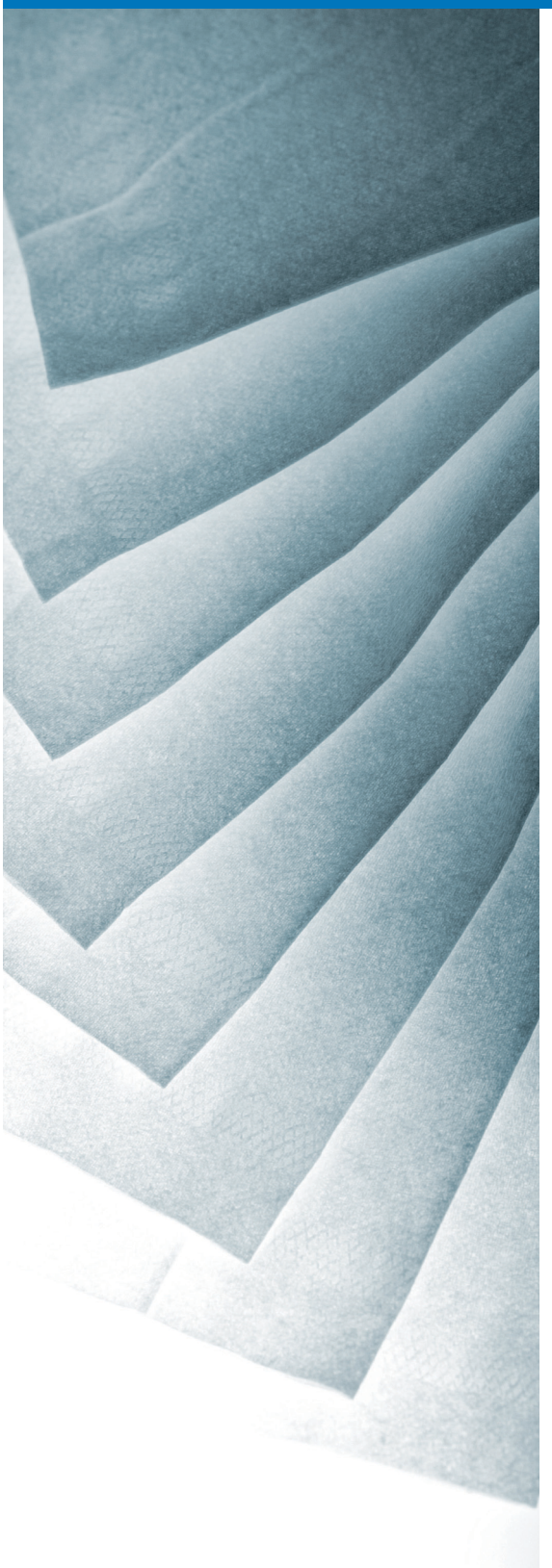
Nalco TULIP Adhesive Technology Provides Tissue Manufacturer Improved Productivity and Operational Cost Savings

NALCO Water
An Ecolab Company

CASE STUDY – PAPER
CH-1295



Mill Overview:

Equipment:	Crescent Former
Production:	90 Tons/day
Machine Speed:	6000 fpm
Machine pH:	Neutral
Furnish:	Recycled Fiber
Grade:	Tissue

BUSINESS SITUATION

A North American Tissue manufacturer was experiencing low creping blade life and a significant number of creping related sheet breaks. In an effort to increase machine throughput, a project was implemented with the objectives of doubling blade life, eliminating hard coating related edge cracks, and reducing blade pick-out sheet breaks. After working with the incumbent Yankee coating application and not meeting the above objectives, the mill leadership requested recommendations from alternate suppliers.

Customer Impact	eROI℠	Economic results
44 ton/year reduction in adhesive chemistry and a 73 ton/year reduction in release chemistry	EARTH	Total Yankee Coating Application Cost Savings of $177,000/year
Spray boom redesign reduced dryer energy load by 9,100 MM Btu/year	ENERGY	Associated reduction in natural gas led to a cost savings of $36,500
Spray boom redesign reduced fresh water usage by 980,000 gallons/year	WATER	Associated reduction in fresh water led to a cost savings of $1100 / year

eROI is our exponential value: the combined outcomes of improved performance, operational efficiency and sustainable impact delivered through our services and programs.

BACKGROUND

Traditionally, Tissue and Towel manufacturers have used PAE (Poly(aminoamide)epichlorohydrin) resins as the Yankee adhesive. When faced with a hard Yankee dryer coating film, the standard approach is to move towards lower MW (Molecular Weight) adhesive chemistries by implementing low cross-linking density or fully cross-linked PAE resins. When lowering the film's MW does not provide relief, the standard release oils paired with the adhesive chemistry are transitioned to more expensive modifying chemistries.

In an effort to produce a soft, high adhesion, and durable adhesive chemistry, Nalco developed the TULIP creping technology. The TULIP program consists of a MVP (Modified Vinyl Polymer) resin that tested extremely well in the laboratory environment and those results have translated directly to the machine in numerous trial activities over the past two years. TULIP technology provides excellent adhesion at significantly lower addition rates compared to PAE resins. It is significantly softer than even fully cross-linked PAE resins resulting in creping blade tip penetration and the elimination of the troublesome outside the sheet edge build-up commonly witnessed on crescent formers. Despite the soft film, TULIP technology protects the Yankee from the blade leading to low wear rates (< 3 mils/hour). These results have been verified over time as many of the trial activities resulted in new coating accounts.

ANALYSIS OF BUSINESS SITUATION

The mill manager met with several Yankee coating suppliers and outlined the mill's project objectives. They included increasing blade life with a stretch goal of doubling the current average creper life, eliminating the sheet edge cracks that were caused by the hard outside the sheet coating build-up, and reducing the amount of creping related sheet breaks.

Key Drivers

- **Increased Blade Life:** The short creper life was caused by excessive wear rates above 10 mils/ hour versus the industry standard of less than 3 mils/hour. The high wear rate was a function of the hard inside the sheet film.
- **Eliminating Edge Cracks:** Despite an edge spray system that delivered a significant volume of water to cool the edges and the application of additional diluted edge oil sprays, a hard outside the sheet build-up was lifting the blade causing sheet edge cracks.
- **Reduce Creping Related Defects:** Being a recycled fiber machine, sticky holes were consistently present in the sheet. Due to the hard coating preventing creping blade tip penetration, the sticky holes would often open up causing sheet breaks. Additionally, many break samples contained the typical dry V tail associated with a hard coating streak blade pick-out.

PROGRAM DESIGN

The Nalco team, consisting of both the Tissue Team and experienced local representatives, completed a machine survey to understand the potential root causes associated with the three problem statements. After completing the survey, Nalco decided to utilize the MOC (Mechanical, Operational, and Chemical) approach. Mechanically, Nalco redesigned the Yankee spray boom to supply uniform chemical coverage with less water load to the dryer surface. Operationally, a dry-end centerline sheet was implemented with changes to the PLI (pounds per linear inch) loading associated with the creping and cleaning blade and grade based coating add-ons. Chemically, the TULIP technology program was selected because of its ability to stay soft enough to allow for blade tip penetration and durable enough to protect the dryer from blade contact.

The technology paired up with a proprietary release oil, Nalco 64575, to eliminate the edge build-up. The Nalco 64575 additive was also added to the existing edge spray system.

KEY PERFORMANCE INDICATORS

Increased Blade Life: While the average creping blade life was the primary KPI (key performance indicator), we used blade wear rate measurements (mils/hour) as our initial KPI to insure our program was headed in the right direction.

Eliminate Edge Cracks: The primary KPI was using the mill's break identification log sheet, but we used the visual appearance of the hard outside the sheet edges to insure we were softening the edges.

Reduce Creping Related Defect: The break identification log sheet was used as the primary KPI, but a visual inspection of the sheet using a strobe light as well as unwinding the reel for sheet inspection was used to determine the size and frequency of pick-outs.

PROGRAM RESULTS

The introduction of the TULIP creping technology and Nalco 64575 release oil combined with the mechanical and operational changes met the mill objectives.

The softer TULIP adhesive replaced the incumbent hard film, but still provided dryer protection leading to an 80 percent reduction in blade wear rates. This resulted in a 75 percent increase in blade life falling just short of the stretch goal of doubling the creper blade runtime.

The softer TULIP chemistry combined with the aggressive Nalco 64575 release oil significantly reduced the outside the sheet build-up, which eliminated the edge cracks. Additionally, we were able to turn-off the edge cooling water sprays and reduce the nozzle orifice size and release oil addition on the edge oilers.

Creping related sheet breaks reduced significantly leading to a 40 percent reduction in the total number of sheet breaks per day. After running for a full month, the average production increased by 3 tons/day.

The TULIP program provides excellent adhesion and dryer protection at low add-on rates (0.5 – 1.5 mg/sqm). After optimization, the Yankee adhesive addition rates were reduced by 66 percent compared to the incumbent centerlines. Including the Nalco 64575 oil flows, the Yankee release addition rates were reduced by 60 percent. The coating transition resulted in an application cost savings of $177,000/year.

The spray boom redesign combined with the reduction of water to the edges of the dryer led to an annual fresh water reduction of 980,000 gallons. Eliminating this water from the dryer surface reduced the energy load needed to evaporate it providing a 9,100 MM Btu/year reduction. The water and energy reductions resulted in an operational cost savings of $37,600/year.

CONCLUSION/SUMMARY

By working with the customer to understand the process during our machine survey, NALCO Water was able to establish the root causes associated with low the blade life, edge cracks, and Yankee coating related sheet breaks. By expanding our focus beyond the chemistry, we were able to customize a solution that included both mechanical and operational changes. The MOC thought process is providing an efficient Yankee coating application that has maintained the benefits witnessed initially.

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