



HYBRID technology saves annual \$700,000 at gypsum liner mill.

Water treatment and process improvement company Nalco, an Ecolab company, has been able to save a paper manufacturing operation vast amounts of money with its development and installation of new HYBRID technology.

This technology enables papermakers to attain important on-machine efficiency and sheet quality and provides controllable drainage in high-speed machines. It also improves ash or fines retention to complement existing programmes without hurting formation.

Nalco's Brett Dunbar explains that improved retention reduces money spent on additives and furnishes to deliver operational cost savings. At the same time, productivity is increased through higher machine speeds and improved overall performance. It also maximises retention and drainage performance while reducing environmental impact.

"The technology has been designed primarily for board and packaging and newsprint manufacturers and offers quantitative benefits, especially to producers using systems with medium to high charge demand, high speed paper machines, systems with closed water and fibre loops, high conductivity and where traditional flocculants or coagulants perform poorly," he says.

Its benefits were recently established at a gypsum liner mill in Europe.

"The running of today's gypsum liner paper machines presents many challenges owing to the presence of more recycled raw materials in the furnish, higher ash and closer water recycled systems, which brings more anionic trash and high conductivity in the wet end.

"Quality retention and drainable controllability is more difficult to achieve for high shear force to break flocs, strong drainage suction and low reactivity between fibres, fines and chemicals under these challenging wet-end conditions."

He adds that after using more locally recycled raw materials and increasing machine speed, the customer wanted to advance vacuum and press section drainage to improve dryness out of the third press nip. This was to be done by creating a bigger slice opening that would allow better formation and retention improvement for stable sizing and alkenylsuccinic anhydride (ASA) usage. (ASA is a sizing agent used to impart a degree of hydrophobicity to the paper fibers during production, and an overall resistance to liquid absorption to the finished paper product.)

CUSTOMER CHALLENGES, AREAS FOR IMPROVEMENT

- The mill produced between 160 and 190g/m² gypsum liner typically for 170g/m² grade at a speed of 740m/m. Production stood at around 680 tonnes a day.
- The machine has four piles and used OCC/DIP (old corrugated containers/deinked pulp) furnish for the top layer and OCC for the others.
- The gypsum linerboard machine had limited drainage capacity in the vacuum and press section.
- The wire load in the filler ply was unstable and ran at a very high level if freeness varied from raw materials.
- The dry line in the forming wire of the filter ply was long and limited the slice opening.

The dryness out of the third press nip was low at 43%, which caused pick-up difficulty from the third press roll to the first dryer group, frequent breaks and high speed consumption at the dryer section.

Machine speed was limited by steam pressure, producing high grammage grade.

The mill wanted to improve retention to ensure stable ASA usage. Its previous retention, drainage and formation (RDF) programme used a single flocculent programme which, when increased to between 800 and 1,000 ppm, worsened vacuum and press drainage.

PROGRAMME DESIGN

New HYBRID technology was introduced to the machine as the second component of the RDF programme to improve drainage in both vacuum and press, with a combination of Nalco’s Core Shell 01PF067 to post screen with PARETO mixing technology. The HYBRID chemistry is designed to make paper flocks size and attain shear force resistance/re-flocculation abilities and open structure flocs to improve retention and drainage without sacrificing on formation by combining with the flocculent in a dual and triple polymers programme.

A lab evaluation for overview RDF chemicals was conducted and the results indicated that co-mixing new HYBRID and Core Shell could achieve the best vacuum drainage and retention. All factors related to drainage retention, final sheet quality and machine runnability were monitored.

RESULTS

The technology helped the customer gain annual savings of at least \$957,000 on steam consumption. Retention was also significantly improved, which was of benefit in stabilised sizing and ASA usage, less chemical oxygen demand/biochemical oxygen demand (COD/BOD) and chemical consumption and wastewater treatment.

The mill reported an annualised saving of \$17,000 per year through the reduction in wastewater volume and water treatment cost per tonne. Carbon emission cost reduction was \$58,000 per year (based on \$5/tonne).

Vacuum and press drainage improvement also provided the following opportunities to optimise runnability and final sheet formation:

- Shorter dry line of filler ply in forming wire, which allowed an increase of the slice opening to get headbox consistency down for better formation.
- Electric power saving and longer worklife for forming-wire as a result of a lower driving load for the wire.
- Stronger wet sheet with higher dryness out press section, which would promote less breakage.

As a result of its success, the technology was immediately expanded to two other gypsum linerboard machines in China. Both experienced similar cost and performance benefits. ■

MILL OVERVIEW	
PAPER GRADE	Gypsum liner
MACHINE TYPE	Four-ply Fourdrinier
PRODUCTION	220,000 tonnes per year
SPEED	650-750 metres per minute
BASIS WEIGHT	160-190 gsm

RETENTION IMPROVEMENT

Layer	FPR %		Programme comparison
	01PF067 @600 ppm	01PF067 @550 ppm + 61610 @300 ppm	
Top	61.6%	69.0%	+12%
Under top	62.1%	68.6%	+10%
Filler	69.7%	78.9%	+13%
Back	67.6%	71.3%	+5%

WW% REDUCTION

Layer	FPR %		Programme comparison
	01PF067 @600 ppm	01PF067 @550 ppm + 61610 @300 ppm	
Top	0.17%	0.13%	-24%
Under top	0.20%	0.15%	-25%
Filler	0.22%	0.13%	-41%
Back	0.19%	0.14%	-26%

DRAINAGE IMPROVEMENT

New HYBRID trial results at steam pressure of pre-size press, reduced from 493 kPa to 450 kPa (reduced by 8.7%)