

Textile pulp: another bright moment for Sun Paper

Supplying China's clothing producers
with a natural fiber alternative.

In November 2011, Sun Paper entered an entirely new business at its pulp mill in Yanzhou, Shandong Province, China. Sun became a producer of dissolving pulp made from local poplar at a capacity of 200,000 t/a.

Dissolving pulp has a very high cellulose content (> 92-97% compared to 85-90% for kraft pulp), making it suitable for the production of rayon, acetate textile fibers, filters, etc. The pulp gets its name from the fact that the cellulose fiber is dissolved in a caustic solution to form viscose, which is extruded through spinners to form rayon filaments.

Declining global production of cotton in 2009, and the corresponding high prices, opened the door for dissolving pulp producers. In 2011, China's dissolving pulp capacity reached 896,000 tonnes, of which roughly 70% was newly added.

Modest investment

According to Sun Paper's management team, the leap into "textile" pulp required a surprisingly modest investment to convert the 300,000 t/a bleached hardwood kraft line.

"By adding an ANDRITZ pre-hydrolysis tower next to our existing continuous digester, and an extra bleaching stage with a wash press, we basically converted from paper pulp to dissolving pulp," says Ying Guangdong, Vice President and Technical Director of Sun Paper. "We were the first to install this new technology, but it was a calculated risk. Given our long partnership with ANDRITZ, we were certain that the investment would pay off."

Similar, but different

The production processes for dissolving pulp and paper pulp are quite similar, and both use wood chips as the raw ma-

terial. But for the production of dissolving pulp, a pre-treatment step is added to remove most of the hemicelluloses in the wood.

According to Hannu Råmark, Director of Technology for ANDRITZ's Fiber Technology Division, "The emphasis today is on modifying existing lines so they can 'swing' production to either paper pulp or dissolving pulp depending on market conditions. This type of project fits right into an ANDRITZ strength."

ANDRITZ technology for the production of dissolving pulp is based on many years of experience with chemical pulp fiberlines and intensive R&D in the area of hemicellulose removal. "Many of our existing process technologies are suitable for dissolving pulp production," Råmark says. "By planning for this in advance, with careful consideration in the piping design and materials of con-



◀ Ying (left) and Chen Jieyu, ANDRITZ Project Manager, inspect a textile sample made from Sun Paper dissolving pulp.

"It is bold to be the first to try a new technology. But being bold often yields the highest results."

Ying Guangdong,
Vice President and Technical Director,
Sun Paper

struction for example, a mill can switch pulp grades to take advantage of market pricing."

Clouds removed

Notes Liu Yan Bo, Pulping Production Manager for Sun Paper, "With any new technology there are bound to be challenges. Soon after start-up, we faced some production problems with the continuous pre-hydrolysis. After some adjustments, and good support from ANDRITZ, the benefits of producing textile pulp have already proven to be significant."

According to Ying, "We trust ANDRITZ because they understand our needs to produce quality pulp and paper. They are also willing to educate us about running this new technology. They organized a special R&D seminar just for us with the Helsinki University. In addition, we have been doing research and trials at their lab in Glens Falls, New York (USA), both before and after the conversion."

Adds Liu, "Our continuous process for dissolving textile pulp started up very quickly, and has maintained high yield and productivity ever since. Our textile pulps are considered the best by leading textile producers. "We have good cooperation with ANDRITZ and very good results. The frequent exchange of ideas is helpful to both companies."



◀ The ANDRITZ PHV (Pre-Hydrolysis Vessel) is a new technology developed for hemicellulose removal with continuous cooking. The world's first PHV was delivered to Sun Paper and is shown here next to the existing continuous cooking system. The mill has the flexibility to swing production between dissolving and traditional kraft pulp.

The Wash Press (AWP) represents ANDRITZ's first delivery to China. The compact unit was originally ordered to provide additional brownstock washing capacity, but was moved to perform P-stage bleach washing in the dissolving pulp process. It removes a range of contaminants to achieve the quality standard necessary for textile pulp producers. Liu points out that the value of the wash press cannot be underestimated. "The purity of the pulp gained from this compact unit assures a quality level not otherwise possible," he says. "Our customers require exceptional cleanliness."



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Liu Yan Bo,
Pulping Production Manager,
Sun Paper

Forget about batch

"Batch has been the tradition with viscose pulps," says Chen Jieyu, ANDRITZ Project Manager. "But, the batch process is expensive to run. Sun Paper recognized the benefits of a continuous process and had the confidence in us to make it happen."

"Everything in this line is controlled by a DCS, so very little operator attention is required," Ying says. "Running our dissolving pulp line is almost as easy as taking photos with a quality digital camera. By contrast, the batch process depends too much on

the chef. You can have a gourmet meal, or something terrible. When you consider the value of a continuous process, highly automated where quality is constant, it is an easy decision."

Removing hemicellulose the continuous way

The key to dissolving pulp production is efficient removal and recovery of hemicellulose from the fiber source. Otherwise, the hemicelluloses will precipitate during the rayon production process, plugging up the filament spinners. The spin-

ners convert the pure cellulose into yarn, looking much like cotton once it is processed.

According to Aaron Leavitt, Principal Engineer for cooking technology at ANDRITZ, "Stable production was a problem with older technologies. All that changed with the introduction of the Pre-Hydrolysis Vessel (PHV)."

The ANDRITZ PHV is a new technology developed for hemicellulose removal with continuous cooking. "We redesigned the cooking process to include auto-hydrolysis for efficient hemicellulose removal," Leavitt explains. "The PHV can be installed in a new line, and is easily applied to existing installations, such as at Sun Paper."

Based on initial findings, installation and operational costs with the PHV are lower than with the traditional, batch-based dissolving pulp process. "The pulp quality is better than with existing batch technologies," Chen says. "This is due to better selectivity of the hydrolysis reactions and a controlled, sustainable recovery of the hemicellulose by-products."

Seizing a market opportunity

The dissolving pulp market in China has experienced a boom in recent years, both because of the strong textiles manufacturing base, and a governmental shift away



◀ The ANDRITZ Wash Press (AWP) is the first in China. The compact unit performs P-stage bleach washing in the dissolving pulp process.



◀ Chen Jieyu of ANDRITZ (left) with An Qingchen of Sun Paper in front of the ANDRITZ MVR evaporators which considerably reduce fresh water consumption in the mechanical pulping lines. Sun Paper is leading the world with its zero discharge accomplishments at this mill.

from supporting cotton. The government, highly aware of the need to feed 1.4 billion people, has chosen to encourage more planting of food crops, such as rice and corn. Combined with the emergence of poplar tree plantations owned by Sun Paper and local farmers, the company was ideally positioned to gain from this hardwood fiber for textile production.

Explains Ying, "Because of a fast start-up, we were able to take advantage of the spike in prices. Even now, we are profitable with the current pricing. When prices go up again, we will do even better."

Flexibility can be sweet

The best measure of the value of Sun Paper's textile pulp is acceptance by consumers. "We are hearing from producers that our textile pulp has qualities that consumers want," Ying says. "In addition to excellent moisture absorption, the smooth, soft surface allows fabrics to drape in a way that flatters the figure. We are told that our pulp is good for sensitive skin. In addition, the process employed to turn our pulp into yarn is considered to be environmentally friendly."

Says Liu, "We did a lot of research before converting our line to textile pulp. We realized that customers wanted more than cotton replacement. They wanted properties that made end products better, and sometimes cheaper. Our fiber comes from nature, but can behave in different, desired ways compared to cotton. It can be shorter, or longer, providing our customers' customers with a new range of options."

A key criteria for Sun Paper's choice of the ANDRITZ dissolving pulp production technology was the ability to swing the system back to bleached kraft production when they choose. Says Ying, "Flexibility is always wise, because markets fluctuate. We have a strategic advantage to shift production. Another bonus is that our textile pulp investment opens the way for other value streams from the byproducts. The hemicellulose extracted during pre-hydrolysis can be used to produce xyclose for chewing gum. And, if the quality of the hemicellulose is not sufficient for this, we mix it with the black liquor as a fuel for the recovery boiler."

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A long partnership with ANDRITZ

Significant pulp production at Sun Paper comes from their four ANDRITZ P-RC APMP mechanical pulp lines (first one started up in 2008) which produce 700,000 t/a. All the mechanical lines employ ANDRITZ Zedivap system to eliminate normal effluent treatment by utilizing mechanical vapor recompression (MVR) technology to remove most of the water from the effluent. Condensate is returned to the APMP process, reducing considerably fresh water consumption. Residuals are further concentrated and incinerated.

According to An Qingchen, Sun Paper's Project Manager for the APMP mechanical pulp lines and evaporation systems at Sun Paper, "Sun Paper is leading the world with its zero discharge accomplishments here. We enjoy the challenge of leadership in environmental performance."

Two other recent projects include the installation of ANDRITZ biomass handling equipment for the power generation plant (September 2011) and an ANDRITZ LimeKiln, started up in December, 2012.