



TULIP Creping Technology Helps Tissue Manufacturer Improve Productivity, Reduce Operating Costs

Mill Overview

Grades:	Commercial Tissue
Process:	LDC (Light Dry Crepe)
Former:	Crescent former
Yankee:	Cast iron with Metso Infinicoat surface treatment
Speed:	1400 mpm
Previous Program:	Competitive crosslinking PAE with surfactant-based release
Current Program:	TULIP Creping Technology Adhesive Based Platform

BUSINESS SITUATION

A North American tissue manufacturer was producing commercial tissue on a conventional light dry crepe machine utilizing ceramic doctor blades and conventional Yankee coating materials. At this customer's mill

location, doctor blade wear was extremely high. This was leading to sheet defect, breaks and excessive lost time. Even with additional conventional coating materials, the wear rate could not be reduced. The excessive wear and higher Yankee coating consumption was resulting in extremely high operating costs for

ENVIRONMENTAL RESULTS

Reduced dry strength application from 20 lb/mt to 0 lb/mt

Improved functional life of creping doctor blade 450% Extended life from 8 to 36.5 hrs, minimizing replacement

Reduced Application Rate \$230/day.
 • Adhesive Application Reduce by 70%
 • Release Application Reduced 43%

Increase annual tonnage by 134 tonnes

Reduced refining energy for sheet strength by 1.2 hpdt (horsepower-day-per metric tonne on adry tonne basis) or 54.5%

Reduced number of times per day that operator handles sharp doctor blades and material that could cause personal injury



ECONOMIC RESULTS



\$227,500 in chemical savings

\$210,000 in replacement cost savings

\$80,500 in chemical savings



\$96,000 in incremental profit

\$34,125 in savings



Minimize exposure and liability caused by dangerous activity

the mill. It was also noted that dry strength chemical costs and a loss of quality followed the increased wear of the creping doctor blade.

The mill needed a coating solution that would protect the Yankee dryer, and facilitate longer functional creping doctor blade life without increasing operating costs. This needed to be accomplished while assuring continued production of quality products for the commercial marketplace.

ANALYSIS OF BUSINESS SITUATION

Key Drivers

- Extend the life of the creping doctor blade. The mill was using ceramic doctor blades to achieve an acceptable level of process stability. Ceramic doctor blades are typically very expensive and functional life was eight hours. The desire was to extend this to 24 hours or longer without negatively impacting sheet quality.
- A reduction in the cost of the Yankee coating and release application. The incumbent program was being applied at very high dosage rates and it was desired to reduce this cost while improving asset performance.

- Improve overall productivity at reduced operational expense levels. If this could be accomplished the mill cost per ton would go down, making the mill more competitive in the market place.

Challenges/Opportunities

- The tissue machine had a long history and relationship with the incumbent supplier. Due to this relationship, operators had come to accept a low level of performance from the creping transformation. The barrier to succeeding was significant. The opportunity was to deliver expected results and let the performance of the program speak for itself.
- TULIP Creping Technology is not based on traditional polyaminoamide - epichlorohydrin, PAE, chemical backbone structures. Because this is a new technology, it is surrounded in the marketplace with a certain amount of skepticism. The challenge was to ensure the customer was comfortable with the trial approach and mutually defined outcomes. Delivering more than the expected and defined results led to a rapid commercialization of the TULIP technology based program.

- Through audits it was determined that sheet integrity was compromised in the tissue manufacturing process. Many indicators were used to focus on Yankee creping as a way to improve the level and uniformity of customer desired sheet properties - strength and softness. The challenge was to demonstrate through stable operations and process optimization that a new Yankee coating could help the mill shift up to higher level of productivity and quality.

PROGRAM DESIGN

Nalco Water designed a Yankee coating program based on a revolutionary new adhesive platform known as TULIP Creping Technology. This program was designed to deliver very high adhesion and lead to development of a robust Yankee coating on the surface of the dryer. The coating, in turn, led to reduced doctor blade wear and improved sheet properties. Due to the inherently high adhesion levels of the TULIP technology program, addition rates were also expected to be very low.

KEY PERFORMANCE INDICATORS

The focus of the TULIP technology program development efforts at this mill were to drive out cost while maintaining product quality and productivity:

- Reduce doctor blade expenses
- Reduce Yankee coating and release application costs
- Maintain key quality attributes
- Improve overall productivity

PROGRAM RESULTS

The TULIP creping technology Yankee coating program far exceeded the trial KPIs, and as a result of the program, average doctor blade life has now been extended to 37 hours at this facility. Sheet surface characteristics were improved and are significantly more stable, as seen in Figure 1. Overall productivity also increased approximately 160 tons/year due to a reduction in machine lost time. Dry strength aids were eliminated due to the production of a tissue sheet free of defects (Figure 2). All of this was accomplished with a net Yankee coating application annual cost savings of \$80,500. The total value of the TULIP technology program to the customer was approximately \$648,000 dollars.

CONCLUSION

The results achieved on this machine demonstrate the robustness of the TULIP technology platform. TULIP technology coating-based systems generally lead to even thicker coating development. This thicker coating provides a protective, lubricating layer between the doctor blade and the Yankee surface. This layer acts to minimize blade tip wear and leads to longer blade life.

Strength, stretch and softness benefits were realized by having a thicker, softer coating that develops with a TULIP technology platform. The thicker coating allows the doctor blade tip to ride in the coating under the sheet-coating interface. By being under the sheet there was less tendency to generate sheet weakening defects or to structurally damage the creped sheet. By being able to control the thickness and coating build on the dryer surface, with appropriate modifying release materials, the creping process was effectively optimized and stabilized. With a stable coating the creping transformation was also able to produce uniform quality in the base sheet for extended periods of time.

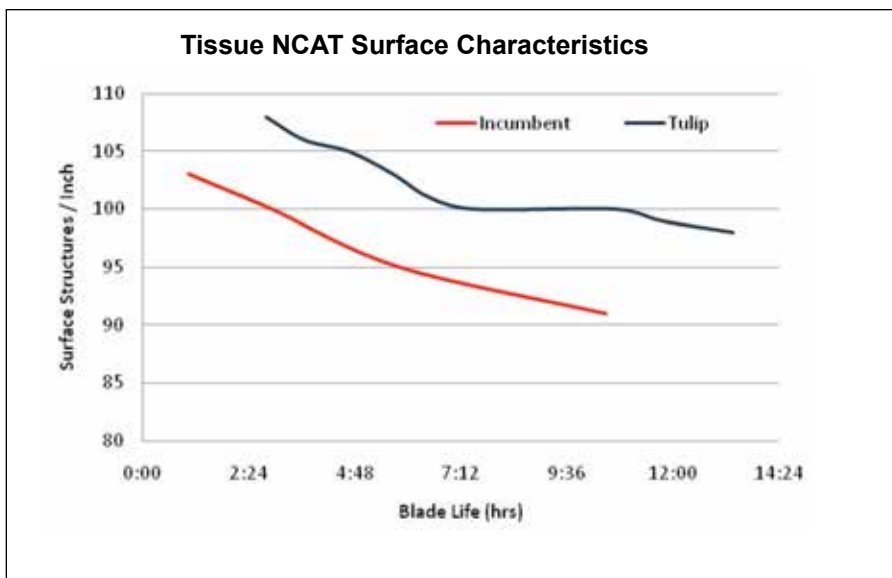


Figure 1 – Nalco Water Crepe Analysis Toolbox (NCAT) Technology results demonstrate the stability that was achieved with use of the TULIP technology platform. The higher the NCAT value the softer the surface of the sheet will be. The less downward slope overtime indicates stability.

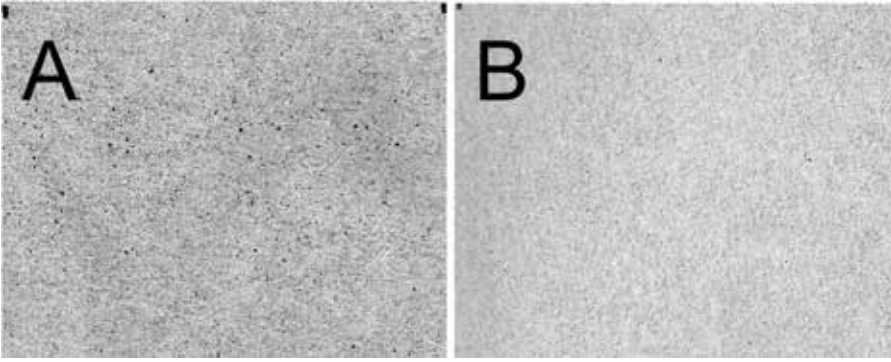


Figure 2 – Image A shows the degradation of tissue that was produced using the incumbent’s traditional PAE coating package, while Image B clearly demonstrates the improved sheet integrity when the same sheet is produced with the TULIP technology platform.

The improvements in strength resulted from less sheet degradation while utilizing the TULIP technology- based coating and release platform. With less degradation the sheet was inherently stronger and did not require costly additional dry strength additives or high levels of mechanical refining. The results were significant savings in materials and energy that had historically been used to meet sheet strength targets.

In summary, TULIP technology based coating platforms afford the tissue maker a new level of opportunity to improve overall productivity and reduce operating costs. Due to the commercialization of the TULIP technology program described above, this customer has saved \$648,000 per year on the first machine that was fully commercialized and continues to expand this technology to other tissue machines where similar gains are being achieved.

Nalco Water reports Environmental Return on Investment (eROI) values to customers to account for contributions in delivering both environmental performance and financial payback.

Nalco Water, an Ecolab Company

North America: *Headquarters* – 1601 West Diehl Road • Naperville, Illinois 60563 • USA
Nalco Champion – 7705 Highway 90-A • Sugar Land, Texas 77487 • USA

Europe: Richtstrasse 7 • 8304 Wallisellen • Switzerland

Asia Pacific: 2 International Business Park • #02-20 The Strategy Tower 2 • Singapore 609930

Latin America: Av. das Nações Unidas 17.891 • 6° Andar 04795-100 • São Paulo • SP • Brazil

nalco.ecolab.com