

TOUGH CONDITIONS. EASY DECISIONS.

HOW ACT STRATUS DELIVERS
ACCURATE FIBER CONSISTENCY
CONTROL WHERE OTHER SENSORS
STRUGGLE



Accurate consistency control of the stock plays an important role in successful pulp, paper, board or tissue machine operations. It is a key element in mass flow and water consumption management of the mills. Fiber consistency has even greater significance because it is directly related to the principal raw material used to make paper or tissue, and because it influences basis weight stability and consequently quality and productivity.

When it comes to choosing the right consistency transmitter for a control loop, several parameters must be taken into consideration, and there is no one-size-fits-all solution. Specific process conditions and requirements will lead to the selection of an appropriate technology. This article describes a unique technology developed by BTG: the amplitude method consistency measurement, available as ACT STRATUS. On the market for several years, it has demonstrated its advantages in multiple applications with very good feedback from papermakers.

PROCESS CHALLENGES

A principle often heard in mills is that consistency transmitters go unnoticed as long as they don't act up. While sensors can do the job for years without trouble, when consistency control problems appear or are finally discovered, the importance of consistency comes back to the top of the agenda. And then it is not only the transmitter that must be diagnosed, but the complete control loop including process conditions, pulp mixing and dilution lines, to find the root cause of the issue.

Whether it is a new or existing installation, consistency control can be challenged by different process conditions. Some of the most common are described below.

Pipes' arrangement might not be suitable for the installation of a shear-force sensor, which requires a certain calming length with straight pipe to meet plug-flow conditions. This can lead to constraining piping design or costly pipe modifications.

Flow velocity is a parameter that can influence consistency measurement. Different sensor types require different minimum flow velocities, which may only be met in certain pipe sections. Variations in flow, such as those inherent to broke chest locations or caused by production changes, can have a negative impact on the performance of static blade shear-force transmitters.

Fiber composition can, for some productions, result in stock made of very different fibers. From a mix of bleached hardwood and softwood to a mix of unbleached softwood with OCC, the conditions for measuring consistency vary considerably across technologies. This is overcome with multiple calibration sets when fiber mixes are fixed and identified, or by using more versatile technologies such as microwave, optical or AmpliForce™.

Fines and fillers are part of the stock, and together with fibers are measured as total consistency. As fines or filler content increases, it is important to keep fiber consistency under control to avoid the risk of reaching the right total consistency but with insufficient fibers to make a proper sheet. This is where accurate fiber consistency measurement brings its most important benefits.

Pulp slurry properties are also important considerations. Variations in air content and conductivity affect microwave velocity, while air bubbles and dark-coloured pulp can affect optical measurements. These variations must either be compensated within the transmitter, or the process issue must be addressed, for example by increasing line pressure to reduce air content.

Contaminants such as knots, stones, wire or plastic fragments in waste paper repulping can damage or block shear-force transmitters, requiring additional protection. Finally, pH, pressure and temperature of the media determine the metallurgy of pipes and all related elements of the consistency control loop.

AMPLITUDE METHOD CONSISTENCY MEASUREMENT

Online fiber consistency measurement is based primarily on shear-force technologies. While static blade and active blade measurement methods come with minimum performance requirements, the rotating measurement method is a well-known, proven and highly accurate fiber consistency measurement method that BTG has provided for decades. Another technology from BTG, called AmpliForce™, has been available for several years and delivers fiber consistency measurement performance close to that of rotating technology. It therefore deserves some further explanation.

The AmpliForce™ technique uses an active sensor oscillating at its resonance frequency. It combines measurement of shear force and viscoelastic properties to obtain higher sensitivity and better signal quality than conventional blade consistency transmitters. The result is high and dynamic sensitivity to fiber consistency, combined with low sensitivity to normal variations in fiber composition, freeness, flow velocity, air content and pressure.

ACT STRATUS is the consistency transmitter from BTG based on AmpliForce™ technology. It is capable of measuring fiber consistency accurately and precisely from as low as 1% up to 7%, with a single sensing element.

The reason for the improved sensitivity is that, unlike conventional shear-force transmitters, ACT STRATUS is not solely dependent on the breakdown of the fiber network, but also on the viscoelastic damping effect of that network.

For installation, the ACT STRATUS is mounted on a simple weld-on stud and requires a shorter minimum calming length than blade sensors, reducing initial investment. With appropriate maintenance, the transmitter is designed for several years of operation at minimum cost, giving good return on investment.

REAL-TIME MONITORING WITH THE BTG STRATUS PLATFORM

The new ACT STRATUS also integrates with the BTG STRATUS Platform, which extends the transmitter's value beyond measurement. It provides operators with process insights directly on site or remotely. The BTG STRATUS App gives remote access to the transmitter's user interface from any mobile device, so operators can check readings, adjust settings and review diagnostics without going to the instrument. The BTG STRATUS Field Interface is a full-colour touchscreen mounted at the transmitter, providing clear diagnostics for operators working directly on the process line.

The BTG Status Ring is a colour-changing LED that gives operators an immediate visual check that ACT STRATUS is functioning correctly.

Beyond on-site monitoring, cloud connectivity allows BTG's technical support team to maintain correct calibration and troubleshoot problems remotely, rather than requiring a site visit. For mills looking to go further, connectivity options like OPC-UA allows ACT STRATUS to be integrated into IoT systems



Figure 1: AmpliForce™ consistency transmitter ACT STRATUS

CASE STUDIES

Broke consistency issues solved in a premium quality packaging mill

In a modern and large-capacity premium quality packaging mill in Northern Europe, broke consistency control was seriously disturbed by varying flows and different broke types. Operators sometimes had to control manually, and the board machine had been stopped completely due to activation of a fail-safe at 5% consistency triggered by incorrect consistency information. Flows are influenced by production and availability of broke from different sources including cartonboard, containerboard and liquid packaging board. The broke lines were initially equipped with static blade consistency transmitters, which gave insufficient performance. These were replaced with microwave transmitters, but performance was still not at the required level, likely because of uncontrolled air content in the stock. The installation of six ACT STRATUS transmitters finally provided the right cost-effective solution. The transmitters deliver accurate fiber consistency of broke without disturbance from flow variation, air content or broke type. There are no further complaints about broke consistency and the mill can operate at the best conditions.

Mass flow reduction in tissue mill using virgin fibers and deinked pulp

A leading tissue mill in Northern Europe using various fiber types to produce different toilet paper and towel grades experienced unstable consistency variation in approach flow. Fiber mixes included SW, CTMP and DIP from office waste and magazines. The recipes were so diverse that it was not possible to work with different calibration sets. AmpliForce™ consistency transmitters were installed on the mixing chest and machine chest, demonstrating the capability to handle heterogeneous fiber mixes and providing high accuracy at these sensitive process locations. The improved fiber consistency control reduced mass flow variation and enabled basis weight reduction and fiber savings.

NSSC pulp operation issues solved

In a pulp mill in Northern Europe, consistency control at the NSSC (Neutral Sulfite Semi Chemical) production unit was disturbed by plugging of the static blade sensor and its flow aligners. The installation of an ACT STRATUS immediately removed the problem at limited cost. The pulp maker appreciated the good consistency measurement as well as the shorter calming length required.

Improved basis weight stability in white-top testliner mill

A packaging mill in Southern Europe making white-top testliner experienced basis weight variations on the white-top layer, affecting runnability and quality. Although total consistency measured by an optical sensor at the machine chest was under control, the automation staff were not able to fine-tune the basis weight control loop correctly. Process investigations showed significant variation in fines and filler content, leading to variation in fiber content as part of total consistency.

It was decided to install a shear-force consistency transmitter at the machine chest with sufficient accuracy for basis weight control. ACT STRATUS accomplished this successfully, providing an accurate fiber consistency signal in line with the required stability of the white-top layer basis weight.

Better mass flow control of mechanical pulp

An integrated mill in Northern Europe identified inaccurate mass flow control of PGW (pressurised groundwood) to the paper machines. Consistency measurement on this line was carried out by a static blade transmitter that was not reliable enough to keep the target of 4.5% consistency. Upgrading to an ACT STRATUS gave immediate satisfaction, improving mass flow measurement and control.

Variations in the incoming sludge limit operations across the whole process. With ash content of almost 60% and low shear force, measuring the consistency of this media had proved impossible for several traditional techniques. Instead of dosing polymer based on volumetric flow, it is now dosed based on dry solids flow, thanks to consistency measurement from an ACT STRATUS installed after the sludge tank and before the dewatering unit. In addition to higher dry solids and improved yield at the incineration plant, polymer consumption has been reduced with estimated savings of €40,000 per year.

CONCLUSION

Pulp, paper, board and tissue makers have a good alternative for accurate fiber consistency control. To face process issues such as limited straight-pipe length, flow variations, complex fiber mixes or basis weight instability, the amplitude method consistency measurement is a valid and proven solution across multiple applications, as the case studies above demonstrate.

The BTG STRATUS Platform adds further value by connecting ACT STRATUS to real-time monitoring and remote diagnostics capabilities, supporting mills in reducing downtime and acting faster on process variations.

To benefit from this cost-effective solution, BTG's sales and service teams are available locally to provide suitable advice and support.

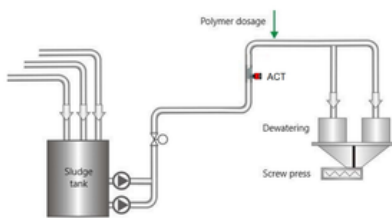


Figure 2: ACT STRATUS, AmpliForce™ consistency transmitter to measure consistency of sludge

Optimized dosage of polymer in sludge dewatering

A mill producing tissue from recycled fiber handles sludge in a dewatering process, with the dewatered sludge burned in an incineration plant. High dry solids content of the dewatered sludge, high capacity of the screw presses and low suspended solids in the reject are all beneficial for process economy. Before the dewatering units, a flocculant polymer is added to make dewatering possible.



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ACT STRATUS

New in-line amplitude transmitter engineered for smarter mill performance with precision 1-7% consistency measurement

- ▶ Track weak fiber networks and variable pulp blends
- ▶ Rely on advanced AmpliForce™ technology
- ▶ Act faster with real-time insights on any device
- ▶ Cut down time with simple set-up and less maintenance

Confidence in the future



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