Pulp testing and monitoring

Inline, online and offline testing methods and industry-specific instruments to give you deeper pulp processing insight

Optimize refining to achieve the most cost efficient raw material use and stock blending – with frequent and reliable pulp measurements from ABB

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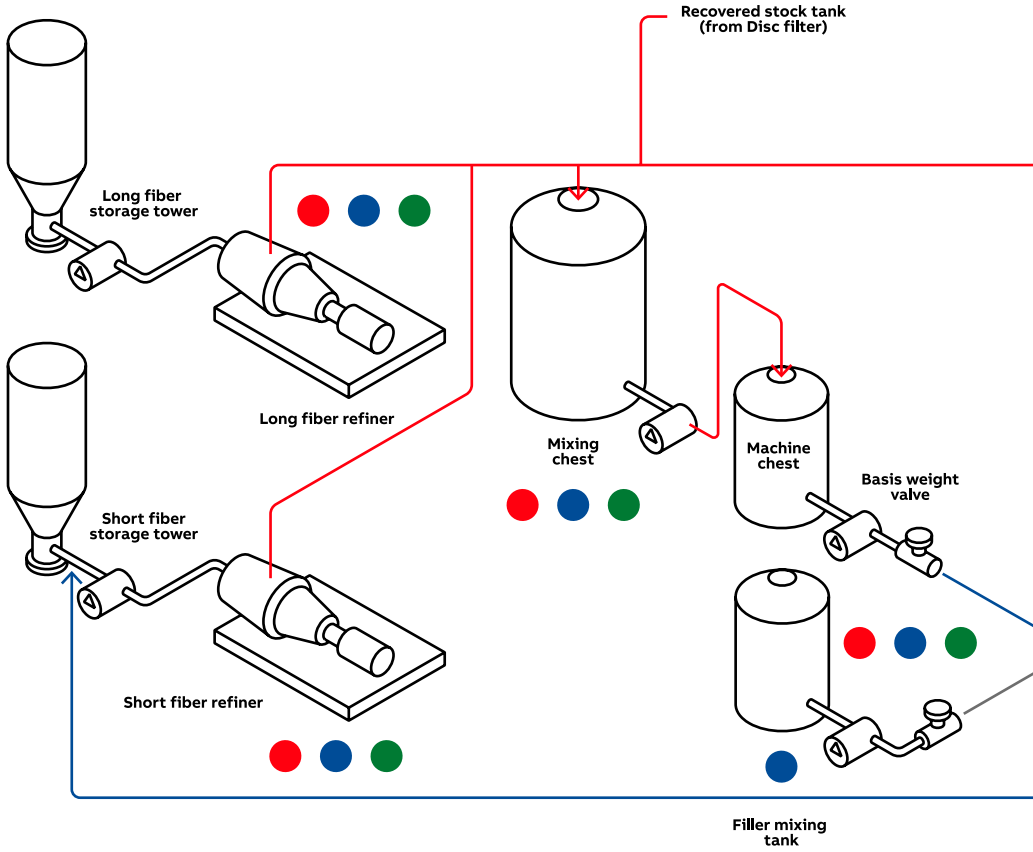
Papermaking is easier with better pulp testing

Uniform pulp quality is the foundation for making the best quality paper, with consistent on-spec properties that meet customer demands. Comprehensive inline, online and offline pulp testing methods make this possible with the lowest fiber, energy and chemical consumption.

Frequent, reliable and repeatable testing of pulp properties helps you fine tune and run your pulp lines, refiners and paper machines more efficiently. This creates value by helping you achieve your precise pulp property targets. ABB's industry leading range of proven inline, online and offline pulp testing equipment gives you the tools to make the best paper for your customers – at the lowest fiber and energy costs.

ABB's pulp testing portfolio covers a wide application range and which ones your mill needs depends on your specific circumstances. Investing in robust pulp quality testing, and using a combination of the three methods above, not only helps optimize the process but also supports new opportunities for material evaluation, recipe handling, etc. while also validating online measurement. Coupling the accuracy and reliability of these measurements with your control strategy will further maximize process optimization efficiencies. Advanced Process Control (APC) based on these measurements allows closed loop control of critical process stages like refining, retention and total ash. This enables savings in energy and chemicals, and gives reduced variability in the stock approach and wet end of the paper machine for improved runnability and production throughput.



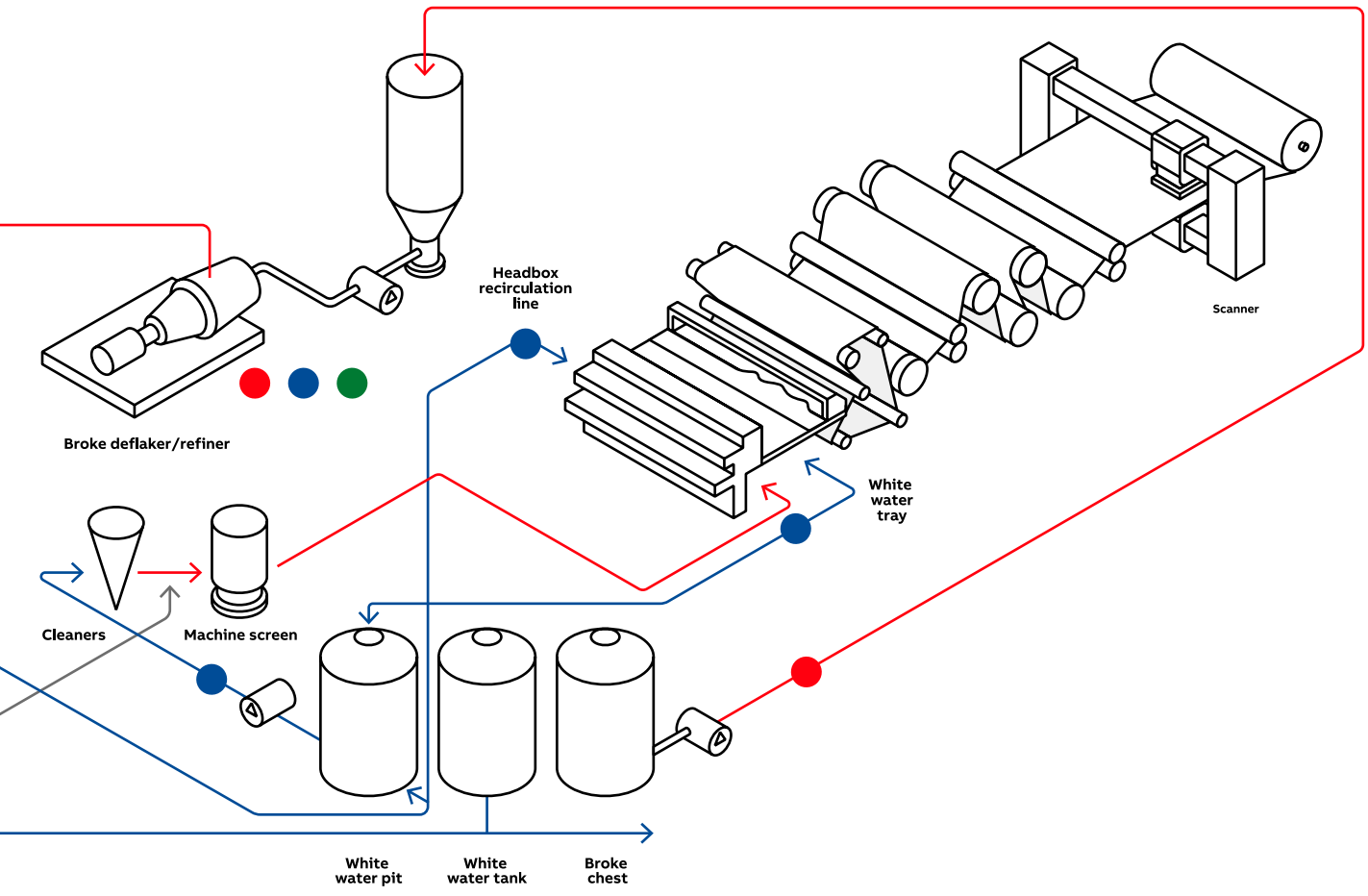
- Fiber online
- Freeness online
- KPM Consistency

Pulp testing

Inline
A sensor in the process, usually in a pipe, that measures consistency directly. Measurement readings are made at a mill-specified interval.

Online
Continuous, frequent measuring of fiber properties and freeness in the process line through automated sampling and testing; frequent measurements enable immediate process optimization.

Offline
Standalone lab instruments or automated systems for pulp, paper and board property testing , based on samples collected manually.



Benefits of incorporating precise measurement from ABB into your operations

Early online detection of quality deviations allows faster corrective actions
Problems on the paper machine, including both runnability issues and variability in final paper quality, are often caused by fluctuations in the types and quantities of fines, shives or vessel cells in the pulp. Similar problems can also result from unknown or undetected variations in the fiber mix, the fiber quality or the refining levels. Continuously measuring key pulp quality properties with L&W Freeness and Fiber Online makes it easy for operators to see correlations and take corrective actions.

Regular, repeatable measurements help achieve uniform consistency
Rapid and uncontrolled variations in both fiber flow rate and pulp consistency are very common occurrences, which in turn generate pulp quality variations. ABB has a full range of consistency sensors for feedback control of consistency and a full range of samplers for calibration samples.

Process optimization starts with reliable, accurate measurement
Optimal papermaking often involves compromises, which is well illustrated by the fact that an increase in tensile strength will cause a decrease in tear strength. Similarly, a long fiber used for strength reinforcement can give poor sheet formation. This can be rectified by using a lower forming consistency. But achieving the ideal recipe starts with accurate measurement from the lab and/or online.

A better window into your pulp lines, based on a portfolio you can trust

ABB's world-leading pulp and paper testing equipment helps papermakers know more about what is actually going on in their process. By measuring key pulp quality properties at strategic points in the pulp lines, it is much easier for operators to see correlations with other things happening in the process. This insight enables corrective actions to be quickly undertaken – based on measured, reliable facts about the fiber properties – so they can always stay within the required specifications.

The quality of the ABB pulp testing portfolio is a testament to the reliability and innovation of Lorentzen & Wettre, the company that pioneered many of these paper testing methods and equipment. The accuracy and precision of this portfolio is further validated by the thousands of pieces of L&W testing equipment used at pulp and paper mills worldwide, coupled with the more than 100 years of ABB experience in the pulp and paper industry bringing the best solutions that offer the best results to our customers.

Deeper, immediate insight into your pulp properties

Across the entire pulping and bleaching line

Fast, reliable fiber testing, on both mechanical and chemical pulps, helps the operators and the automation system fine tune the properties and the process.

With more targeted and frequent measurements of pulp properties as it moves along the pulp line, which ABB's testing equipment can provide, pulp makers can achieve much better control of their process. This means better quality and more uniform pulp coming out of the line, with the lowest raw material inputs.

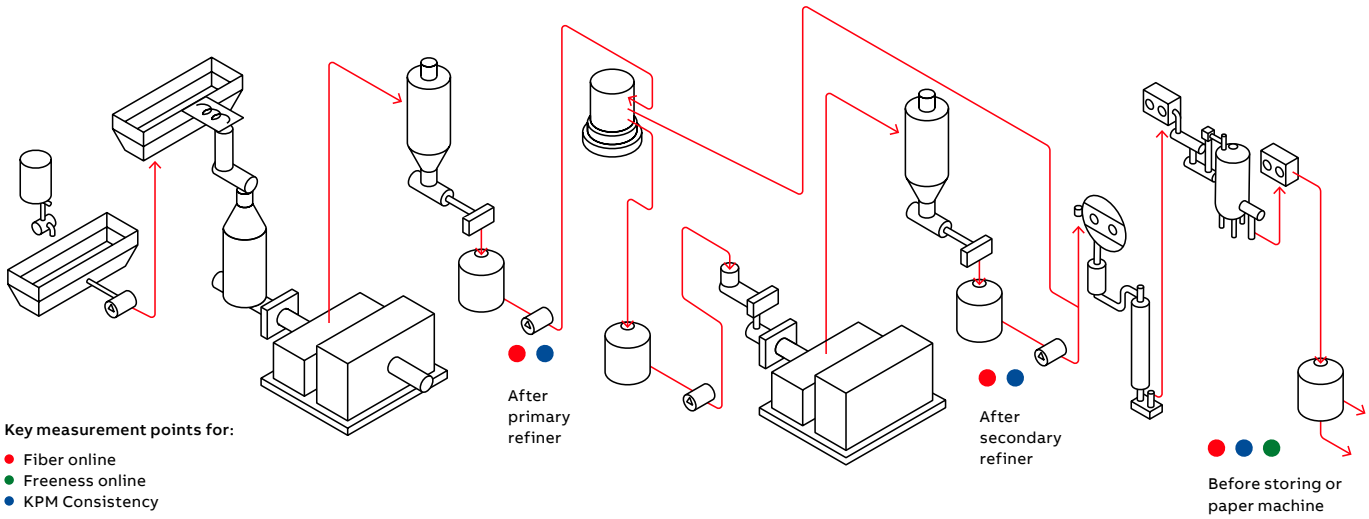
Pulp is generally produced using one of the two dominant processes, mechanical pulping or chemical pulping, or a hybrid of these such as the chemi-thermomechanical (CTMP) process. ABB's portfolio has multiple options to support the different process steps in each of them.

Mechanical Pulping

In mechanical pulping the aim is to liberate the wood fibers entirely by mechanical means, using either grinding stones or metal refiner plates to accomplish this. The advantage of mechanical pulp is the high yield of over 95%. The pulp also has a high opacity, which means that thin papers with good printing properties can be made.

However, since the lignin is retained in the pulp, paper from mechanical pulp tends to yellow with aging or exposure to light. Mechanical pulps are thus used in short lifetime papers. Mechanical pulp is also weaker than chemical pulp because the fibers are shorter and stiffer, resulting in less bonding points. Mechanical pulping generates a lot of fines material, and kinked and curled fibers, that need to be monitored with online testing for fiber morphology.

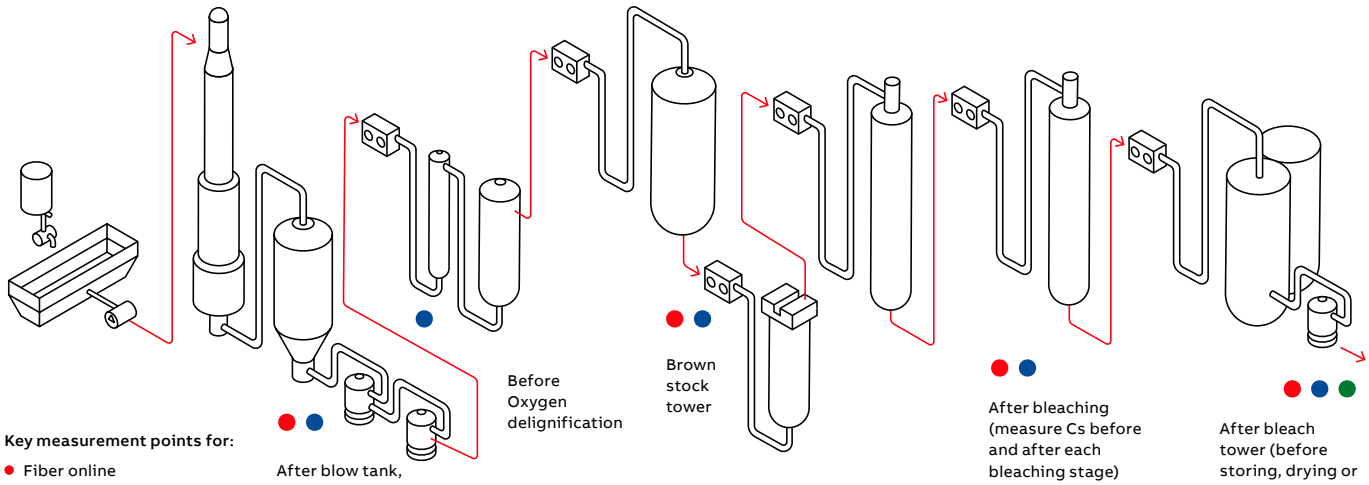
Mechanical pulp



Chemical Pulping

In chemical pulping, the objective is to break up and dissolve the lignin and leave behind most of the cellulose and hemi cellulose, i.e. the fibers. This is done by cooking wood chips at high temperature and pressure in a solution of pulping chemicals. The resulting pulp is strong since the cellulose fibers are long and intact, making it useful for a wide range of paper grades. However, since almost all of the lignin is dissolved, the yield of chemical pulp is low relative to mechanical pulping, usually 40–70%. Analyzing the fiber morphology and consistency between the process stages is vital for producing a uniform pulp with the desired properties that build a strong sheet.

Chemical pulp



Inline pulp testing

Providing accurate consistency measurements and sampling for improved control and product uniformity throughout your process.

KPM consistency measuring devices

Our comprehensive offering of blade, rotary, microwave and optical consistency transmitters can fit any application, allowing you to know the exact solids content in the stock flows at any time.

KC3 Blade Consistency Transmitter
Featuring a shock resistant seal-less transfer mechanism with unbreakable diaphragm, no o-rings or seals, KC3 is the only transmitter available with no moving parts, preventing process liquid from leaking inside the sensor.

KC7 Microwave Consistency Transmitter
Uses microwave true-phase measurement technology to measure total consistency with excellent accuracy for mixed pulps, different quality pulps, and pulps with fillers.

KC5 Rotary Consistency Transmitter
Built-in gate valve assembly allows you to retract the transmitter on the fly, at full process pressure, without having to shut down or drain the line. It is applicable to consistencies between 1.5–16% and can be installed and removed while the process is running – and at full process pressure – due to its built-in gate valve. Its lightweight design and reduced maintenance needs makes it one of the most advanced transmitter on the market.

KC9 Optical Consistency Transmitter
Is the best total consistency transmitter covering the widest range, even below 2%, for inline and bypass installations. The transmitters are pre-calibrated for quick and easy start up.

KS Pulp Samplers
For secure and representative sampling for both screened and unscreened pulp flows, the KS pulp samplers extract samples from the process line in a safe manner. Designed to eliminate errors by the operator, the sampler breaks through the water layer inside the pipe, thus preventing any dewatering from occurring.

ABB offers the widest portfolio of cost-effective, durable and versatile sampling valves for all applications. The KPM KS2 covers low consistency screened applications, while the KPM KS4 and KPM KS6 samplers handle unscreened pulp extraction with a cutting piston. Both manual and pneumatic versions are available.

Complete solution for the wet end

For a completely integrated wet end solution for better runnability and fewer PM upsets, ABB has a wide portfolio of measurement and control solutions for the wet end including consistency transmitters, retention measurement, pulp analyzers, fiber measurement, process control and advanced process control solutions. As a scalable offering, mills can implement a completely integrated solution that covers everything from shop floor automation to supervisory controls or augment their measurement devices with individual control solutions that best align to their objectives.

- **Wet End Control Performance**, an ABB Ability™ Performance Service for paper mills, is a fully integrated quality measurement, control and optimization solution that enables paper specifications to be met at the lowest cost. ABB is uniquely able to leverage soft sensor technology with advanced process controls to make process adjustments based on calculated predictions and deep domain expertise. This ensures optimum quality from before the fiber even enters the paper machine to when results are confirmed in the lab, enabling the highest profitability.
- **Retention measurement and control** is essential for papermakers, due to the strong influence retention has on paper quality variability. ABB's KRA and KRT Retention Measurement solutions help decrease MD basis weight, ash and moisture content variations. They also help reduce web breaks, allow faster grade changes and start-ups, and optimize retention chemical usage.
- **For overall machine control and automation**, ABB offers the advanced System 800xA, which features an industry-leading pulp and paper control library. In the DCS layer it provides APC solutions for a range of critical paper machine parameters including stock flow control, power control, and chemical flow, as well as wet-end control, refiner freeness control, fiber length control and OPT800 solutions for pulp tracking.

Online freeness and fiber testing

There is money to be saved through better control of refining energy input. ABB's L&W Freeness and Fiber Online quickly and easily delivers true real-time information about both freeness levels and fiber properties, to fine tune the refining and cut expenses.

Papermakers' efforts to optimize stock refining to save both energy and fiber costs are often hampered by a lack of real-time data about freeness and fiber properties. This is mainly due to infrequent manual sampling and testing.

ABB's L&W Freeness and Fiber Online monitoring system solves these problems by providing accurate and continuous fiber morphology and freeness measurements about the stock going to the paper machine's wet end. This detailed information about the actual pulp characteristics allows optimized refining to cut energy consumption.

It also enables tighter closed-loop control, producing a highly uniform pulp furnish that gives better runnability and fewer breaks on paper, board or tissue machines. The result is more on-spec tons produced at less cost and trouble.

Compared to other such systems, ABB's is the simplest to use and maintain while providing superior accuracy, fast sampling rates and high reliability. Its few moving parts and easy accessibility make it one of the lowest total cost of ownership solutions on the market, thus delivering a fast payback on your investment.

Features

- Automatic online sampling of the process at multiple positions with up to 8 samplers
- Measures according to ISO and TAPPI standards
- Frequent data with up to 300 measurements per day enabling operators to correct control actions
- Automatic cleaning functions using integrated detergent pumps
- Integrated input of manual samples
- Few moving parts
- Integration with ABB Ability™ System 800xA

Benefits

- Provides fast and accurate measurement
- Enables closed loop control for more consistent quality
- Helps optimize refining and reduce energy consumption
- Improves machine runnability with more uniform pulp furnish
- Decreases wet end sheet breaks
- Enables faster grade changes
- Excellent correlation to lab measurement results
- Low maintenance and operational costs
- Enables resources to focus on quality optimization and value-added tasks

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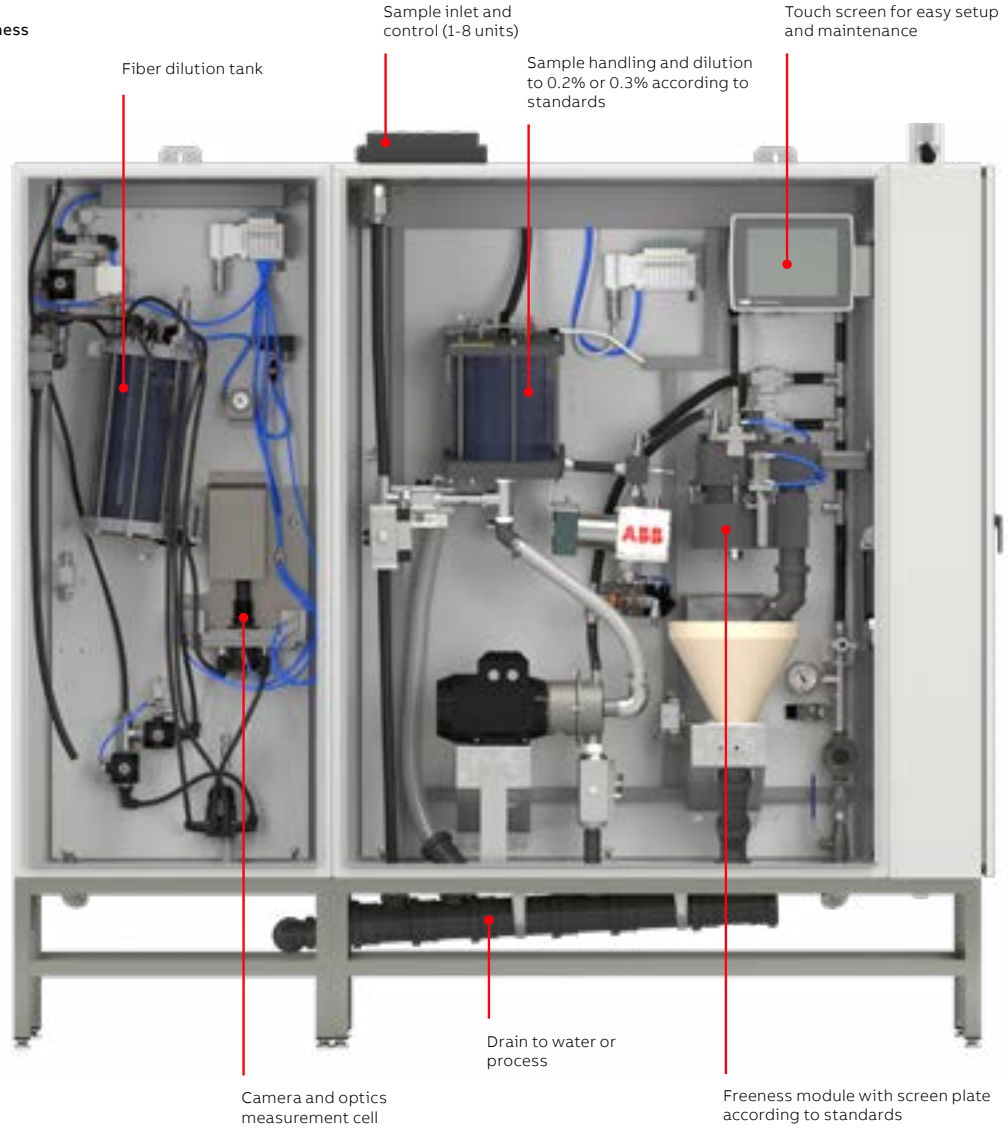
Inside L&W Freeness and Fiber Online



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Different options to meet all mill needs

Depending on your specific paper machine and refining needs, the Freeness or Fiber testing units can also be installed separately.

ABB's L&W Freeness Online is an automated, reliable and cost effective measurement system for the wet end. With a fast sampling rate for Canadian Standard Freeness (CSF) or Schopper-Riegler (SR, MSR) measurements, mills can close the control loop, create a more uniform pulp furnish and eliminate costly over-refining.

ABB's L&W Fiber Online is an image-based measurement system that provides an accurate and comprehensive assessment of fiber quality in real time to easily pinpoint furnish quality trends and ultimately reduce runnability problems and web breaks. Based on ABB's L&W Fiber Tester concept, in which the fibers are oriented in an image plane in the measurement cell and do not allow spread in the direction perpendicular to this plane, L&W Fiber Online is the only online fiber analyzer on the market that meets ISO 16065-2:2007, the latest international standard for fiber length measurements.

Paper mill delighted with L&W Freeness Online

FPC Papeles in Chile breaks production records by stabilizing process and quality with freeness monitoring

"All papermakers know that variations in raw materials significantly affect both process stability and product quality," explains Eduardo Izquierdo, Technical Director at the FPC Papeles mill near Concepción, Chile. "To overcome this, and both stabilize quality and reduce production costs, we sought a way of adapting our refining processes to the natural variability of the incoming fibers."

Considering that the mill uses incoming recycled paper and paperboard collected in 27 cities around Chile, this variability posed an enormous challenge.

To attempt to stabilize fiber properties, FPC Papeles installed an ABB L&W Freeness Online system equipped with two samplers. This enabled operators to measure freeness efficiently at the output of the mill's two refining lines, thus giving them valuable insight into the fiber properties and allowing them to adjust the refining loads to get the right paper properties.

"Following a two-month validation period, during which the L&W Freeness Online and lab readings were regularly compared and correlated, operators placed their full trust in the new system and began to manually adjust the refiners' load based on the L&W Freeness Online readings," says Izquierdo. "This enabled us to adapt our refining process to changes in the incoming fibers, helping to stabilize the overall process."

Following installation of the system, and other improvements at the mill, FPC twice broke its historical monthly production record during 2018.*

*Full details can be found at:
https://new.abb.com/pulp-paper/abb-in-pulp-and-paper/articles/latest/paper-refining-from-re-used-materials-how-to-stabilize-quality-and-reduce-costs-with-on-line-freeness-analyzer

L&W FIBER TESTER
PLUS+

Offline pulp testing

Everything needed for accurate lab testing of pulp samples for high quality and productivity.

With ABB's trusted L&W laboratory pulp testing devices, you can get fast and accurate feedback about the current state of a very wide range of pulp properties, allowing you to take corrective actions if needed.

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Advanced Measuring Devices

ABB's L&W Fiber Tester Plus
Gives quick, easy and reliable measurement and analysis of fiber dimensions in a pulp furnish. It quantifies common properties like fiber length, width, coarseness, fines, vessel cells, mini-shives, local deformations (kink) and impurities, as well as being the only instrument that can analyze crill, the tiny particles in a pulp suspension. It has a small footprint, making it easy to place in any laboratory.

ABB's L&W Moisture Tester
Is the ultimate offline moisture measurement solution for paper, paperboard, corrugated board, dry pulp, and other fiber materials. It measures moisture content at all stages of the process and, thanks to the quick measurement procedure, can also be used for product checking when online sensors indicate that moisture is out of specification.

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Sample Preparation Equipment

ABB's L&W Pulp Disintegrator
Conforms to industry standards for pulp disintegration, with propeller blades that will not cut or otherwise alter the pulp fibers. Therefore the inherent fiber properties are not affected, allowing accurate and credible testing. The pulp container is made of stainless steel for durability and ease of cleaning, and for operator safety the instrument will not start unless the container is properly placed.

ABB's L&W Rapid Dryer
Reduces the drying time of wet pulp or paper samples, thereby ensuring rapid, efficient and accurate moisture measurements. It is equipped with rectangular drying plates with temperature adjustment that allow precise control of the drying conditions. The lower plate is lined with wire cloth to lead off the vapor during the drying process.

Pulp and Paper Care

To make sure your laboratory and automated paper testing equipment is always functioning correctly and accurately, over a long lifetime, we offer a range of professional service and support agreements.

Lifecycle Management

A Lifecycle Management Agreement with ABB is the modern, proactive way to ensure that your instruments always maintain their precision and are calibrated to current industry standards. With emphasis on Preventive Maintenance Activities (PMAs), this helps reduce the risk of serious and costly operational disruptions. In addition to giving you reliable measurements, it also lowers your maintenance costs while extending the asset's life.

Benefits of the Lifecycle Management Agreement include:

- Maintenance (PMAs) and calibration
- Replacement of consumables and parts
- Calibration according to standards
- Advice on measurements and maintenance
- Scheduled date for visits
- Fast issue resolution
- Coverage for all laboratory instruments

Performance Improvement

For mills seeking an even higher level of service, we offer our Performance Improvement Agreement that includes everything included with Lifecycle Management plus all visits, spare parts and emergency services. This makes it even easier to budget for annual servicing and calibration costs, thus functioning as an insurance against unforeseen expenses.

Benefits include:

- All the above benefits of a Lifecycle Management Agreement, with all PMAs covered
- Emergency visits, working hours and spare parts
- Priority phone support

Service you can fully trust

Pulp and paper is a high tech, capital intensive industry that requires continuously high uptime to produce superior profits. Maintenance of your testing equipment is a small but crucial step towards ensuring you always get on-target quality.

Complete professional service to keep your testing reliable and accurate

ABB offers a wide range of service options for your laboratory and automated paper testing equipment that can be perfectly tailored to your specific needs. Within the framework of the service contract, you can choose from items such as remote diagnostics, supplier-independent calibration and training.

We currently have over one thousand cost-effective maintenance service contracts active in mills worldwide. These mills get our specialist expertise and proprietary tools to make sure their testing equipment is always reliable and accurate, providing measurements according to industry standards.

ISO 9001:2015 certified
ABB ensures high quality service and support by maintaining ISO 9001 compliance, thus ensuring calibration and service follow best practices and processes. These routines also secure traceability for all the calibration tools used, guaranteeing services are performed with the upmost accuracy and precision.

Modern digital connectivity makes support even more effective
Continuously accelerating digital advances such as our ABB Ability™ Collaborative Operations offering means that we can provide more value-added services, even remotely, to ensure top asset performance. All modern equipment (stand-alone instruments, L&W Autoline, L&W Freeness and Fiber Online, etc) includes remote connection capabilities, for in-depth monitoring and analysis.

In addition, we have powerful tools like Visual Remote Support that use augmented reality for closer interactions. This allows on-site mill personnel to benefit from deep and direct collaboration with ABB experts for faster problem solving.

Ask about our additional services:
- Instrument rental
- Supplier independent calibration
- Installation and commissioning
- Third-party calibration
- myABB for L&W

For any pulp testing challenges your mill faces, ABB has a solution to give better insight into your pulp properties and improve both your pulp and papermaking processes.

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ABB AB
Box 4
SE 164 93 KISTA, Sweden
Phone: +46 8 477 90 00
Fax: +46 8 477 91 99

For more information, please visit our website:
abb.com/pulpandpaper

or email:
Se-pulpandpaper@abb.com

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