulp samplers need to be robust with a unique design to prevent the samplers to jam. The sample is diluted directly at the sampling point and transported at low consistency in separate tubes to the testing system. All this, and much more is L&W Pulp Tester.

Reliability is very important, and it is achieved when international standards are met and little or no calibration is needed. Calibration of online units has been regarded as a major problem, but L&W Pulp Tester uses methods close to, or exactly following established standards in order to improve reliability.

With manual testing, measurement frequency is very occasional, as illustrated in table 2. Manual testing generates more of historical data. An automatic system measures continuously and with a system like L&W Pulp Tester, based on 6 samplers, complete data can be reported every 30 minutes. Single point measurements can be reported every 5 minute. If faster response time is required an inline fibre quality transmitter (L&W Fibre Quality Transmitter) can be installed, for reporting every minute or even faster.

Table 2: Measurement frequency of pulp quality

Handsheets	Less than 1 test/day
Other manual wet tests	Less than a few per shift
Online automatic laboratory	One every fifth minute

Automatic paper testing

L&W Autoline 400 is an automatic paper testing laboratory providing reliable, accurate and precise information about the quality and condition of the paper. It can perform almost all quality testing, prepare reports, archive data, and communicate with other devices that monitor process parameters. Furthermore, most of the measurement methods conform to well-established industry standards, thus maintaining the continuity of information obtained from previous testing instruments. All this while generating positive cash flow by improving quality and reducing costs. Connection to a mill-wide information network ensures that the crucial information can be in the papermaker's hands within minutes of reel turn up.

In order to get the results as soon as possible it is necessary to measure all properties directly in the process. This is of course not possible for tests of strength properties, since those measurements are destructive and therefore offline testing is still required. At every shift of tambour, profiles from the reel are cut out manually, after that everything is automatic and operator independent.

It has long been recognized that the traditional system of manually gathering and testing paper samples can produce unacceptable levels of measurement uncertainty. With L&W Autoline 400 the sample preparation is always done in the same way, it is always the same position in the profile that is tested. Testing is done in true MD (machine direction) and CD (cross direction), and it is possible to measure several data points in each profile. Significant reductions in test variation have been reached. This reliability improvement, combined with quick access to test results, allow the paper maker to shift production targets, and achieve a more consistent performance.

The capacity to quickly measure and report more than 50 different paper properties means that one **L&W Autoline 400** can serve several paper machines with a minimum of manpower. For example, an optimized testing program of an 8 meter wide web, in 20 positions, takes approximately 8 minutes. As soon as the measurements are completed the results are displayed directly on the screen as cross-direction profile graphs or in table form. Data from each measured reel of paper can be documented just as easily. The results are used to verify paper quality and optimize the process. The fast feedback enables the machine operator to correct any faults in the paper machine during operation, thereby preventing the next reel from also being outside specifications.



A paper sample is fed into the L&W Autoline system and measurements start automatically.

Important objectives for automatic pulp and paper testing are:

- Automatic sample preparation leads to; accurate measurement of MD/CD properties
- Correct positioning in CD
- Cost reduction
- Meet increasing customer demands for more measurements and measurements related to each roll in CD
- Enough statistics for optimization of the process
- Enough statistics for calibration of QCS systems

With standardized quality testing the process operators can produce a product within given specification at the lowest possible cost. Reliable, rapid and cost-effective measurements of pulp and paper properties throughout the process are necessary for product optimization – and measurements according to established standards is the best way getting there.

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