Efficient running of pulp bleaching stages is often challenging for operators, who must control numerous reactions to consistently hit final brightness targets, while also preserving the fiber strength (pulp viscosity). It’s a delicate balancing act that is influenced by many dynamic variables, both in the bleaching stages and also by the preceding digester and oxygen operations. Getting stable runs can require frequent operator intervention.

At the same time, poor performance of the bleaching stages can have significant negative impact on both pulp quality and bleaching chemical costs. Furthermore, disturbances due to variations in wood species, chip quality, pulp grades and production rates add to the complexity of pulp bleaching. Because of the nature and dynamics of delignification processes, it can take only a few minutes to destabilize bleach lines – and then several hours to recover.

OPT800 Bleach tightly controls Kappa to preserve pulp quality during the bleaching phase. In the subsequent stages, brightness and chemical residuals are tightly controlled. Mills can better meet their brightness targets - with 30-50% lower brightness variation and 3-10% lower chemical costs.

**Features**
- Kappa, pH and final brightness control
- Production rate and grade change controls
- Pulp tracking and pulp quality footprint
- 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

**Benefits**
- Reduced pulp brightness variation by up to 50%
- Reduced chemical consumption by up to 10%
- Reduced chemical residuals
- Reduced pulp strength variation
- Improved pulp quality and yield
- Reduced environmental impact
- Improved diagnostic capability using pulp tracking function

**How it works - Keeping bleaching in balance**
To smooth out bleach plant operation, OPT800 Bleach manages and controls production rate and grade changes, ensuring smooth transitions. The Pulp Tracking module continuously aids in monitoring, analyzing and optimizing the complete process by tracking key process parameters through the various bleaching stages and adjusting as needed.

OPT800 Bleach utilizes a model based predictive control approach to accurately capture process dynamics. It manipulates chemical charges proactively to stabilize pulp brightness while minimizing bleaching chemical consumption. Control performance will not degrade over time with always-on monitoring and analysis of the APC solution. The control system can be applied to different types of bleach plants with a variety of bleaching sequences, including all ECF and TCF processes.
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 (covering the digester, oxygen, bleaching, washing, causticizing and lime operations) are dynamically updated if the process conditions change for things like grade changes, production rate changes, high inlet Kappa, etc. If any important process condition or property changes, the models can be updated automatically, keeping production and quality smooth and consistent.

Pulp Tracking function accurately compensates for retention times
Pulp Tracking accepts various process and quality measurements upstream from the oxygen delignification stage and tracks them through the various sections of the process such as the unbleached storage tank, various bleaching reaction towers and blow tanks, filtrate tanks and final high density storage towers.

The tracked process variables are used to develop non-linear empirical models of key quality variables such as pulp brightness that are then used for tighter closed loop control of bleaching chemicals and final brightness. The function accurately captures the process delays and retention times in the storage tanks and bleaching reactors, which are critical to tight control of first stage Kappa number and final brightness. It also provides insights during swings in pulp quality and improves the process diagnostic capabilities. Pulp tracking also facilitates automated grade changes in the brown stock and oxygen delignification processes.

Pulp Brightness Virtual Measurement
OPT800 Bleach includes a Pulp Brightness Virtual Measurement. Also known as a soft sensor, the Pulp Brightness Virtual Measurement utilizes models generated from machine learning technologies to predict an online measurement in order to increase the frequency of brightness measurements. These real-time calculations provide insight into the brightness factor at a faster rate than standard measurement devices and at various locations throughout the process.

This, when paired with the tracking function, gives operators a complete profile of brightness through the various zones of the bleaching stages, helping to close the brightness control loop and reduced variability and rejects.

Operator displays and reports
Highly-intuitive, task-oriented and easy-to-access operator displays are provided to monitor real-time, historical and prediction trends data as well as modify tuning parameters. OPT800 Bleach allows customization of the user interface to meet a wide range of project needs. The reports module calculates the key performance indicators such as controls utilization, and steam consumption, and presents them in the day/shift report. OPT800 Bleach 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.