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Clarifying TMP White Water

Ponderay's unique strategy to treat and remove TMP white water extractives in the pulp mill leads to improved sheet strength and reduced deposition on the paper machine

BOB GRACE and BRIAN REED

Ponderay Newsprint Company, located in Usk, Wash., utilizes a unique strategy of combining chemistry and mechanical equipment to concentrate, treat, and remove TMP white water extractives in the pulp mill to reduce chemical costs, increase sheet strength and maximize paper machine production. The high yield thermo-mechanical pulping (TMP) process liberates problematic wood extractives that have been documented to have negative effects on sheet properties, paper machine cleanliness, and sheet quality.

The mill has limited flexibility in controlling the chip species coming to the mill; therefore, at times the extractives-rich species, such as Ponderosa pine, can be >65 percent of the total chip mix. Chemical and mechanical methods have been implemented to manage the varying levels of extractives in the process in order to maintain paper machine efficiency and sheet quality. Recently, a significant mill wide step change was observed in the process when the strategy of super-clarifying the TMP white water at the Krofta DAF clarifier was implemented. The Krofta has proven to be a valuable process tool, not only for improving the efficiency of the TMP water lock, but also helping the mill achieve energy, water, and fiber loss sustainability goals.

The TMP twin roll press (TRP) is a critical component of the TMP water lock, which minimizes the amount of TMP process water moving forward to the paper machine process. The twin roll press squeezes the TMP pulp to 30 percent consistency, and paper machine white water is used to dilute the stock back down to 4 percent prior to the PM stock chests, creating the water lock. The pressate coming from the TRP is a highly concentrated extractives-rich pressate stream.

A Krofta DAF clarifier, which was removed from the recycle process several years ago, provided an opportunity to clarify TMP white water without capital expense. It was recently configured into the TMP process in an effort to chemically treat and purge the extractives from the extractives-rich TRP pressate stream. A fiber recovery screen was added to scalp the usable fiber and minimize fiber loss at the Krofta (Figure 1).

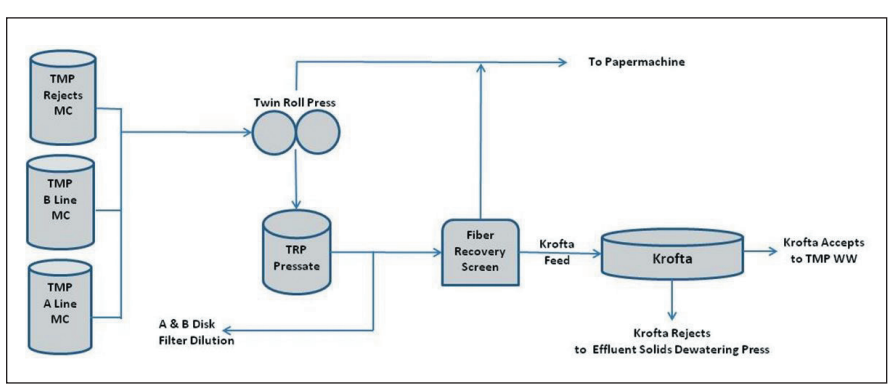
This project has provided a way to reclaim fiber and heat (energy) while reducing water usage helping the mill meet sustainability goals. Prior to the TMP water lock and Krofta implementation, the mill relied primarily on a polymeric pitch control program, which has been reduced significantly providing chemical cost savings.

Bob Grace, Pulping Manager at Ponderay Newsprint, says, "The twin roll press has always done an outstanding job of concentrating extractives and keeping them back in the TMP. The Krofta clarifier provides us with a means of efficiently removing these extractives from the process."

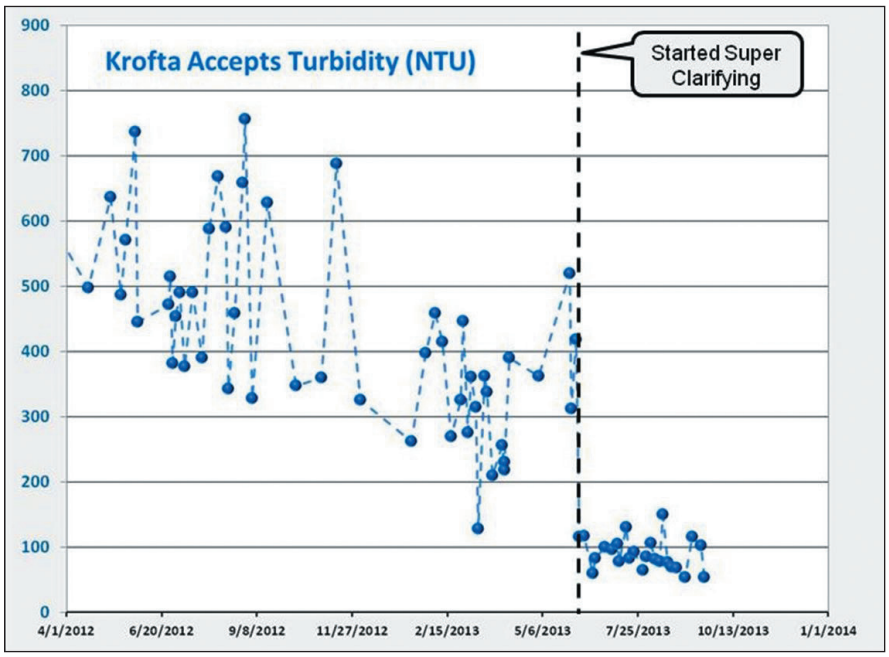
Although the TMP Krofta is used to clarify the TRP pressate, the chemical treatment begins early in the TMP process when a portion of the extractives is chemically treated with a pitch enzyme. Enzyme-based Buzyme 2567 pitch control product is added to convert the non-charged hydrophobic triglycerides into a charged hydrophilic fatty acid. The negative charged fatty acids are more manageable compared to triglycerides, and react with the dual cationic clarification program at the Krofta and are purged out of the TMP white water.

According to Grace, "We have defined 'super-clarification' as cleaning this pressate such that the turbidity of the clarified accepts is less than the turbidity of the TMP cloudy white water. This results in a significant turbidity reduction throughout the entire process, and fewer extractives in the final sheet."

A mill wide process step change was achieved when the super-clarification strategy was implemented in combination with increasing the TRP pressate flow to the Krofta. Super-clarification is defined as achieving a Krofta accepts centrifuged turbidity of <100 ntu. This turbidity is a measurement of colloidal solids after the sample is centrifuged, which correlates well with extractives loading in the process. Super-clarification resulted in a 97 percent suspended solids removal efficiency based on an incoming average Krofta feed turbidity of 2,648 ntu (Figure 2).



▲ Figure 1. Ponderay Newsprint twin roll press and Krofta flow diagram. Source: Ponderay Newsprint.



▲ Figure 2. Ponderay Newsprint Krofta accepts turbidity (ntu). Source: Ponderay Newsprint.

	Baseline (Turbidity Ave.)	Super Clarification (Turbidity Ave.)	Reduction (%)
Krofta Accepts	435	89	**80%**
PM WW	109	46	**58%**
TMP Leveling	91	47	**49%**
Headbox	58	36	**38%**
TMP WW	296	208	**30%**
TMP Latency	947	801	**15%**
Krofta Feed	2648	2455	**7%**

* Baseline Data Set: January 2012 to July 2013 (51 data points)

* Super Clarification Data Set: July 2013 to September 19th (21 data points)

▲ Figure 3. Ponderay Newsprint wet end chemistry audits before and after super-clarification. Source: Ponderay Newsprint.

When the TRP pressate flow rate to the Krofta was increased, an immediate step change was observed in the wet end chemistry audits and sheet extractives. The clarified Krofta accepts are routed to the TMP white water chest, which dropped the entire equilibrium of extractives in the TMP white water chest, resulting in cleaner TMP process water. The TMP white water clarification resulted in a lower extractives load in the TMP white water loop, and eventually the paper machine white water loop, resulting in a noticeable 19 percent reduction in sheet extractives. There are a lot of variables which affect sheet strength and paper machine efficiency. However, since the extractives content of the sheet has been reduced, the paper machine has achieved some of the highest efficiencies in recent history.

After the immediate step change, the equilibrium in the mill wide process waters continued to clean up. The extractives in the mill wide water balance continued to drop to record lows since the TMP water lock was installed (Figure 3). Since super-clarification began, the sheet extractives have been reduced 19 percent, paper machine process turbidities show a 38-58 percent reduction, and multiple deposit control chemical program reductions have been made. Figure 3 shows some of the key sample points from various sample points in the process, comparing the baseline data to the super-clarification data. The data set was sorted based on the largest reduction in centrifuged turbidities.

The most substantial benefit from super-clarifying has been the increase in sheet strength. The sheet strength data was statistically analyzed and strength improvements were confirmed as statistically significant. The paper machine speed is dependent on achieving a desired sheet strength. Therefore, when sheet strengths increase, the mill has the ability to increase production. As a result of super-clarification, the paper machine process is cleaner allowing for reductions to be made to the deposit control chemical programs on the paper machine itself. The mill has been able to realize an overall net chemical cost savings by managing the extractives in the TMP mill more efficiently.

The clarified water from the Krofta provides additional opportunities to use the clean water in the TMP process in the most efficient areas. For example, cleaner TMP white water going to the TMP refiner plates should have a positive effect on fiber development from reduced interference from plate filling. This will also allow for reductions to be made to the chemical TMP Refiner scale control program.

Determining the most efficient use of the contaminated water sources in the pulp mill is just as critical to deposit control management. Of the total 1350 gpm of TRP pressate, only 700 gpm can go to the Krofta due to hydraulic limitations; the remaining 650 gpm of TRP pressate goes back to A and B disk filter dilution in the pulp mill (Figure 1).

The TRP pressate flow bypassing the Krofta and returning to the disk filters is another opportunity for process optimization. For example, after a fiber recovery screen, this low consistency, extractive-rich TRP pressate could be re-routed to the chip wash water loop taking the place of a cleaner white water source. This could potentially have another positive impact on the overall process. "We continue to partner with Buckman in our efforts to leverage this process to reduce both chemical costs and enhance final paper properties," concludes Grace.

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