



Bleached Kraft Pulp Mill Saves \$5/Ton in Bleaching Chemicals Through SCALE-GUARD™ PLUS Technology

NALCO Water
An Ecolab Company

CASE STUDY - PAPER
CH-809

Mill Overview



Mill:	Integrated Kraft Pulp Mill
Grade:	Market Pulp, Uncoated Free Sheet
Equipment:	3 Stage Bleach Plant - D100, Ep, D1 Kamyr Digester
Production:	1,050 BD TPD
Species:	Bleached Hardwood

BUSINESS SITUATION

This mill had been running a competitive anti-scalant program for 4 years. The program was performing poorly, as the bleach plant had to shut down every six weeks for 10 hours to high-pressure water clean the E_p stage tower. Nalco Water initiated the discovery process by testing the bleach plant process filtrates utilizing the Scale Scaling Rate Monitor (SRM) and, subsequently, the IDM Independent Deposit Monitor (IDM) to determine the nature of the calcium carbonate and calcium oxalate scaling potential in each filtrate stream.

In addition, a complete bleach plant audit utilizing the Mechanical, Operational, Chemical (MOC) approach was conducted that detailed general operating parameters and the specific caustic and anti-scalant addition application points. SRM and IDM data revealed that Paper Machine process water, D100 washing efficiency, and caustic and anti-scalant addition points all had a major impact on scale control in the Bleach Plant.

After detailing the audit findings to the customer, Nalco Water proposed to integrate its SCALE-GUARD PLUS Technology to help correct the situation in the bleach plant and allow them to meet their challenges.

BACKGROUND

Management of inorganic contaminants begins at the digester and plays a critical role in controlling the problems such contaminants can create throughout the pulp mill. Water optimization and process changes can result in the accumulation of tenacious scale deposits in critical areas. In addition, many pulp mills have modified their washing and bleaching processes due to changing environmental regulations. All of these changes have created an ideal environment for increased scaling problems, reduced brightness ceilings, escalating energy costs, imbalances in organic levels and increased operating costs. Figure 1 depicts a typical metals profile of a modern pulp mill.

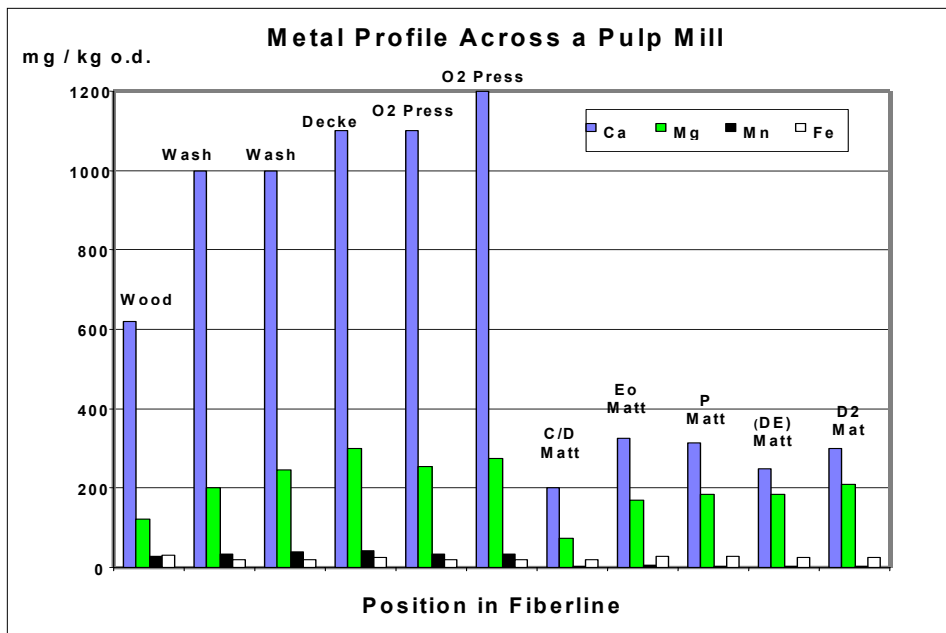


Figure 1 - Typical metals profile of a modern pulp mill. Taken from: "Metals Management in the Fiberline", Patrick S. Bryant.

The mill had the capability to utilize every ton of pulp that can be produced, either as paper machine production or market pulp. To help reduce fresh water consumption, the bleach plant was mandated to utilize carbonate-filled paper machine white water as shower water on the D100 washer. This caused significant scaling in the E_p stage, resulting in the loss of 460 tons of bleached pulp production every 6 weeks.

The mill's biggest challenge was in understanding that the chemical recommendations given by the existing supplier were not delivering the necessary results. The total MOC approach proposed by Nalco Water was the key to addressing the mill's issues.

ANALYSIS OF BUSINESS SITUATION

Key Business Drivers

- Bleach Plant Efficiency
 - Increased Production
 - Reduced Fresh Water Usage
- Bleaching Costs

Challenge

- Paper machine white water contains carbonate used in D100 shower water.
- Caused significant scaling in the E_p stage, resulting in the loss of 460 tons of Bleached Pulp production every 6 weeks.
- Incumbant anti-scale was performing poorly, as the bleach plant had to shut down every 6 weeks for 10 hours to high pressure water clean the E_p stage tower.
- Nalco Water's audit efforts identified that the D100 washer was blinded with calcium oxalate scale. This severe deposition had resulted in an increased usage of 15 lbs/ton of ClO₂.

Opportunity

- Increased production by reducing downtime for cleaning
- Reduced bleaching costs
- Use paper machine white water in bleach plan

KEY PERFORMANCE INDICATORS

- Time between Bleach Plant shutdowns for high pressure cleaning of E_p stage
 - The mill wanted to eliminate a 10 hour shutdown every 6 weeks
- ClO₂ usage
 - Scaling reduces washing efficiency resulting in increased ClO₂ usage
- Temperature on the E_p reactor
 - Scaling fouls the temperature probes in the E_p stage, generating false readings, and leading to poor operational control
- Caustic usage
 - Scaling reduces washing efficiency resulting in increased caustic usage
- Steam usage
 - Scaling reduces the consistency of the stock coming off the D100 washer, thereby increasing the steam demand to reach temperature set point
- Chemical program cost

PROGRAM DESIGN

Nalco Water's audit efforts identified that the D100 washer was blinded with calcium oxalate scale. This severe deposition had resulted in an increased usage of 15 lbs/ton of ClO_2 . Nalco Water implemented its SCALE-GUARD PLUS Technology to allow the mill to meet production demands and improve the efficiency of the process. The first step was to implement an effective cleaning program. Nalco Water developed a procedure to clean the D100 washer utilizing NALKLEEN™ 62619 and NALKLEEN™ 2657, a chelant/surfactant boilout program. The successful completion of this boilout translated to a decrease of \$4.00/ton in bleaching costs. This demonstrated to the mill that Nalco Water knew how to work in a bleach plant. Credibility in managing bleach plant metals was established and the mill agreed to work with Nalco Water on a comprehensive scale control trial.

The next step was to begin an effective continuous treatment program, however prior to that Nalco Water recommended a true MOC approach to managing the scale deposition problem at this mill. The bleach plant audit revealed that the mill's existing caustic feed points were contributing to scale generation and had to be relocated. The SRM work confirmed that calcium oxalate and calcium carbonate scales could be managed chemically. It was also discovered that the paper machine white water, which was used as shower water in the D100 stage, was a significant source of calcium ions, thereby contributing to scale development (Figure 2). To address this issue, Nalco Water recommended that an additional anti-scalant feed point be added to the D100 shower. A final observation

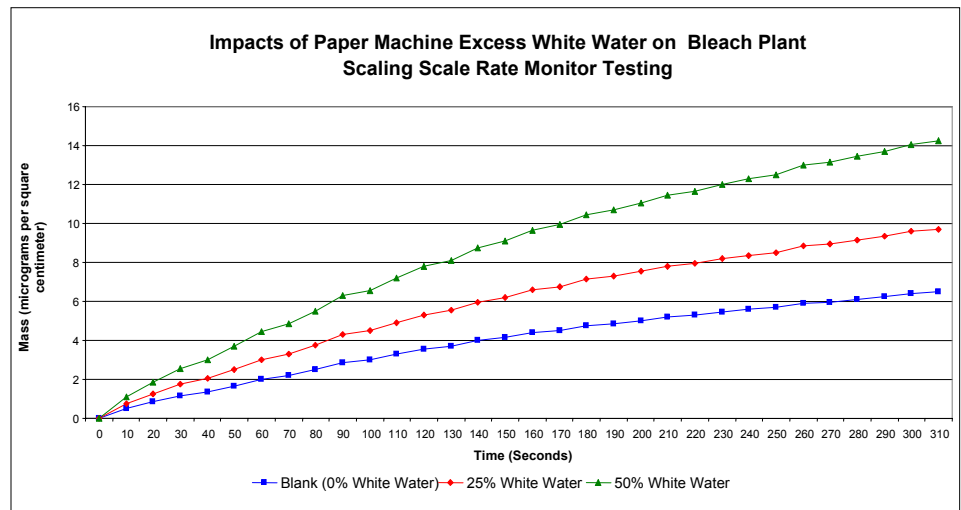


Figure 2 - Impact of Paper Machine White Water on Bleach Plant Scaling with Scale Rate Monitor.

was that the D100 washer cleanliness was critical to E_p scale generation. To address this issue, a testing protocol was developed to define when a chelant boilout would be required to maintain metals management.

Finally, Nalco Water implemented the continuous SCALE-GUARD PLUS Technology program as an ongoing treatment to deliver the desired results. To treat the calcium oxalate scale that was depositing in the D100 system, Nalco Water recommended SCALE-GUARD PLUS 341 Technology. The calcium carbonate in the E_p system was treated with SCALE-GUARD PLUS 60123 Technology fed into three separate feed points. NALKLEEN 62619 Technology was recommended for continued use as the boilout treatment.

During a bleach plant outage, the E_p system was thoroughly cleaned utilizing high-pressure water. The Nalco Water chemistries came online at the start, directly replacing the previous supplier. The recommended dosage rates, derived from SRM and IDM studies, were achieved immediately.

PROGRAM RESULTS

- The bleach plant ran 12 weeks without a shutdown for scale issues. The elimination of the 10-hour shutdown at six weeks resulted in savings of \$140,000 in lost production and \$30,000 in high pressure cleaning costs. This translated into a conservative estimate of \$1.2MM in annual savings.
- Inspection of the EP system after 12 weeks revealed that the amount of scale was less than half of what was present during the competitor's program after six weeks.
- The combination of caustic and ClO_2 usage was \$4.00/ton less during the Nalco Water total SCALE-GUARD PLUS Technology program than during the competitor's program. This equates to \$1.5MM in annual savings.
- Temperature probes were not fouled, which indicated that scale was not depositing and allowed for better process control.
- Nalco Water's SCALE-GUARD PLUS Technology program costs were equivalent to the competitor's, while delivering over a 250% ROI.

MAINTAINING THE VALUE

Nalco Water has worked with the mill to ensure results of the program and continue to prove its value. Regular testing includes:

- Monitoring all process streams for their contribution to scale deposition
- Continuing to monitor bleach plant operating parameters
- Temperature, pH, ClO₂ usage, caustic usage

CONCLUSION

Today's market conditions have created an ideal environment for increased scaling problems, reduced brightness ceilings, escalating energy costs, imbalances in organic levels, and increased operating costs. Working closely with the Fiberline operations staff Nalco Water implemented this SCALE-GUARD PLUS Technology program that delivered a savings of \$5/ton in the bleach plant.

SCALE-GUARD PLUS TECHNOLOGY

Management of inorganic contaminants begins at the digester and plays a critical role in controlling the problems such contaminants can create throughout the pulp mill. Water optimization and process changes can result in the accumulation of tenacious scale deposits in critical areas. In addition, many pulp mills have modified their washing and bleaching processes due to changing environmental regulations. All of these changes have created an ideal environment for increased scaling problems, reduced brightness ceilings, escalating energy costs, imbalances in organic levels, and increased operating costs.

Nalco Water's SCALE-GUARD PLUS Technology programs combine tailor made chemical programs, new monitoring and control technology, and most importantly Mechanical, Operational and Chemical (MOC) best practices. Nalco Water's analytical capabilities and extensive resources enable us to accurately assess your scaling problem and develop cost-effective solutions. With over 80 years of water treatment expertise, we have developed successful scale control programs for every application in your pulp mill, including digesters, bleach plants, evaporators, and refiners.

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