Sheet Hole Reduction at Paper Mill Leads to Improved Machine Runnability

OxiPRO™ Deposit Control Technology

Mill Overview:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Uncoated Freesheet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine</td>
<td>Twin-Wire Gap Former</td>
</tr>
<tr>
<td>Speed</td>
<td>1,600 mpm</td>
</tr>
<tr>
<td>Basis Weight</td>
<td>70-120 g/m²</td>
</tr>
<tr>
<td>Production</td>
<td>450,000 tpy</td>
</tr>
<tr>
<td>Furnish</td>
<td>55/10/35 HW/SWRecycle</td>
</tr>
<tr>
<td>Filler</td>
<td>16-20%</td>
</tr>
</tbody>
</table>

BUSINESS SITUATION

High productivity is one of the major goals that most paper mills pursue, but many mills experience losses from sheet breaks and unscheduled downtime. Often even new machines also sacrifice machine speed due to poor deposit control management.

Nalco implemented its new OxiPRO Deposit Control Technology to improve machine efficiency at an uncoated freesheet mill. This integrated approach utilizing tailored chemistry programs, proprietary monitoring tools and global expertise helped the customer to achieve profit improvement through sheet break reduction and cost reduction. OxiPRO Deposit Control Technology successfully improved machine efficiency with a 35 percent reduction in the cost of the program. As a result, Nalco earned the trust of this customer, and this was a critical step in developing a long-term partnership.

BACKGROUND

Recently, this customer built a new machine to increase production of high quality paper. The former supplier had been utilizing oxidizing and non-oxidizing biocides. However, the customer was not satisfied with the program due to the high cost relative to the market, as well as poor sheet quality resulting from sheet holes.

The customer wanted to improve sheet quality, and also wanted to maintain the existing boil-out period. After Nalco proposed OxiPRO Deposit Control Technology as a potential solution, Nalco performed a Bioaudit and then submitted a proposal with the results of a micro-biological survey. By using a comprehensive concept, Nalco clearly defined program objectives that addressed the mill’s expectations.
ANALYSIS OF BUSINESS SITUATION

Key Drivers
- Reduce sheet holes, defects and breaks.
- Prevent unscheduled downtime.
- Improve efficiency.
- Optimize program cost.

Challenge/Opportunity
- Reduce cost, while improving machine efficiency.
- Large volume of white water requiring treatment.
- Long retention time
  - Broke system
  - Whitewater system

PROGRAM DESIGN
Nalco's program approach was tailored to meet the customer’s requirement to reduce sheet holes, improve sheet quality, and to reduce sheet breaks to prevent unscheduled downtime. Nalco evaluated and implemented a combination of oxidizing and non-oxidizing chemistries to effectively control microbial growth throughout the system. Nalco tailored the program of oxidizing biocides to address the challenges of large volumes of a white water system and the long retention time of the broke system. Treatment of the additive system was included in this comprehensive deposit control program.

Furthermore, on-site expertise provided by the local sales representatives and continuous, on-line monitoring with Nalco’s proprietary monitoring tools allowed for optimization of total program costs.

Nalco’s approach to program design, monitoring, and optimization satisfied the customer’s expectations and the problem-solving approach earned the trust of this customer to help build and ensure a long-term partnership.

KEY PERFORMANCE INDICATORS
New world-class machines were running at speeds of 1,500 meters per minute or higher and machine efficiency was one of the Key Performance Indicators (KPI). These can be accomplished by increasing productivity of high quality paper.

KPI
- On-Machine Efficiency (OME)

Measure(s)
- Reduce sheet holes
- Reduce sheet breaks
- Extend boil-out period
- Prevent unscheduled downtime

Comments
- Reduce or eliminate impact of microbial deposit on machine efficiency

PROGRAM RESULTS
Implementation of the OxiPRO Deposit Control Technology program reduced hole counts from an average of 35.8 to 14.2 per day (about a 60 percent hole reduction, see Figure 1). In Figure 1, Xbar represents average value and UCL for upper control limit to show how variation is changing. The average hole count was 35.8 per day before the Nalco program, which was significantly reduced to an average of 14.2 per day with Nalco’s program.

Furthermore, control variation was very wide before the Nalco program; hole counts up to 148 per day was considered as ‘within the control range’. However, UCL has been reduced to 47 holes per day with Nalco’s program, clearly showing that performance is tightly controlled with much less variation.

Figure 1 - OxiPRO Deposit Control Technology reduced sheet holes to improve machine runnability.
Figure 2 - OxiPRO technology monitor demonstrated the opposite trending between activity and ORP. This is demonstrated using TrendGen to analyze data. The red line is the Activity Trend, and the green line is the ORP trend.

Figure 3 - Improved control of microbial activity correlated with the reduction of bio-fouling index. The Cusum values represent the trend in microbial activity and bio-fouling index relative to the average values for the period of program optimization.

The customer was also able to maintain their scheduled boil-out period due to the reduction of unscheduled downtime due to frequent sheet breaks. All of these improvements were accomplished with optimized program cost. The OxiPRO Deposit Control Technology implementation improved machine efficiency from 89.1 to 91.3 after eight weeks.

The OxiPRO Deposit Control Technology Monitor has successfully captured this relation.

TrendGen analysis demonstrated that the activity index increased first and then two days later the bio-fouling trend increased accordingly (Figure 3). This shows that the microbial activity sensor is a very sensitive tool. It can be used as an early warning system that responds much faster to system changes than any bio-fouling sensor. After Nalco’s optimization of the program, activity decreased and then bio-fouling decreased hereafter.

The TrendGen analysis demonstrated that following the program optimization, there was a decrease in bio-fouling index and hole counts relative to the average value for the parameters when the program adjusted. The data analysis showed that the bio-fouling index and hole counts have a positive correlation (Figure 4).

Nalco was also able to help this customer to save additional deposit control program costs through program optimization, which has led to a long and trusting partnership.

**MAINTAINING THE VALUE**

Nalco and the customer will continue the process of regular machine audits to make sure that machine efficiency improvement is maintained. This will be accomplished using the strategy outlined in Figure 5.

**Monitoring the Program Proactively**

TrendGen™, a proprietary data analysis software system developed by Nalco, was used for the data interpretation. Cusum is the accumulated sum of the difference between a specific data point (ex. activity) and the population average. This showed an excellent opposite trending (Figure 2). Because of the microbial activity increase, it can be expected that the ORP will drop.
CONCLUSION

Nalco’s approach using a tailored chemical program and sophisticated monitoring tools enabled the implementation of OxiPRO Deposit Control Technology to improve overall machine efficiency. The customer was able to save substantial profit losses by reducing sheet holes and sheet breaks.

OxiPRO DEPOSIT CONTROL TECHNOLOGY

Machine deposits in a paper production process can influence On-Machine Efficiency (OME). OxiPRO Deposit Control Technology provides an innovative, patent-pending offering that prevents operational problems caused by such deposits. OxiPRO Deposit Control Technology provides comprehensive solutions tailored to your unique application. These solutions improve environmental performance, while impacting your bottom line. Nalco’s newest innovative patent-pending SMART Solutions offering, OxiPRO combines proactive monitoring tools, sophisticated data analysis tools, tailored programs, innovative application strategies, and application expertise. This leads to improved control of microbial growth and deposit formation, fewer sheet breaks and defects, reduced downtime, and increased machine speed. The overall result is increased OME and enhanced finished product quality.

Reduction in boil-out frequency lowers the demand for fuel resources, reducing greenhouse gas emissions and their impact upon global warming potential. Reducing demand for biocide chemicals promotes the conservation of renewable and non-renewable resources associated with production and transportation. Together this supports the sustainable operation and development of the customers’ plant and processes.