

# DIP plant provides much-needed fiber and flexibility

With a new printing/writing machine on the way, Tamil Nadu Newsprint & Papers Ltd. better known as TNPL, predicted a shortfall of pulp. This led to the decision to purchase a deinked pulp processing line. With the new plant from ANDRITZ, the mill now has ample high-quality pulp to feed its paper machines, and will soon be sending part of the DIP plant's output to a new cartonboard machine being erected 90 km away.



“The investment in a new DIP plant removes a major bottleneck in production, and gives us fiber flexibility that we never had before,” says S. Udayasankar, Chief General Manager, Projects Department. With a post-graduate degree in chemical engineering, Udayasankar heads the in-house projects department of TNPL, which is responsible for implementing major capital projects including capacity expansions, environmental improvements, projects etc.

TNPL is a government-owned enterprise established in the 1980's to produce newsprint, printing, and writing papers. The mill uses bagasse (a sugarcane residue) as the primary raw material. Paper production started at 90,000 t/a and, over the years, increased to 245,000 t/a. A mill expansion

plan which TNPL undertook raised capacity to 400,000 t/a. TNPL is now the largest bagasse-based paper mill in the world.

TNPL caters to the requirements of multi-functional printing processes like sheetfed, web offset, and digital printers. Printing and writing paper grades are manufactured with a grammage range from 50-110 g/m<sup>2</sup> on three machines. The newest, PM3, was installed in 2011. It was, in fact, the installation of PM3 (wire width 6.1 m and a design speed of 1,200 m/min) which was the primary driver for the addition of a deinked pulp (DIP) plant.

“With the new machine, we expected there would be a shortfall of about 250 t/d of pulp,” Udayasankar explains. “This is on top of our bagasse pulping line (500 t/d)

and our hardwood line (300 t/d). To give us more flexibility in handling our raw material mix at the lowest investment cost, we elected to add deinked recycled fiber to our furnish.”

### More than enough

In discussions with various suppliers, a DIP capacity of 300 t/d was arrived at. This should be more than enough to meet the mill's pulp requirements.

In the early discussions, ANDRITZ was one of the potential suppliers for Udayasankar and his deputy, S.J. Varadarajan, who became Project Manager for the DIP plant. “Of course, we knew of the company and had installed some ANDRITZ equipment in our pulp mill,” Varadarajan explains, “but other suppliers have strong references in

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S. Udayasankar  
Chief General Manager of Projects  
TNPL

(Left to right): Michael Roßker, ANDRITZ VP of Recycled Fiber Systems; S. Udayasankar, TNPL's Chief General Manager of Projects; Chen Zuqing, ANDRITZ Project Manager; and TNPL's S.J. Varadarajan, Deputy General Manager of Projects and Project Manager for the DIP installation. ▶



India. We have had a long association with Vikas Kothari (ANDRITZ's Country Manager in India) and he encouraged us to inspect their workshop in China and visit some references before making up our minds."

As Udayasankar explains, "We visited the ANDRITZ workshop in Foshan to see the quality of engineering and manufacturing. We were really impressed with the ANDRITZ installation at Yueyang Paper in Hunan Province. They have a three-loop DIP plant with 550 t/d capacity, including a FibreFlow drum pulper, producing pulp for a new LWC machine. One of the key factors for us was the performance of the drum pulper and the SelectaFlot flotation, as we were not that familiar with ANDRITZ's technology." (See story about this mill in *Spectrum* No. 21)

"Based on our analysis, we knew the drum pulper would be a good fit here," Varadarajan says. "It is a continuous process with very low fiber losses and less disintegration of impurities. We knew that it would be key to our success here and is a core technology for DIP processing."

The contract with ANDRITZ was signed in July 2010. Key to the final decision, according to Varadarajan, was ANDRITZ's willingness to guarantee performance. "Of all the pulp characteristics, the two that



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R. Venkateswaran  
Pulp Production Manager  
TNPL

were most important to us were brightness gain and fiber yield. ANDRITZ was willing to guarantee these."

#### No DIP experience

With no DIP operating experience in the mill, TNPL brought in R. Venkateswaran, a man with 20+ years' experience in recycled fiber processing, to be the Pulp Production Manager. Venkateswaran had previous experience with ANDRITZ equipment and worked side-by-side with Chen Zuqing, ANDRITZ Project Manager, during the build-up, commissioning, and start-up of the plant.

"ANDRITZ was very responsive to any questions or concerns that we had during the project," Venkateswaran says. "The relationship was very good. We are, of course, buying much more than just equipment with an investment like this. We are

interested in the process knowledge and technical support as well, since we did not have experienced deinking operators at this mill."

"Our equipment began arriving on-site as planned," Zuqing says, "and TNPL, through its engineering company out of Chennai, began the civil and structural work. Then there was a delay in getting all the environmental permits from the authorities, so we were not able to keep to the original schedule."

The line started up in July 2013. "You can really tell the quality of the project work during start-up," Venkateswaran says. "We started up the line in the morning and were making quality high-bright and clean pulp by evening. Pulp that was used on the machine without problems. It was a very smooth start-up, which is remarkable."

#### First of its kind

The ANDRITZ DIP system with three loops – including drum pulping, three flotation stages, two dispersing stages, and a sludge dewatering system – is state-of-the-art and the first of its kind in India.

According to M. Subramanian, Chief General Manager of Production, "We are producing very high quality pulp. This deinking technology produces a furnish that is excellent for the production of high-quality printing and writing grades."

The raw material – 80% sorted office papers and 20% old magazines – enters the line with an initial brightness of 60-65%



▲ The FibreFlow drum pulper is considered a core technology in the DIP line by TNPL management. It disintegrates the secondary fibers without harming them, while large contaminants are removed intact.

ISO. The deinking and bleaching processes increase the final brightness up to 87% ISO. The Effective Residual Ink Concentration (ERIC) of the final pulp is as low as 50 ppm. In addition to the high final brightness and cleanliness of the pulp, another highlight is the 75%+ yield, which is outstanding for a three-loop system.

"A critical parameter for us in the system design is the type of ink and the printing process used in the raw material mix," says Michael Rošker, Vice President of Recycled Fiber Systems for ANDRITZ. "Office papers have what we call a 'hard' ink, with the laser print virtually fused onto the paper surface. Magazine papers have a 'soft' ink that is smoothly printed onto the coated surface via an offset or gravure press. The right balance of equipment and process knowledge is required to remove both of these ink types."

#### Three-loop system design

Due to impurities coming with the secondary fiber furnish, deinked pulp systems require a series of process stages in order to remove and/or reduce the impurities without harming the fiber material.



▲ After pulping, the next task is the removal of heavy particles in a two-stage cleaning system, preserving the life of downstream equipment.

Disintegration without affecting of the secondary fibers is the main task of the FibreFlow drum pulper, according to Erwin Hertl, ANDRITZ's Chief Technology Manager for fiber preparation systems. After pulping, the next concern is the removal of heavy particles in a two-stage cleaning system to reduce the wear on downstream equipment.

The first loop in the TNPL system is focused on screening and cleaning technology. Although ink detachment is not fully completed at this point, flotation equipment to remove the "soft" inks and dirt particles is also included in the first loop. "With the exception of ink and small dirt particles, the removal of contaminants is completed in the first loop and clean pulp



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Chief General Manager of Production  
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## Bagasse fiber

Bagasse is the residue that remains after sugar is removed from sugarcane. Manufacturing paper from a sugar cane waste product is another example of the paper industry producing quality products from what used to be considered "waste" material. Bagasse has its limitations, but also its useful characteristics: it is plantation-raised with a short growth cycle, is easily harvested, and requires less bleaching chemicals. As the largest bagasse-based paper mill in the world, TNPL has the experience to extract the most value from this renewable, sustain-



able fiber source. It also now has the flexibility to blend the bagasse furnish with deinked pulp and hardwood sources.



▲ The high-bright and clean DIP is utilized for TNPL's high-quality printing and writing grades which are preferred for sheetfed, web offset, and digital printing. Here, a machine operator at PM3 takes a sample that will be fed into the automated paper lab for analysis.

the ash content going up, our pulp requirement is reduced accordingly."

"We operate the DIP plant at a steady rate, though not at full capacity," Venkateswaran says. "It will be utilized to the maximum when we complete the installation of a double-coated multi-layer cartonboard machine in a greenfield location just 90 km away. The new machine is designed to produce 200,000 t/a. The target for commissioning the new machine is 2015."

The DIP plant gives TNPL a lot of flexibility. "We handle one million tonnes of bagasse each year – which is a huge quantity," Udayasankar says. "But if the monsoons are particularly bad, which occurs some years, the sugarcane crop is impacted and we have a shortage of bagasse. Similarly, we sometimes face a shortage of chips for our hardwood line. In these cases, DIP gives us enormous flexibility in shifting our raw materials. It is very important to our mill."

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is sent forward in the system," Hertl says. A heated and pressurized disperser at the end of the first loop detaches ink particles and reduces the size of other impurities to achieve a homogeneous particle size distribution.

The second flotation stage is used mainly for removing detached "hard" inks. "Office waste also contains fragments of varnished and special coated papers which can be eliminated at least partially by cleaners which provide high centrifugal separation forces," Hertl says. A second disperser handles the most resistant ink particles as well as some very small stickies and dirt particles. Oxidative bleaching chemicals are also mixed into the pulp at this dispersing stage to enable high-consistency bleaching.

The final flotation stage removes the remaining dirt and ink particles. The third thickening is followed by a reductive bleaching stage, important not only for bleaching colored fibers, but also for achieving high final brightness.

"An effective water management system reduces overall fresh water consumption at this mill," Rošker says. "Filtrate from sludge dewatering is clarified partly reused as dilution water for the drum pulper. This reduces the effluent volume and make-up fresh water required."

According to Udayasankar, fresh water consumption is a critical factor at the

Kagithapuram mill. "We draw water from the nearby river, but do not return our treated effluent there. Processing recycled fiber can be done basically effluent-free, so this is a big plus for us."

**Shortfall becomes a surplus**

When PM3 started up, the ash content of the sheet was about 8-9%. "We changed our chemistry to alkaline sizing, which allowed us to increase the ash content by another 7-8%," says Subramanian. "With



▲ The raw material mix consists of 80% sorted office paper and 20% old magazines. The ANDRITZ deinking and bleaching technology achieves a final brightness up to 87% ISO.

# Growth in India

Anyone who visits India is impressed by the size of the country and the population density – 1.24 billion people, with 20 million being added each year. This population growth is the equivalent of two and one-half times the total population of Austria being added every year.

As a growing nation, India is experiencing a dramatic increase in paper consumption. Yet, the quantity of domestically produced quality virgin fiber for the manufacture of high-quality paper grades remains scarce, so there is an intense focus on recycled fibers.

In the south of India, the state of Tamil Nadu (where TNPL is located) has over 65 million residents (equivalent to the population of the United Kingdom or France). Where there are people, paper is needed. Tamil Nadu is a good location for a mill the size of TNPL. With an ample supply of fiber, and easy access to domestic and export markets, TNPL is well positioned for growth.

