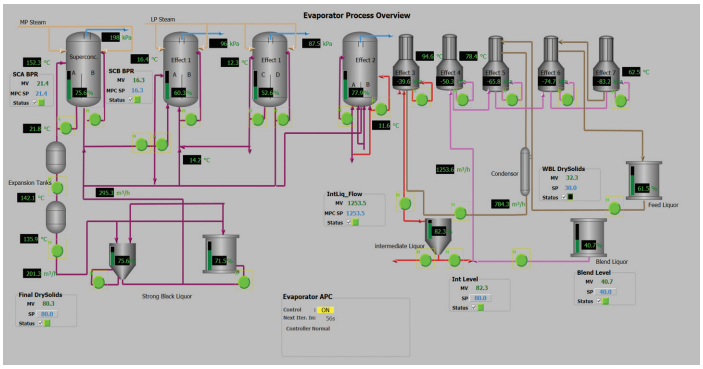
PULP AND PAPER

OPT800 Vapor

ABB Ability™ Advanced Process Control for multiple-effect evaporator plants



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OPT800 Vapor overview display

OPT800 Vapor is an Advanced Process Control (APC) solution for controlling and monitoring of the multiple-effect evaporation plant. Using a multivariable model-based approach, the solution controls the strong liquor production rate and dry solids content to minimize energy consumption and increase evaporation plant capacity.

Black liquor evaporation is a very important part of the recovery process. Dilute black liquor from the pulp mill fiberline is fed to the evaporation section to produce concentrated black liquor. This is then burnt in the recovery boiler to recover the cooking chemicals and produce steam for process heating and generation of electric power. Thus, the evaporation unit provides the link between the fiberline and recovery sections and plays a major role in the operation of pulp mills.

Ensuring the production of strong black liquor with on-target dry solids content and minimum variability is the key to stabilizing the recovery section and optimizing steam utilization. The multi-effect evaporators use low and medium steam pressure to transform weak black liquor with a dry solids content of 15-20% into strong black liquor with a dry solids content of 80-85%.

A common trade-off in pulp mills involves balancing the effects of washing on the bleaching process and the evaporation process. Increasing the dilution factor in washing uses more water to produce cleaner pulp, resulting in better bleaching with lesser chemical consumption but increased evaporator loads and more steam consumption. Conversely, decreasing the dilution factor in washing, results in lower evaporator loads and steam consumption, but higher bleaching loads, carryover soda losses and chemical consumption. Thus, there is a delicate balance and finding the sweet spot for pulp mill operations is not trivial.

OPT800 Vapor solves these challenges by providing tighter control of the evaporation process, reducing variability of the black liquor quality while also lowering operating costs and increasing capacity.

Features

- Dry solids control to optimize steam economy and provide higher evaporation capacity
- Production rate controls
- Real-time adaptive modelling: Automatic adjustments based on process changes
- Higher-order model support: Captures process dynamics accurately
- Cost optimizer: Looks for ways to optimize operational costs within process constraints
- Evaporators performance monitoring
- KPI dashboard and control usage reports by day/shift
- Performance monitoring, with both on-site and remote access for customers and ABB
- Task-oriented, user-friendly and customizable operator displays

Benefits

- Increased production rates
- Removes bottlenecks
- Reduced strong liquor dry solids variations
- Decreased energy consumption, enabling steam savings

How it works – Stabilizing black liquor quality and lowering costs

OPT800 Vapor effectively uses a multivariable model-based approach to optimize the black liquor dry solids profile across the multi-effect evaporation process. OPT800 Vapor coordinates the gradual rise of the boiling point of the individual effects (or evaporators) as well as the feed and intermediate liquor flows. By reducing the variability in the black liquor dry solids, the APC solution minimizes overall steam consumption while stabilizing operations. This results in fewer upsets and longer intervals between cleanings.

The included production rate control ensures fast and smooth changes during swings in the production rate by efficiently coordinating the various operating parameters (i.e. flow and boiling point rise) to ensure minimal disturbance to the system. The liquor tank levels are also maintained within desired levels to ensure optimum inventory levels and smooth transitions during disturbances and process upsets. Control performance will not degrade over time with always-on monitoring and analysis of the APC solution.

Real-time adaptive modelling

Dynamic model adjustment and adaptation in real time is a unique feature to ABB's APC platform. It means process models are dynamically updated if the process conditions change for things like production rate changes, fouled evaporation effects, etc. If any important process condition or property changes, the models can be updated automatically, keeping production and quality smooth and consistent.

Remove bottlenecks

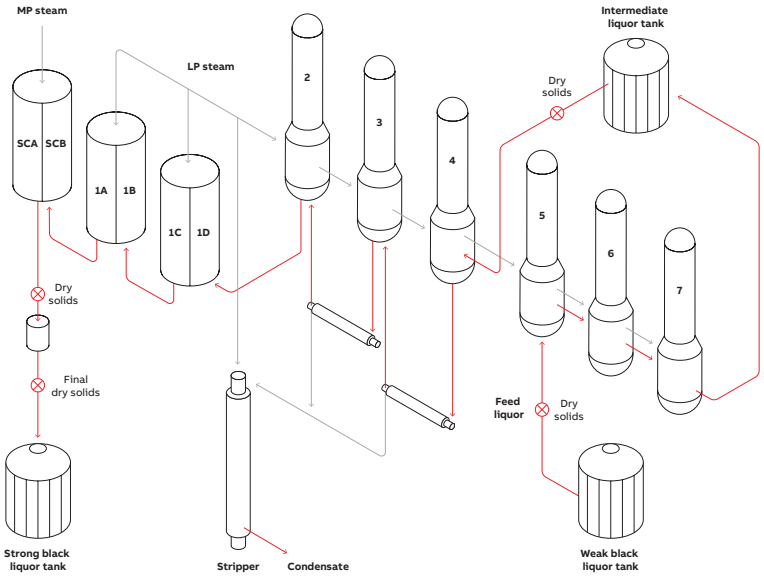
Importantly, use of the APC on the evaporator line can help find and implement control strategies to increase the throughput, opening up the bottleneck that the evaporators may be causing. Thus this is an easy way to get higher evaporator capacity, and therefore more black liquor produced in the recovery process and ultimately more pulp, without additional capital expenditure.

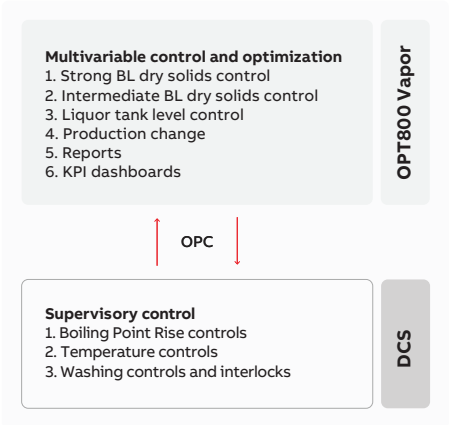
Coordinate with OPT800 Wash

OPT800 Vapor can coordinate with OPT800 Wash to optimize the dilution factors in washing and adjust the steam flow within the First Effect, also known as the Concentrator. By working together, these two APC solutions help control steam flow to the first effect, and then monitor solids in the firing liquor tank before the recovery boiler in a feedforward control loop on the countercurrent steam and black liquor flows.

Operator displays and reports

Highly-intuitive, task-oriented and easy-to-access operator displays are provided to monitor real-time, historical and prediction trends as well as modify tuning parameters. Using OPT800 Vapor, operators can create their own displays using the predefined graphical elements to meet their specific needs. The reports module calculates the key performance indicators such as controls utilization, steam consumption, production and quality and presents them in the day/shift report. OPT800 Vapor is delivered as a subscription-based service and consists of the state-of-the-art APC installation, start-up, and training, as well as tuning and monitoring services.





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Multi-effect evaporation process overview

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ABB Inc.
579 Executive Campus Drive
Westerville, Ohio 43082 USA
Tel: +1 614 818 6300
abb.com/pulpandpaper

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ABB Pte. Ltd.
2 Ayer Rajah Crescent
Singapore 139935
Tel: +65 6776 5711

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