Machine Productivity Increased up to 8% at a Constant Energy Input

VELOX Dewatering Aid Technology Increases Productivity in Coated Fine Paper Mill

BUSINESS SITUATION

NALCO Water created an alliance with a global reference coated fine paper mill while successfully incorporating VELOX Dewatering Aid Technology into the mill’s production program. With VELOX Dewatering Aid Technology, the mill was able to surpass its paper machine’s production constraints by enhancing water removal in the press section. By improving dewatering in the press section, the paper machine was able to increase its production speed for multiple basis weight grades.

BACKGROUND

The coated fine paper mill was in need of increasing its incremental production volume per hour to stay competitive with other coated fine paper producers. With market fluctuations and grade consolidations, the producer found itself needing to quickly produce multiple basis weight grades to serve the demanding market while keeping variable costs down.

The coated fine paper mill had a paper machine producing on-line coated paper of high quality. The mill initiated a VELOX Dewatering Aid Technology

### Mill Overview

<table>
<thead>
<tr>
<th>Grade</th>
<th>Coated Fine Paper</th>
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</thead>
<tbody>
<tr>
<td>Basis weight range:</td>
<td>100-300 g/m² (21-62 lb/1,000ft²) finished paper</td>
</tr>
<tr>
<td>Filler:</td>
<td>GCC (12 to 17% ash in base sheet)</td>
</tr>
<tr>
<td>Machine Speed:</td>
<td>230-570 m/min (755-1,870 ft/min)</td>
</tr>
<tr>
<td>Average Production:</td>
<td>66,385 tpy (60,224 mtppy)</td>
</tr>
<tr>
<td>Machine Type:</td>
<td>Fourdrinier/TriNip/Shoe Press</td>
</tr>
<tr>
<td>System pH:</td>
<td>Alkaline</td>
</tr>
<tr>
<td>Kraft:</td>
<td>50-70%</td>
</tr>
<tr>
<td>CTMP:</td>
<td>0-15%</td>
</tr>
<tr>
<td>Broke:</td>
<td>up to 30%</td>
</tr>
</tbody>
</table>

### Customer Impact

Machine productivity increased up to 8% at a constant energy input.

### Economic Results

Annual incremental profit of $5.25 million due to additional production of 25 tons per day and assuming $595/ton for price of coated paper and operating days of 350.

eROI is our exponential value: the combined outcomes of improved performance, operational efficiency and sustainable impact delivered through our services and programs.
project with NALCO Water to increase the machine productivity. VELOX Dewatering Aid Technology is a wet-end program that combines a reactive polymer with an engineered NALCO Water retention and drainage system. The paper machine’s productivity was steam-limited in all grades above 150 g/m² (31 lb/1000 ft²). As a result, the project focused on finding a solution to improve dewatering with the intent of increasing machine speed.

ANALYSIS OF BUSINESS SITUATION

Key Business Drivers
- Increase machine productivity

Challenge/Opportunity
- Machine steam limited in most grammages
- Maintain machine runnability and sheet quality specifications

KEY PERFORMANCE INDICATORS
- VELOX Dewatering Aid Technology dosage and steam consumption: Shows which dose has the optimal effect on steam demand.
- VELOX Dewatering Aid Technology dose and base sheet moisture: Shows how dose affects drying.
- VELOX Dewatering Aid Technology dose and machine speed for various basis weight grades: Shows productivity based on dose.
- First Pass Retention (FPR) and VELOX Dewatering Aid Technology dose: Shows ash retention based on VELOX Dewatering Aid Technology dose.

PROGRAM DESIGN

Before VELOX Dewatering Aid Technology was implemented, a comprehensive system survey, which includes cationic demand and zeta potential determinations, was conducted to understand the wet-end chemistry balance of the process. The information was then used to design the VELOX Dewatering Aid Technology program, in terms of dose and addition point strategy. In this particular case, the optimal location where VELOX Dewatering Aid Technology reacted the most or retained to fiber was between the starch and NALCO Water’s microparticle injection points.

After determining the optimal addition point, various dosages of VELOX Dewatering Aid Technology were explored, ranging from 0.5 to 3.5 kg/mt (1.0 to 6.8 lb/ton) on a dry basis. Other additives such as starch and NALCO Water’s microparticle were kept constant throughout the trial. Key parameters recorded during the trial were steam consumption, machine speed, base sheet moisture, first pass retention, basis weight, and VELOX Dewatering Aid Technology dose.

PROGRAM RESULTS

In the first part of the trial, VELOX Dewatering Aid Technology was added between 0.6 kg/mt (1.2 lb/t) to 1.3 kg/mt (2.6 lb/t) during the production of a 300 g/m² (62 lb/1,000 ft²) grade. As the VELOX Dewatering Aid Technology dose increased from 0.7 kg/mt (1.4 lb/t) to 1.3 kg/mt (2.6 lb/t), steam consumption decreased by 5%. This key benchmark provided evidence that VELOX Dewatering Aid Technology was able to reduce its energy demand in the drying section as less steam was necessary to produce a relatively high basis weight grade. Figure 1 illustrates the decrease in steam consumption with increased dosages of VELOX Dewatering Aid Technology.

Another benefit shown from VELOX Dewatering Aid Technology during the first part of the trial was a decrease in base sheet moisture without sacrificing sheet specifications and machine runnability. Figure 2 shows the moisture of the base paper before coating decreased from 7.2 to 5.6%. By improving base sheet moisture profile, VELOX Dewatering Aid Technology was...
effectively removing water from the fiber suspension, and in turn reducing the amount of steam needed for drying and reducing the risk of sheet breaks.

The second part of the trial consisted of running VELOX Dewatering Aid Technology on 150 and 170 g/m² (31 and 35 lb/1,000 ft²) grammage grades to investigate the reactive polymer’s effectiveness of speed increase across different basis weight grades. Figure 3 illustrates that the machine speed could be increased above previously achieved maximum speed for different grades. For these two grammage grades, the optimized dosage range at which process derived the maximum speed at constant steam consumption level was 0.75-1.0 kg/mt (1.5-2.0 lb/t).

This part of the trial showed that the mill has the flexibility of turning VELOX Dewatering Aid Technology on when producing steam-limited grades and turning VELOX Dewatering Aid Technology off during grades where speed is not limited by available steam.

An additional benefit observed during the second part of the trial was that there was an increase in total ash retention. By increasing ash retention, the mill has the possibility to increase refining and substitute raw material with cheaper fiber. This added benefit can consequently decrease total cost of operation and improve sheet properties such as strength.

Figure 4 shows 1-2% increase in FPR for different grade production with the VELOX Dewatering Aid Technology addition.

Figure 2 - Base sheet moisture decreased 1.6% when 1.2 kg/mt (2.4 lb/t) of VELOX Dewatering Aid Technology was added.

Figure 3 - Machine speed increased by an average of 30 m/min (98 ft/min) at various grades with VELOX Dewatering Aid Technology.
MAINTAINING THE VALUE

VELOX Dewatering Aid Technology allowed the opportunity for the mill's paper machine to increase speed on an average of 30 m/min (98 ft/min). This represents an overall 7-8% increase in productivity. Mill personnel calculated that the resulting net profit to the mill is 17 Euro per metric ton of treated paper.

The customer continues to implement VELOX Dewatering Aid Technology to maximize production throughout by improving water removal performance.

CONCLUSION

The VELOX Dewatering Aid Technology program, a combination of using a reactive polymer and a robust retention and drainage system, provided the desired speed increase and return on investment for the mill. The system is flexible in that it can be turned on for grades that are steam-limited while not sacrificing sheet properties. VELOX Dewatering Aid Technology can also be turned off for grades where improvement in drying capacity is not needed.

VELOX DEWATERING AID TECHNOLOGY

Graphic Papers producers are under unique market pressure to improve efficiency of their operations. VELOX Dewatering Aid Technology offers graphic grade mills the opportunity to increase On-Machine Efficiency (OME) by improving water removal performance, runnability, and sheet properties. Consequently, these improvements present the potential to reduce Total Cost of Operation (TCO) by using cheaper raw materials and reducing steam demand.