BrainWave
Control solutions for the panelboard industry

The challenge: To control your mill
so that it runs at peak efficiency

The solution: Measure. Control. And profit.

In today's economic climate, your facility faces more challenges than ever before. Your plant must run at optimal performance. Product consistency is a must. And utility and chemical costs must be kept to a minimum to maintain profit margins. That's why ANDRITZ AUTOMATION offers a portfolio of advanced control solutions—BrainWave—for industrial operations.

These solutions are revolutionizing control at plants around the world, helping producers large and small remove bottlenecks, reduce energy and chemical consumption, produce higher quality products more consistently, and lower production costs—all of which result in significant savings.

Historically, advanced process control technologies have been deployed only at large scale petrochemical plants where the high cost of implementation and maintenance could be supported.

BrainWave will change the way you think about advanced process control. This patented controller can be implemented quickly. It is robust and stable, and is used by operators continuously. With BrainWave, advanced process control can now be applied in an effective and economical manner in a wide variety of industries.

Don't see your solution listed? No problem—our control experts not only implement our solutions, but can audit your operation and devise a custom control strategy for you.

"I haven't touched my BrainWave controller since we installed it seven years ago and it is used all of the time by our Operators."
Tom Barker, DCS Manager
FMC Phosphates, Green River, WY

What is BrainWave?

BrainWave is a patented advanced controller that outperforms conventional Proportional-Integral-Derivative (PID) control. BrainWave outperforms PID systems because of its two main components: an adaptive model and a predictive controller.

BrainWave builds its own live models during normal plant operations, a powerful feature not offered by conventional Model Predictive Control systems.

BrainWave's predictive controller accurately forecasts process responses and accounts for multiple objectives. It adapts to process conditions such as changes in production rate or operating point, keeping your process on target. BrainWave can also accept measured disturbance inputs, like raw materials properties, and takes corrective action before your process is pushed off target (PID, by comparison, must wait for the error to occur, then react).

Feature	PID	BrainWave
Controls long dead-time processes	✕	✓
Reacts before being pushed off-target	✕	✓
Handles nonlinear processes	✕	✓
Adjusts to process disturbances	✕	✓
Learns while process is running	✕	✓

Because it uses a standard OPC connection, BrainWave easily integrates with an existing control system. In addition, BrainWave's patented Laguerre technology means an average implementation time of just a few weeks, saving a remarkable amount in operating costs compared to conventional methods. Best of all, your own staff can support and deploy BrainWave, making it a technology that you can live with—and one you can't afford to live without.

Benefits

- Remove bottlenecks
- Reduce energy use
- Produce higher quality product
- Easily integrate with existing control systems
- Usually deployed within a few weeks

The challenge: To fully stabilize and optimize your processes

The solution: BrainWave advanced control

ANDRITZ AUTOMATION offers a complete suite of BrainWave solutions for industrial operations.

Reduced variability

BrainWave has been proven to reduce variability by 30% to 95%. This allows for more consistent production and products, and reduced operating costs.

Guaranteed results

BrainWave projects include a performance guarantee to ensure results are achieved. All costs are known and defined in advance.

Rapid deployment

In most cases, the initial results of BrainWave are obtained in just a few weeks.

Easy connection

BrainWave easily connects to existing control systems and allows migration to new systems. In addition, BrainWave can be used across an enterprise in which a customer may own a variety of DCS components from various suppliers.

Reporting

ANDRITZ AUTOMATION offers full reports on the results of BrainWave, including economic benefits obtained, additional benefits realized, and opportunities for further improvement.

ANDRITZ AUTOMATION provides solutions for all areas of a manufacturing operation where more stable operation is desired.

If you have a specific need that you do not see covered, be sure to contact our sales staff.

Achieve full optimization with Advanced Control Expert

Once you have achieved outstanding success stabilizing your process with BrainWave, you can take your operations to the next level with Advanced Control Expert (ACE).

ACE is an automated "expert operator" that works in conjunction with the BrainWave solution to fully optimize a process. The expert operator in ACE is always at full attention, never distracted, and achieves optimum conditions for your mill.

BrainWave makes sure your process gets to set point and stays there. But how do you know if you have the best set point to run your process? Which set point will help you save the most energy? Will changing the set point improve your product quality? Will it help you save money?

That's where ACE comes in. Once BrainWave has stabilized your process, then ACE can be implemented to determine the best set points, so that the process can operate at maximum efficiency.

Unlike the "black box" solutions offered by others, ACE communicates to the operators in their native language, advising them about changing strategies and goals, constraints, and operational issues.

| Feature	ANDRITZ	DCS Vendor	Brand X
Advanced regulatory control	Always	Sometimes	No
Learning feedforwards	Always	No	No
Solutions hard-coded in DCS, dependent on programmer skill for success	Never	Yes	Yes
Black box supervisory layer	Never	Yes	Yes
Common structure for all solutions to minimize training time	Always	No	No
Best possible solution/excellent uptime	Yes	No	No

The challenge: To stabilize and improve refiner performance

The solution:
BrainWave refiner

BrainWave is a proven control system that stabilizes the refiner operation and the fiber quality while driving plant operating costs down to the lowest possible levels.

BrainWave can bring a new level of automation to your refining process. First, BrainWave uses a special algorithm to stabilize the level in the steaming tube or digester. This enables all chips to spend the same exposure time to steam in the column, giving them more uniform characteristics than when BrainWave is not utilized. In fact, BrainWave typically reduces variability of this critical parameter by over 70%. Secondly, BrainWave stabilizes the refiner specific energy to help the system achieve more consistent operation.

BrainWave helps the plant achieve energy savings of at least 5%. In addition, the stabi-
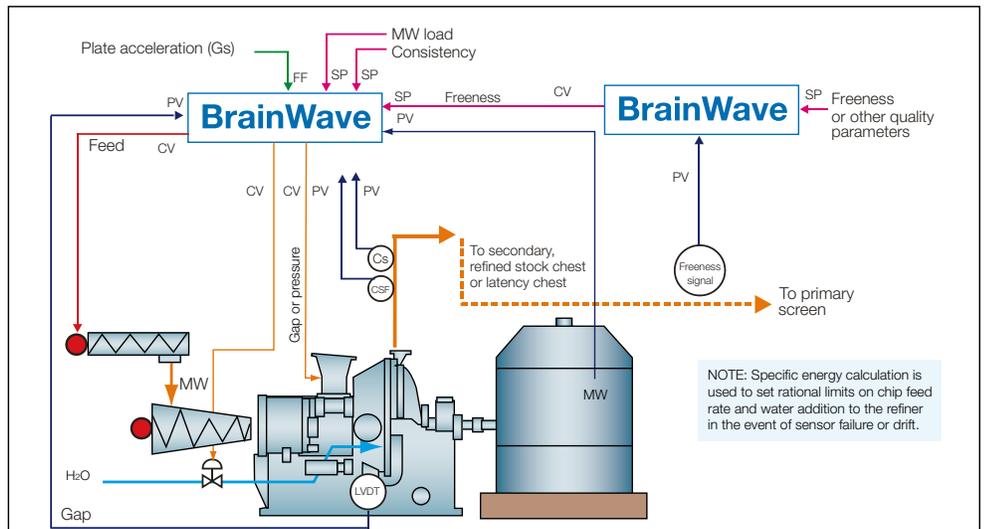
▲ Refiner control schematic

lization of fiber quality means resin addition can be fine-tuned to achieve new, stable fiber supply. This leads to a reduction in resin consumption of at least 3%. The combined reduction in energy and resin consumption results in dramatically reduced plant costs.

BrainWave's predictive control technology allows it to account for dead time and measured disturbances automatically, while the multivariable controller can adjust for variable kilowatts per metric ton, case steam flow, refiner differential pressure, and steam/wood ratio simultaneously. This provides a profound improvement in refiner performance, while unmeasured effects (including valve wear, sensor degradation, changing raw material properties, and production rates) are handled automatically.

BrainWave assists the operator by automatically handling start-up of the refiner after a line stop. This also leads to more consistent operation and reduced operator workload. Specifically, BrainWave:

- Adjusts the set point for the plate gap controller
- Controls the column temperature, case pressure, and blow valve position
- Adjusts to production rate changes and changing wood properties

Benefits

- Achieve consistent moisture and quality
- Automatic moisture control of dryer
- Reduce off-spec production
- Reduce energy consumption
- Reduce VOC and carbon emissions
- Increase yield
- Experience fewer plant upsets, with less need for operator intervention
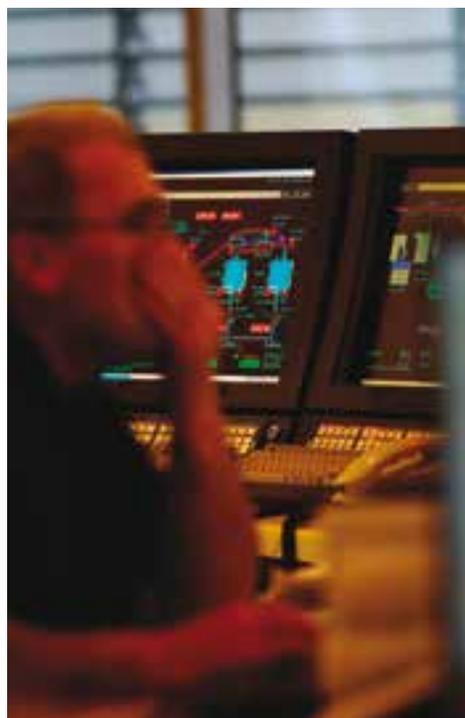
The challenge: To stabilize and improve wood dryer performance

The solution:
BrainWave wood dryer

BrainWave is a proven control system that stabilizes the operation of wood dryers, resulting in improved moisture control of the final product, reduced energy consumption, and/or increased yield.

BrainWave uses patented model-based predictive adaptive technology to provide stable control for the drying of particleboard, MDF, OSB, and other similar products. BrainWave is able to stabilize the measured moisture content at the dryer exit by continuously adjusting the dryer temperature. BrainWave is ideally suited to control this application due to its ability to account for the long transport delay times as the product moves through the dryer to the moisture measurement sensor.

Further improvements to control are possible by monitoring incoming moisture con-

▲ Wood dryer control schematic

Benefits

- Achieve consistent moisture and quality
- Automatic moisture control of dryer
- Reduce off-spec production
- Reduce energy consumption
- Reduce VOC and carbon emissions
- Increase yield
- Experience fewer plant
- Upsets, with less need for operator intervention
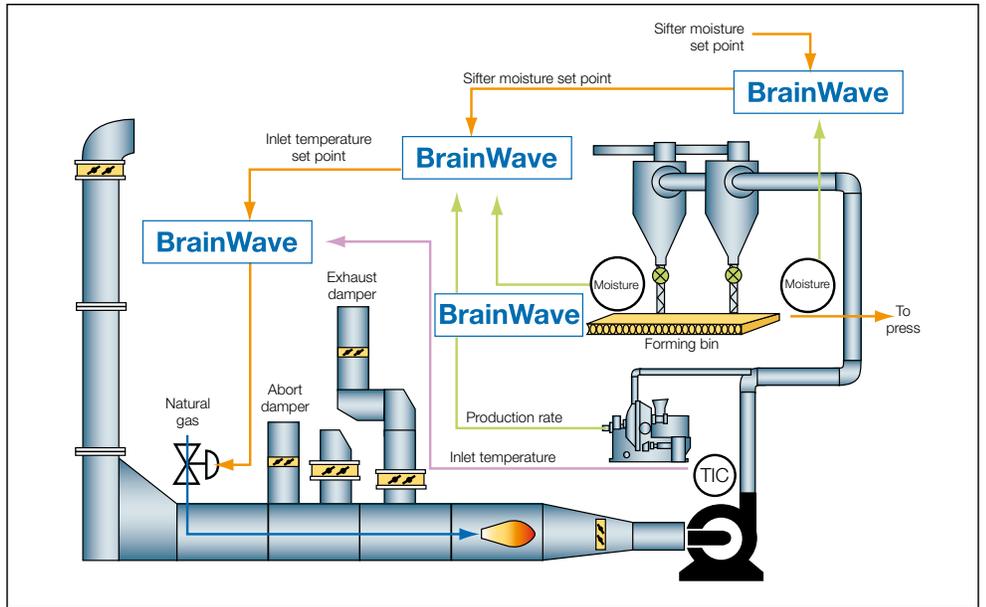
tent and including this in the control strategy as a measurable feedforward. This allows BrainWave to make control corrections as soon as the incoming moisture changes, instead of waiting for the exiting moisture to respond. Variations in the production rate cause the dryer dynamics to change dramatically. BrainWave is able to compensate for these changes by automatically switching controller configurations as the production rate changes, further improving dryer efficiency.

Most dryers try to control product moisture indirectly by using simple temperature or humidity control loops. By contrast, BrainWave directly controls moisture content by monitoring the incoming moisture content and feed rate. Lab measurements are used to correct the moisture control target to compensate for any measurement drift by the online sensors. BrainWave is able to take action before disturbances can upset the process, thereby minimizing error and reducing variability.

BrainWave provides several economic benefits for drying systems. For example, based on a 20 t/h production rate, typical BrainWave benefits include:

- Resin reduction of 3% (340,000 USD annual savings)
- Electricity reduction of 5% (130,000 USD annual savings)
- Steam reduction of 10% (50,000 USD annual savings)

Success stories

Customer: Temple Inland
Control objective:
- Reduce moisture variability
- Stabilize operations

Temple Inland installed BrainWave to stabilize the dryers for all of its particleboard and MDF plants. The results exceeded the company's most optimistic projections. Moisture variation was greatly reduced and dryer temperatures were stabilized, resulting in much more consistent fiber being delivered to the forming line.

The plants were able to reduce the amount of 'extra' resin being added and stabilize the board weight. The plants realized significant dryer energy savings, resin savings, reduced sand-off, yield increase, and fully automatic production, resulting in substantial operational cost savings.

Customer: Del-Tin Fibers
Control objective:
- Reduce utility costs
- Stabilize temperature

Del-Tin Fibers in El Dorado, Arkansas had a Smith Regenerative Thermal Oxidizer (RTO) system designed to provide heat for the drying process. When plant manager Joe Heard observed the high natural gas consumption, he urged operations to reduce utility costs.

Remembering the success he had achieved with BrainWave at another MDF plant, Mr. Heard had the advanced controller installed, achieving great results. BrainWave stabilized the temperature in the Smith RTO, resulting in more than 10% natural gas savings and substantially improving plant profitability.

Customer: Confidential
Control objective:
- Automate start-ups
- Reduce moisture variability
- Improve product consistency

BrainWave wood dryer controls were installed in a modern MDF plant in Alabama, USA, and configured to provide fully automatic start-ups that delivered fiber to the scalper, on moisture target, in about 15 minutes. This stands in stark comparison to the previous manual control, which often took two to four times as long and fully consumed an operator's attention. BrainWave now provides greater consistency for plant operations and allows the operators to focus on other important tasks.

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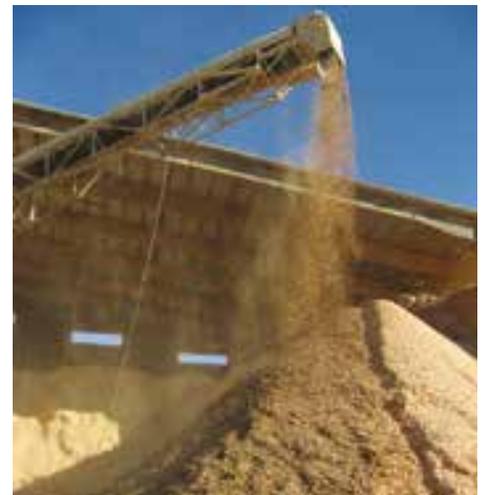
Automation solutions
Release your full potential

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