



Nalco's Wet-End Optimization Program Improves Machine Productivity using PARETO Mixing Technology for a UCFS Operation

Essential Expertise for Wet-End Optimization

Annualized Environmental ROI (e^{ROI})

 water	Water savings of 75,600 gallons/day or 26,460,000 gallons/year.	\$10,500/year in water savings
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Overview

Optimization of the existing wet-end chemistry program for a UCFS operation in Asia Pacific was accomplished through the integration of the retention system chemistry and Nalco's patented PARETO mixing technology. The result was a cleaner machine with improved drainage performance. This improved program translated into less breaks, higher machine speeds and an overall productivity increase of 7%. Operational savings of approximately \$16/ton was realized.

Situation

The papermaking operation produces UCFS paper at 60-100 g/m² that contains approximately 22% sheet ash, using PCC/GCC filler. Production averages 200,000 MTPY.

The Key Business Driver for the operation is the improvement of machine productivity. A critical measure of productivity is On-Machine Efficiency

(OME). Increasing OME will ultimately reduce overall production costs. The operational goal is 85% OME compared to a current achievement of 78-80% OME.

System analysis showed that wet-end process variation is one of the main contributors to OME reduction. The current retention program was controlled via First Pass Retention (FPR) and First Pass Ash Retention (FPAR). These parameters historically remained relatively stable. However, due to the paper machine operational control schemes, tray consistency was variable, ranging from 0.09 g/l to 0.17 g/l, with an average of 0.135 g/l.

In order to provide long-term process stability, the wet-end chemistry program needed to be managed differently by controlling tray consistency, rather than targeting FPR/FPAR. This was accomplished via the implementation of PARETO mixing technology.

Program

PARETO mixing technology enabled the retention system additives (i.e. flocculants and microparticles) to be dosed to the furnish post-screen and relatively close to the headbox while achieving optimum mixing in the process stream. A typical post-screen installation is shown in Figure 1. Normally, three to four PARETO optimizers are deployed for each installation.



Figure 1 – Post-screen installation of PARETO.

Further, the unique engineering design and function of the PARETO optimizer, as seen in Figure 2, enables the use of save-all water for the secondary chemical dilution instead of fresh water. Effective dilution occurs within the mixing chamber and before injection into the process pipe. The hydrodynamics of the system prevent deposit formation in the optimizer and provide the correct injection velocity to promote uniform distribution of the chemical additives into the process stream.

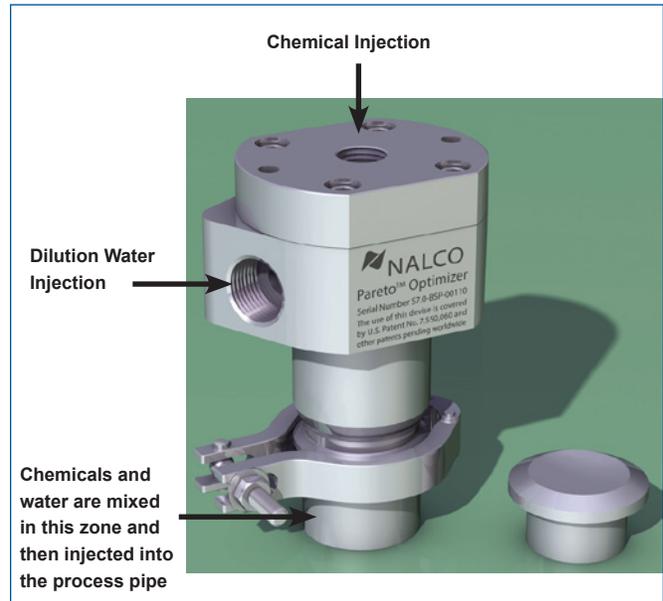


Figure 2 – PARETO optimizer assembly

Results

The implementation of Nalco's patented PARETO mixing technology provided more efficient and effective delivery of the wet-end chemicals to the papermaking system. The result of the post-screen chemical addition includes:

- Wet-end breaks were reduced by 32%
- Production minutes lost per day due to wet-end breaks were reduced by 38%
- Machine speed increased by 1%
- Daily A1 production was increased by 7% (38 tons per day)
- FPR increased by 4%; FPAR increased by 11%
- Tray consistencies were lowered by 16%, ranging from 0.09 g/l to 0.11 g/l through the evaluation period
- The wet-end chemistry program was determined to be more robust with a 38% improvement in performance and an 11% reduction in overall chemical product use
- Target sheet quality specifications (formation, smoothness, porosity) were maintained within target ranges throughout the evaluation period
- Fresh water usage reduced by ~0.43 m³/ton (~115 gallons/ton) or ~289 m³/day (~75,600 gallons/day)

The water savings realized from the application of the wet end chemistry programs, dosed through the Nalco patented PARETO mixing technology, results in water savings of 75,600 gallons/day or 26,460,000 gallons/year to this operation.

KPIs	Current State	Achieved State	Δ Profit/Ton	Total Profit \$
Production	576 Tons/day	614 Tons/day	\$15.47	\$3.4 MM
Fresh Water Use for Secondary Dilution	105,000 m ³ /year	0	\$0.04	\$10,500
Retention Chemical Program Costs	\$3.85/ton	\$3.50/ton	\$0.35	\$77,000
Total			\$15.86	\$3.41 MM

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