

Nalco Water METRIX™ Titan Technology Saves Over \$15/ton for Freesheet Producer

NALCO Water
An Ecolab Company

CASE STUDY - PAPER

CH-1897



MILL OVERVIEW:

Paper Grade:	Uncoated Freesheet
Machine Type:	Top Former
System pH:	7.5
Production:	450 TPD
Speed:	800 fpm
Basis Weight:	Cover Weights
Furnish:	62% HWD, 8% SWD, 5% Recycle
Filler:	Combination of PCC & GCC - 16% sheet ash
Retention System:	Alum, Nalco 625 (flocculant), Nalco 9000 (microparticle)
Other Additives:	Wet-End Starch, Nalco 7542 (ASA), OBA

CUSTOMER IMPACT



ECONOMIC RESULTS

Productivity - 8% Increase in Daily Production Rate (Speed)



Profitability increase of \$15.35/ton
Increase in profitability of \$1,611,750 /year

7% Reduction in Total Steam Demand needed per ton of Paper



Net Savings of \$1.12/ton
Net Savings of \$117,600/year

Reduction of 2.77 KW-Hr of Drive Electric use per ton of Paper

Savings of \$0.21/ton
Net Savings of \$22,050/year

Reduction of 73 lb. of Carbon Emissions per ton of Paper



Net Savings of \$1.26/ton
Net Savings of \$131,925/year

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

BUSINESS SITUATION

In an effort to remain viable and competitive in the current global uncoated freesheet market, this premiere North American producer of uncoated freesheet papers is continually challenged to look for ways to reduce production costs while maximizing sheet quality. This facility is a key producer of heavy weight Cover Stock, and lighter weight specialty grades that require high quality characteristics to remain competitive. The customer desired to improve productivity without sacrificing quality to enable addition of new production orders. The net impact through increased annual production would be a reduction in their total production costs.

The mill maximized efforts to improve productivity through mechanical and operational changes and were now main dryer section steam limited on heavyweight grades. The wide range of weights produced further inhibited mechanical optimization for heavyweights due to the potentially negative impacts to the lighter weights.

As the primary specialty chemical supplier and strategic partner at this customer site, Nalco Water was approached by management to address the current machine bottlenecks to help improve the machine performance. The local Nalco Water Team worked very closely with operations management, participating in daily production meetings, providing trouble shooting analysis, and corrective action suggestions to address the day to day paper production challenges, while striving to provide long term solutions to help the customer reach

their overall goals. In an effort to address the challenges, and provide a solution to address the customer's needs, Nalco Water proposed a METRIX Titan technology program specifically for use during the production of cover grades.

ANALYSIS OF BUSINESS SITUATION

Key Business Drivers

- Reduce Total Cost of Operations (TCO)

Challenge/Opportunity

- Increase speed during Steam limited heavy Cover Stock grades
- Maintain or improve sheet quality

BACKGROUND

A North American Uncoated Freesheet producer manufactures a wide basis weight range of specialty grades with a majority of the annual production being premium Cover Stock grades. Due to dryer section steam limitations, a significant reduction in paper machine speed is required during manufacture of the heavier basis weight grades as compared to production of the lighter basis weight grades. Mechanical and operational optimization steps had been exhausted to maximize speed while maintaining overall target sheet quality requirements with a specific focus on preserving internal strength. Nalco Water had also worked with the customer to fully optimize the retention and drainage program to optimize retention, sheet formation, and former dewatering performance.

Additional investigation of various novel programs provided an

opportunity to introduce a patented strength and productivity program called METRIX Titan. Testing revealed additional former drainage, press dewatering, and sheet strength benefits could be achieved and address their challenges. The mill was excited about the prospects of opening their operating window allowing for improved productivity and strength. A trial plan was jointly developed to evaluate METRIX Titan technology and the impact on increasing speed during the production of steam limited, heavy weight grade production.

PROGRAM DESIGN

The main goal of increasing paper machine speed during production of heavy weight grades was set for trial success. Specific operational, performance, and sheet quality key performance indicators were jointly identified as baseline values for proper evaluation of performance gains. In addition, a potential problem analysis was conducted to develop contingency action plans which could be implemented if any negative impact to the operation or sheet quality where observed.

The METRIX Titan program was co-mixed with the retention chemistries, and applied post-screen through the existing Nalco Water PARETO™ application technology system. The program was dosed in incremental steps of 0.5 lb/ton up to 2 lb/ton. Paper machine speeds were increased as allowed by table drainage, press dewatering and controlling main dryer section steam pressure to increase machine productivity. The dosage changes were done slowly to allow for process adjustments to come to equilibrium

and proper sheet quality testing before moving to the next treatment level increase.

KEY PERFORMANCE INDICATORS

As a means to evaluate and document the operational and sheet quality impact, Nalco Water worked with the mill to establish Key Performance Indicators (KPI's) for the evaluation. These KPI's included:

- Total Steam Flow
- Reel Speed/Production Rate
- Couch Roll Vacuum
- Scott Bond
- MD/CD Tensile

RESULTS

Production and Steam - The METRX Titan technology performed as expected and was found to be very active in the paper machine system. Each increase in dosage rate provided a very positive impact to former drainage and press dewatering which resulted in a significant decrease in main section dryer steam demand allowing speed increases. Upon reaching the target 2 lb./ton dosage, the production rate had been increased by 8%. Total steam flow required per ton of paper remained 7% below the pre-treatment starting point indicating a potential for additional production rate gains in the future. Trends in both paper machine reel speed and main steam pressure verses treatment level can be seen in Figure 1.

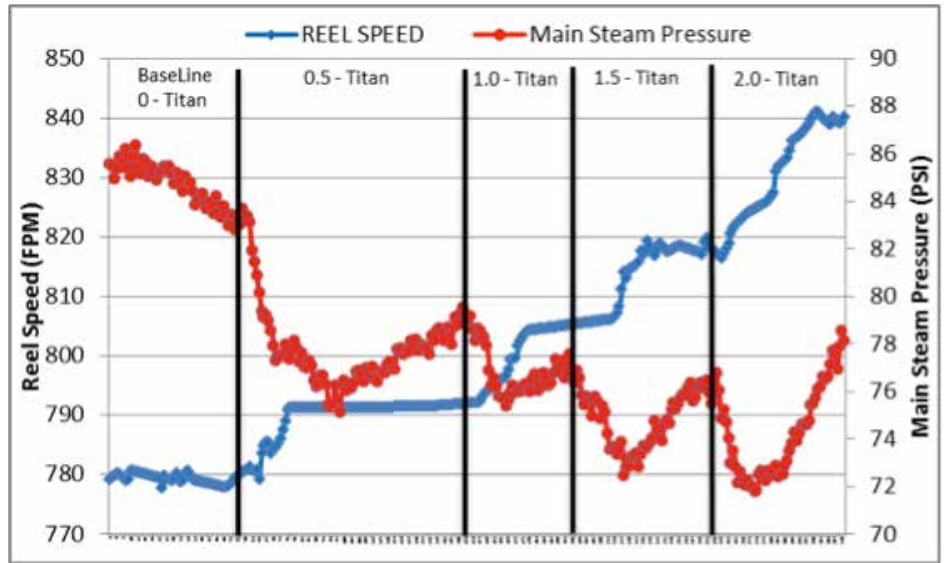


Figure 1 - Reel Speed & Main Steam Pressure

Dewatering - Significant improvements in former dewatering characteristics were documented as the METRX Titan program was introduced into the system. Figure 2 shows that as the program was introduced into the system, water was added to the headbox by opening

the slice to maintain optimum consistency into the top former. Even with the large increase in slice flow per ton of paper, and the paper machine speeding up, couch vacuum remained lower than the baseline levels indicating a dryer sheet off the couch.

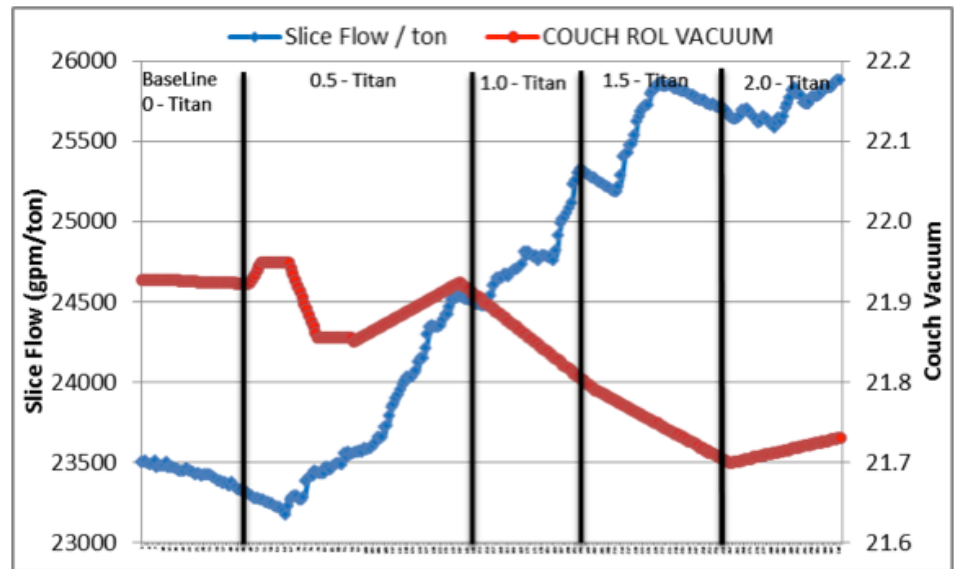


Figure 2 - Slice Flow and Couch Vacuum

The significant increase in former drainage associated with METRIX Titan could be used as an opportunity to optimize the microparticle portion of the retention and drainage program.

Sheet Quality - Based on lab sheet quality testing results, improvements in internal strength were documented. As can be seen in Table 1, an 11% gain in Scott Bond, and 8% gain in MD/CD Tensile was achieved.

CONCLUSIONS

Due to production of a wide range of basis weight grades, the customer was in a box on mechanical and operational changes they could make which may benefit one basis weight segment, but could negatively impact the other. METRIX Titan Technology was found to be very reactive in this machine system and positively impacted former drainage and press dewatering, allowing this customer to reach their goal of increasing paper machine speed during production of heavy weights. An 8% increase in product was obtained, with a coinciding 7% decrease in steam needed to dry each ton of paper produced. The net gain was a Total Cost Operation improvement in excess of \$15/ton.

Table 1 - Paper Machine Trial Results

Variables	Baseline	Metrix Titan - 1.5 lb/ton		Metrix Titan - 2.0 lb/ton	
		Results	% Imp.	Results	% Imp.
Operational	Results	Results	% Imp.	Results	% Imp.
Main Steam Pressure (PSI)	88	75		74	
Total Steam Flow (# steam/# paper)	1.20	1.07	-10%	1.11	-7%
Production Rate (T/hr.)	18.4	19.5	6%	19.8	8%
Headbox Solids (%)	0.81	0.69	-15%	0.67	-17%
Tray Solids (%)	0.041	0.042		0.042	
Slice Flow per Ton (gpm/ton)	23553	25326	8%	25461	8%
COUCH ROL VACUUM (In. Hg)	21.9	21.7		21.7	
PICK-UP VACUUM (in. Hg)	20.3	19.9		19.8	
Paper Quality					
Basis Weight	145.4	145.2		145.1	
Caliper	10.9	11.1		11	
Scott Bond	95	107	13%	105	11%
Tensile - MD	61.9	67.3	9%	66.7	8%
Tensile - CD	30.3	32.6	8%	32.4	7%

Table 2 - Total Cost of Operation Summary

Total Cost of Optimization Summary				
Program	Production Increase	Steam Reduction	Drive Electricity "Couch and PU Vacuum"	Carbon Emissions
Baseline	441 TPD	1.20 #steam / #paper	34.0 KW-hr/ton	1.20 #steam / #paper
METRIX Titan	476 TPD	1.11 #steam / #paper	31.3 KW-hr/ton	1.11 #steam / #paper
	35 TPD Increase	0.16 MMBTU/ton decrease	2.7 KW-hr/ton Reduction	72.9 lb.CO2/ton decrease
Economic Impact	\$25.74 /ton Savings	\$1.12 /ton Savings	\$0.21 /ton Savings	\$1.26 /ton Savings
	@\$350/ton incremental profit/ton	@895 BTU/lb. Steam, and \$7.00 / MMBTU	@ \$0.0758 /KW-hr	@455.86 lbs. CO2/MMBTU, and \$34.47 /ton CO2
Net Savings of \$17.94 / ton or 173% ROI				
Annual Savings with 105,000 ton paper production =				
\$1,883,700				

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