Reducing Paper Machine **Production and Energy Costs** Key Drivers in China, N.A.

Current and future papermaking challenges in both China and North America center around control of production costs or increased output with improved product quality.

By Dean Gudlauski

Paper machine needs change frequently depending on end-use customer demands and just the basic elements necessary to stay in business. New challenges occur with the shifting of driving forces, such as the pressures to increase water closure and raise the levels of recycling.

In the quest for improved quality and new markets, higher demands are being placed on today's base papers. The trend toward papers with ever-higher print performance, for example, is leading to increased filler loading (sheet ash) and the many challenges this brings. Already-high raw material and energy costs are continuing to increase and stringent environmental requirements are becoming even more restrictive.

But among the many challenges that come and go in the global paper industry, one bottom-line demand remains consistent and seems to be never-changing—the need to reduce the costs of production. This over-riding, persistent need challenges not just papermakers but their partnering suppliers equally as well.

The China Challenge. In China, these needs and demands are amplified by the pressures of an emerging economy and a rapidly developing paper industry. New greenfield mills and machines are being built annually in China using the latest, state-of-the-art equipment. At existing mills, equipment and systems are rapidly being upgraded.

In 2001, paper consumption in China was about 37.9 million metric tons. The total pulp and paper production was 32.8 million metric tons. Predicted consumption for 2005 is 50 million metric tons.

According to Jaakko Pöyry Consulting, the majority of production capacity to meet this growing consumption currently comes from the U.S., China, Japan, and Canada, respectively. However, this may change as production in

China shifts from 90% low grade paper (10 years ago) to a balance of 30% low grade, 35% middle grade, and 35% high grade paper by 2006. Grades involved range from coated and uncoated fine paper to board and tissue paper.

As production in China progresses from low to high grade paper, many of the process and market challenges mentioned above will intensify. Some of the latest papermaking technologies will be needed to meet many of these challenges. One such technology involves advanced micro-polymer retention aids and a comprehensive program approach.

Formation, Blistering Problems. For example, a duplex board mill in China (one super former with four multi-layers and two Voith fourdriniers) needed to improve formation for better strength and appearance, increase production to meet demand, and improve overall runnability. This mill has some 10 fiber preparation lines, including deinking. Fiber raw materials include virgin pulp, deinked pulp, mixed waste, and old newsprint. Production is more than 750 metric tpd of 250-350 g/m^2 duplex board on a machine that ranges in speed from 405 to 600 m/min.

Over a period of several years, the mill ran many trials with different suppliers using standard emulsion polyacrylamides and multi-component product approaches. In late 2003 they began using a new approach comprised of a single cationic micro-polymer flocculant that has the impact of using both a high and low molecular weight dual program approach as one polymer for increased retention-drainage through soft floc formation.

Under layer retention increased from 50%-60% to 80%-85%, while the filler and back layer increased from 60%-70% to 80%-90%. The mill reported that this allowed them to increase retention dosage for increased drainage and overall dewatering without negatively impacting formation or strength. The soft floc formation allows for even dewatering, not only in the forming section but also throughout the press section. It also allows for maximum loading in the presses without negatively impacting sheet properties.

Previously, this mill had a problem with blistering. When the micro-polymer flocculant suppressed the small bubbles, the problem went away. With the 300-g/m^2 grade, it allowed the machine to increase speed by 10% with no problems, from 405 to 450 m/min, while also taking advantage of reduced steam consumption from 1.6 to 1.3 tons/ton of board. Return on investment to this machine alone was more than 600%.

Specific advantages of using this type of micro-polymer technology include:

- Ease of handling and distribution to the fiber due to the polymer's water-in-water dispersion characteristics, which translates to simple system and reduced cost of equipment
- Ability to form small but durable flocs with positive impact on formation and sheet quality
- Ability to accommodate wider swings in the wet end chemistry
- Environmentally conscious advantage of no volatile organic compounds (VOC) and no Alkyl Phenoxy Ethoxylates (APE)
- Ability to retain higher levels of filler, optimize performance of other wet end additives such as ASA size or starch, and provide overall retention-drainage responsiveness.

North American Challenges. In North America, increased production is not always the "need of the day". The ability to increase drainage and press dewatering also gives the mill an opportunity to reduce steam usage and energy costs while optimizing the overall cost per ton of paper produced.

Instead of using the cationic micro-polymer to increase production, many boxboard, linerboard, corrugated medium, and newsprint producers have opted to take advantage of a 10%–15% reduction in steam and energy costs. Being able to increase retention, reduce tray solids and turbidity, and manage the impact of sheet properties also allows the mill to save costs through fiber substitution or lower cost fiber utilization.

Producers of specialty grades and printing and writing papers, however, have been taking advantage of the ability to increase the percent of filler components in the sheet—e.g., kaolin, calcium carbonate, and titanium dioxide—to make gains in smoothness, printability, and appearance.

Leading manufacturers of SC-A grade papers are reaching an average of 30%-35% sheet ash. In one case, a 210-tpd mill making envelope, document reader copy paper, stamp, and inkjet paper, was able to increase sheet ash by 3%-5%. Formation increased by 10%, paper porosity was lowered, and a 10% reduction of refining occurred, providing savings in refining energy. Having the ability to increase sheet ash without negatively affecting formation, dewatering, or runnability has given some mills the opportunity to upgrade to SC-A status. ■

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