Separating Retention, Drainage and Formation (RDF) through PARETO Mixing Technology

Annualized Environmental ROI (e^{ROI})

energy	16,500,000 MM Btu/yr in Energy	$90K/year in annual energy savings
water	65.5 gpm fresh water or > 33,000,000 gal/yr	$25K/year in annual water savings

Overview

Due to the adverse effect retention programs can have on sheet formation, a producer of UCFS was forced to run the retention program in the pre-screen application point on most of its grades. They were looking for a technology that would allow them to run their RDF program in the post-screen application point. Historically, when the program was run post-screen, sheet formation suffered, risking off-quality production. Since Nalco had the existing RDF program, PARETO Mixing Technology was presented as an option to help meet the objective of running the program post-screen

PARETO Mixing Technology provided the mill with an opportunity to run the RDF program post-screen without adversely affecting formation. Past attempts without PARETO technology had failed. A bonus was increased production.

Situation

This UCFS manufacturer desired to run the RDF program in the post-screen application point in an effort to improve the program's impact on machine production. One of the issues the customer consistently faced with post-screen addition was poor formation. PARETO Mixing Technology allowed this mill to conserve energy and water, increase retention, and maintain formation. The customized solution was engineered based on the machine's

Mill Overview

Grade:	UCFS
Machine Type:	Fourdrinier with top former
Machine Speed:	230 – 565 m/min (750– 1,850 fpm)
Tonnage:	21 Tons/HR
Furnish Mix:	0 – 10% Recycle; 40 – 70% HW, 9 – 25 SWK
System pH:	7.0 – 8.0
Brightness:	75 – 100

approach system size and flow. The water source used for the PARETO Mixing Technology installation was the mill's lean whitewater system.

The mill could not add microparticle and flocculant in the post-screen application point due to the negative impact high chemistry dosages had on sheet formation. The challenge was to run the chemical program in the post-screen application point without adversely affecting formation and increase machine speed through improved performance of the retention/drainage program.

Key Performance Drivers

- Sustainable operation and development
- Improved Formation
- Machine Speed
- RDF Program Efficiency
- Product Quality
- Reduction in Chemical Usage

Program

The mill had a post-screen addition point, but because of improved mixing with PARETO technology, the addition point could be moved closer to the headbox. The adapters for the PARETO Optimizer heads were installed during the annual maintenance outage and were capped off until construction of the feed liquid booster system was complete.

The booster pump and feed water distribution header was designed and supplied by Nalco and constructed with mill-specified instrumentation and pumps.

Key Performance Indicators

- Sheet Formation
- Chemical Usage
- Retention (Tray solids, FPR, FPAR)

Results

Start-up of the system was very simple. The water and chemical manifolds were balanced in order to equalize flow to each PARETO Optimizer. The system was run on both fresh and clarified whitewater. Over a period of several weeks, the system was operated on a trial basis. Initial trials were performed in order to run the microparticle portion of the RDF program post-screen and maintain sheet formation. These trials proved to be very effective. In one of the trials, formation was the best the machine had ever seen.

Some key results that have been realized from this installation are illustrated on the following pages:

- Because of the improved mixing provided by PARETO technology, formation was maintained.
- Flocculant and microparticle dosages were reduced by as much as 41%.
- Although the effort was made to maintain tray solids at pre-PARETO technology averages, an improvement was noticed. Tray solids decreased by up to 22% while overall retention increased 5.2% at equal or better formation.

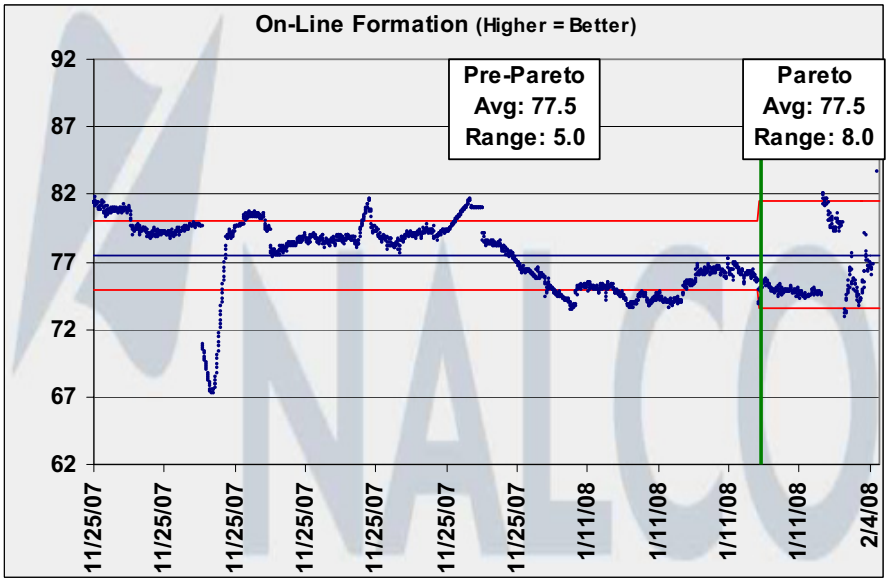

Figure 1 – *Comparison of formation after PARETO technology installation was equal or better than before the installation.*

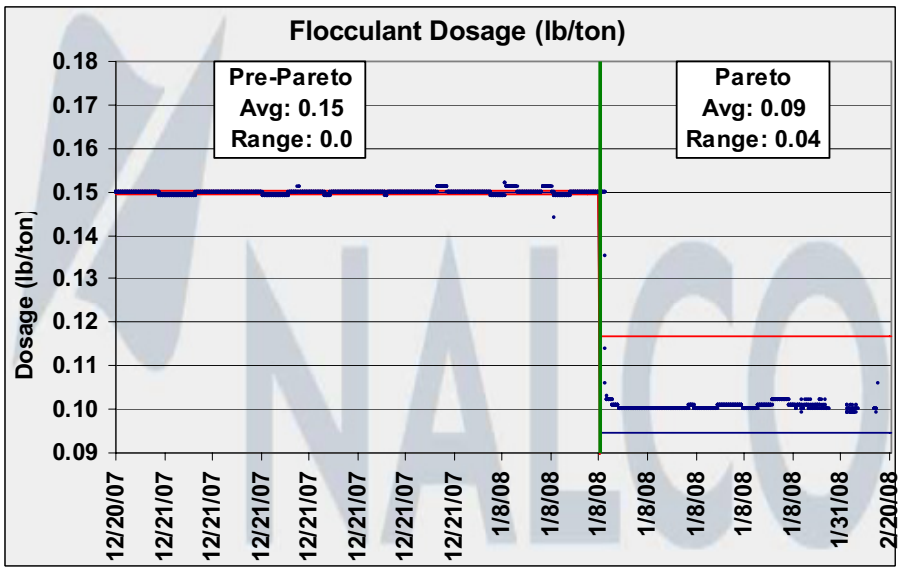

Figure 2 – *Flocculant dosage was reduced by 40%.*

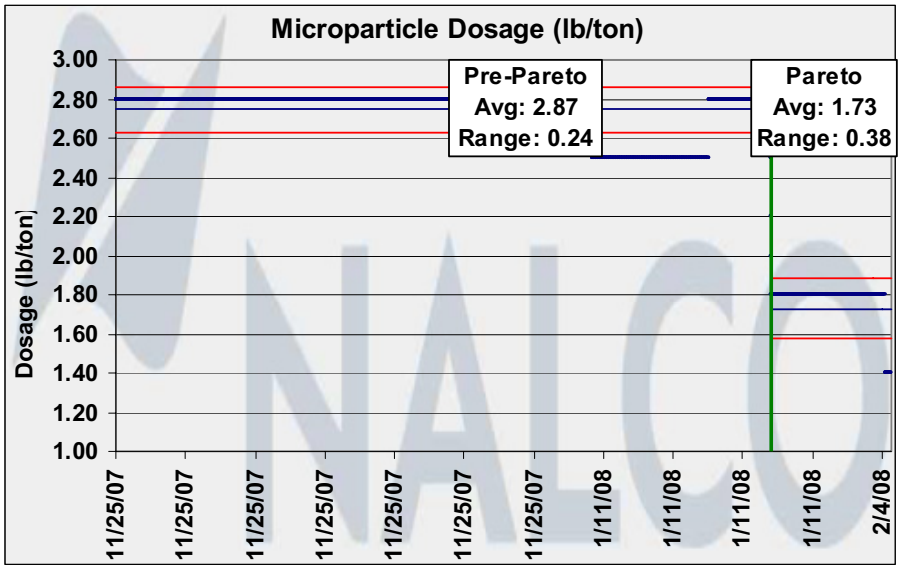

Figure 3 – *Microparticle dosage was reduced by 40%.*

- Before PARETO Mixing Technology, the micro-turbulation sheets in the headbox would develop a build-up that appeared as a hazy film when the sheets were inspected on outages. This was routinely removed during outages by cleaning. Their appearance during the outage after the installation of PARETO Mixing Technology was clear and did not require any cleaning.

Separating formation from the potential adverse effect of retention chemistries can be achieved through proper engineering and design of the chemical delivery system. This case clearly demonstrates that this decoupling can be achieved using PARETO Mixing Technology.

Value Proposition

Maximizing machine performance, optimizing chemical performance and cost, reducing energy consumption and optimizing product quality all require an on-going and constant commitment.

Dosing reduction (>40%) on the RDF Program is equal to $130,000/yr savings.

Fresh water and Energy savings annaully results in $115,000/yr savings.

Total Annual Savings directly related with Pareto Mixing Technology are almost a quarter of million dollars ($245,000).

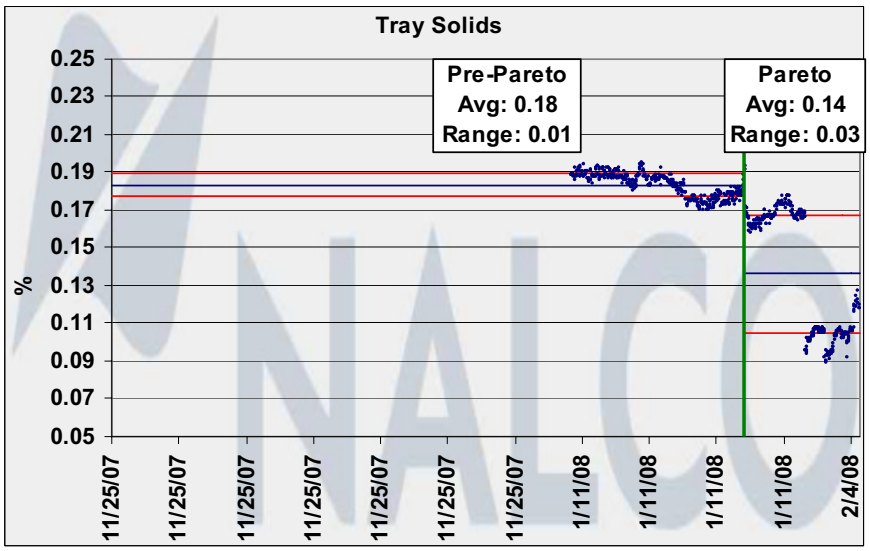

Figure 4 – *Tray solids reduced by 22% at lower chemical use.*

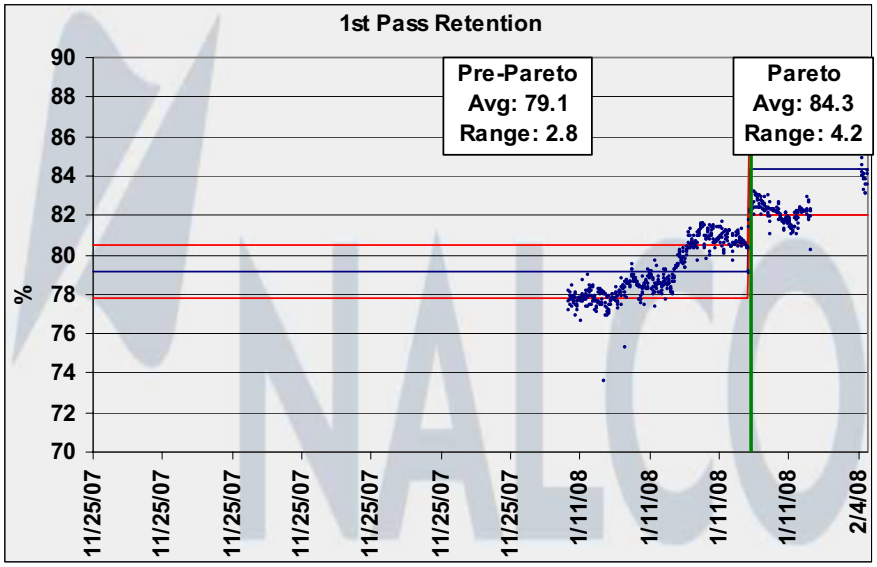

Figure 5 – *First pass retention improved by 5.2%.*

PARETO Mixing Technology

PARETO technology is being used by an increasing number of customers in the paper industry. Enhanced system performance through advanced chemical application yields better fiber recovery, and also delivers major reductions in the demand for water and energy. By reducing this demand, there is a direct impact upon the customer's environmental foot-print and performance, and a major contribution to the sustainable development of mill operations.

Customers using this technology have saved, since its introduction in 2006, over **3.2 Billion gallons** of fresh water (>**12 million m**^{3}) and more than **1350 billion btus** (**>395 GW-h**) of energy.

In our daily life this translates to:

~ 30,000 American homes annual fresh water consumption[1]

~ 6 hrs of Niagara Falls flow[2]

> 230,000 barrels of crude oil[3]

~ 19,000 cars removed from the roads[4]

> 100,000 tons CO^2 released to the environment[5]

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