

# OPERATIONS AND MAINTENANCE

## NO. 3 BLEACH PLANT

### No. 3 Bleach Plant Overview

The Mill uses a Prewash-D-E<sub>op</sub>-D bleaching sequence. In simple terms, the bleaching sequence is:

**Prewash Stage** - provides final washing and consistency control of the pulp before starting the bleaching process.

**D<sub>o</sub> Stage** - the first bleaching stage, where chlorine dioxide (ClO<sub>2</sub>) followed by washing takes place. This stage solubilizes most of the remaining lignin.

**E<sub>op</sub> Stage** - the second bleaching stage, where the sequential addition of caustic (NaOH), then hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) and oxygen (O<sub>2</sub>) takes place, followed by washing. This stage dissolves the soluble lignin and removes it at the stage's wash press.

**D<sub>i</sub> Stage** - the final bleaching stage, where the final bleaching of the pulp occurs using chlorine dioxide (ClO<sub>2</sub>), followed by washing. In this stage, the pulp is bleached to the desired brightness and the impact of impurities (dirt and wood shives) are greatly reduced.

The main objective of bleaching is to increase the brightness (whiteness) of the pulp while still maintaining good physical strength properties. The pulp is then used by the paper mill to manufacture a wide variety of consumer goods.

When bleaching pulp, there are a number of key parameters that influence the results of the chemical reactions and the effectiveness of each treatment. To obtain optimal bleaching results, specific conditions need to be met in each stage. The chemicals used in the different bleaching stages vary in their selectivity when reacting with cellulose and lignin as well as their ability to brighten the pulp.

The four key parameters for all bleaching stages are:

- 1) chemical dosage
- 2) reaction time
- 3) reaction temperature
- 4) stock pH.

All bleaching chemicals react according to the same principle with a fast initial reaction phase and then a slower subsequent phase. Chlorine dioxide (ClO<sub>2</sub>) is unique, however, having an almost instantaneous reaction with pulp.

In order to take advantage of this known reaction mechanism, a typical bleaching stage usually involves chemical addition, a chemical/pulp mixer, reaction in a tower to provide retention time, followed by washing to remove the excess chemicals and reaction products.

The Palatka Mill utilizes this type of equipment for the bleaching of both hardwoods and softwoods in the same and only bleach plant. The physical equipment operation is fundamentally the same for both species with different targeted values for the four key parameters mentioned above.

The following are examples of the type of instrumentation used to assure a safe, effective, and efficient bleaching process:

- Flow indication for stock, water, effluent, chemicals, and steam.
- Consistency meters prior to each bleaching sequence for chemical addition.
- Temperatures for all flows in all stages of the process.
- pH probes for stock and effluent throughout the process.
- Chemical residual analyzers for stock streams throughout process.
- Brightness instrumentation at each stage for brightness development and chemical addition.
- Fiber length analyzers for accurate species tracking and correct chemical addition.
- $\text{ClO}_2$  strength analyzer for maximizing  $\text{ClO}_2$  addition on stock effectiveness.
- Local and DCS gas emission alarms strategically placed throughout all levels of the operation.
- Conductivity probes in sewer effluent.

Operator training consist of initial training and qualification. Refresher training is conducted every 3 years for all operators of the bleach plant.

The operating staff of this equipment utilizes sophisticated digital controls systems via remote PC to monitor and make every control adjustment to the key parameters.

Operators maintain a log sheet that contains critical operating data. Alarms and safety interlocks also help to assure that the four key parameters are kept in check.

In an effort to verify that the control instrumentation is correct, operating staff complete manual test verification log sheets periodically during each shift. Deviations from field instrumentation are adjusted as needed and calibrations are made as soon as possible.

To minimize the need for frequent adjustments, field instrumentation are inspected, cleaned, replaced and/or calibrated on either a daily, weekly, or monthly basis.

All environmental, safety, or major pieces of equipment have written maintenance procedures and parts lists readily available to the maintenance staff. Preventative maintenance routes are completed routinely via either vender recommendations or historical performance. All maintenance work on any piece of equipment is tracked electronically for repetitive issue resolution.

There are various bleach plant operational events that could potentially lead to excess emissions. These events are caused by various malfunctions regarding gas collection and scrubber equipment failures.

For typical and anticipated events, the Palatka Mill has determined the appropriate responses to correct malfunctions as soon as practicable. The mill employs trained maintenance workers who can repair mechanical and electrical problems. The mill also maintains supplies of spare parts deemed necessary to effect good, continuous operation.

During the period required to correct a malfunction while the process continues to operate, the Palatka Mill will limit air discharges following practices designed to minimize emissions (for the bleach plant this entails keeping the scrubber operational). Depending upon the scope of the

malfunction, a complete process shutdown may be required.

