Texas Mill Pioneers First Use of Southern Pine Furnish in High Quality SC Papers

Abitibi-Consolidated mill in Lufkin, Texas is producing quality uncoated groundwood grades from southern yellow pine on new machine with high-tech online supercalender. – By Ken Patrick, Editorial Director

In early 1940, the Southlands Paper Mill in Lufkin, Texas produced the first roll of newsprint made from a southern pine furnish. Some 61 years later, the mill, now owned by Abitibi Consolidated Corp., pioneered yet another first—supercalendered (SC) paper from southern yellow pine, a fiber heretofore considered unsuitable for most SC grades.

Used in newspaper supplements, flyers, catalogs, magazines, etc., glossy but uncoated SC grades, in fact, have historically been the domain of mills in more northern climates, such as Canada, Finland, and Sweden where softwoods typically contain less resinous pitch to cause deposition and quality problems on today’s fast, wide paper machines.

A learning curve has been involved, certainly, along with a great deal of patience and determination, but Lufkin’s new No. 8 paper machine, a rebuilt Beloit Bel Baie III unit fitted with an online Metso OptiLoad supercalender, is today producing a high quality SC-B paper, along with other soft-nip calendered (SNC) and machine finished grades—without any deposition problems related to its chemical and mechanical furnishes.

The Lufkin mill is located in east Texas about 100 miles north of Houston. It was part of Abitibi-Consolidated’s acquisition of Donohue in April 2000. Donohue had acquired the Lufkin and Sheldon, Texas mills from Champion International in 1998.

No. 8 PM has a complex and interesting history (see sidebox on page 18). It was originally installed at the Avenor Gold River Newsprint mill in Vancouver, B.C., in the mid-1990s. The Gold River mill went bankrupt soon afterwards, and Fletcher Challenge of Australia bought the machine, subsequently selling it in 1999 to Donohue, who planned to rebuild and upgrade it for valued-added production at Lufkin. When Abitibi-Consolidated acquired Donohue the following April, it supported the Lufkin upgrade plans already underway, taking them to completion with the startup of No. 8 PM in August 2001.

In preparation for the new machine, the mill’s chemical and groundwood pulp mills were simultaneously upgraded, along with Voith rebuilds of the screens and GL&V rebuilds of the cleaners in stock preparation serving PM 8. A tertiary stage screen was added in stock prep, and both the secondary and tertiary stage screens were changed from holes to slotted baskets.

Most recently, the Lufkin mill waste treatment system was modernized and expanded, receiving an additional
secondary aeration basin and tertiary filtration stage, making it one of the top systems in North America, and the world for that matter, Sylvain-Yves Longval, general manager points out.

The Move to Value Added

With the startup of PM 8, three of the mill's four paper machines (Nos. 1, 3, and 4 fourdriniers) were permanently shutdown. No 2 paper machine, a 244-in.-wide Bel Baie II unit, was kept in operation and currently produces some 475 tpd of newsprint. No 2 and the new No. 8 paper machines have a combined capacity approximately the same as the previous four machines, so no new pulping capacity was needed.

However, at the same time that No. 8 PM was being installed, upgrade projects were underway in both the chemical and groundwood pulp mills, for environmental and quality reasons. The semibleached kraft mill has a capacity of about 500 tpd with seven kraft batch digesters. It was upgraded for Cluster Rule compliance and to produce a cleaner, higher brightness pulp for the new No 8

PM 8 VALUE ADDED PRODUCTS

By varying supercalender loadings, temperatures, and furnish, three grades of uncoated groundwood papers are made on PM 8 at Lufkin, in the basis weight range of 30-32 lb. If needed, newsprint can also be produced on the machine, but General Manager Sylvain-Yves Longval says the game plan, as much as possible, is to keep value added grades on PM 8 and newsprint production on No. 2 PM. Grades currently produced on PM 8 are:

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<tr>
<th>Product</th>
<th>Characteristics</th>
<th>Uses</th>
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<td>Abical SC-B</td>
<td>Supercalendered, 35 Gloss Catalogs</td>
<td>Inserts, Flyers, Circulaires, Magazines</td>
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<tr>
<td>Abical SNC</td>
<td>Supercalendered, 28 Gloss</td>
<td>Inserts, Circulaires, Special Sections</td>
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<td></td>
<td>General Commercial Printing</td>
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<tr>
<td>Abibrite 65 &amp; 70</td>
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<td>Finished, 65-70 GE Brightness</td>
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Before the decision was made to go to value added grades at Lufkin, Moody Smith, superintendent, value added production, says that three separate trials using the mill’s yellow pine furnish and anticipated chemistry were conducted by Metso in Finland. These trials confirmed that a quality supercalendered paper could be made on the machine without any major deposition problems. Printing trials also showed that the paper would be very suitable for use in traditional SC and uncoated groundwood applications.

“For someone coming from Canada with a background in forest engineering, I’m very impressed with the quality of fresh pine fiber available to the Lufkin mill, and the quality of SC papers that are being produced on the No. 8 paper machine with such fiber.”

— Sylvain-Yves Longval, general manager,
Lufkin Div., Texas, Abitibi Consolidated

Joining Abitibi-Consolidated in 1994 as a human resources consultant, Sylvain-Yves Longval worked in labor relations-organizational development for two years. He then headed the company’s Consistent High Performance group that was involved in optimizing and increasing operations and maintenance performance around the company’s mills. In 1997 he became involved in the merger of then Abitibi-Price and Stone-Consolidated to form today’s Abitibi-Consolidated, working closely at the heart of this venture with the company's integration teams.

He continued managing the C.I. (Continuous Improvement) group of Abitibi-Consolidated for another year or so, becoming VP of Human Resources when John Weaver was named president and CEO in January 1999. While in this position, he became involved with the company’s purchase of Donohue, serving on the acquisition team.

Following the Donohue acquisition in 2000, the company's human resources functions were split into Canadian and U.S. & Head Office operations. Longval was assigned the latter, while staying at the Montreal Head Office. He subsequently requested and was given a position on the company's operations side, being assigned to the company's Sheldon, Texas mill where he served as general manager until his appointment as general manager at Lufkin this past April.
When the Beloit Bel Baie III machine that was to eventually become No. 8 PM at Lufkin was purchased from Fletcher Challenge in 1999, it was in crates stored in three different countries. The bulk of the machine was still in several hundred containers in Vancouver, B.C., where it had been disassembled and packed mainly for space efficiency rather than reassembly.

Fletcher Challenge, which had bought the entire Gold River mill including its relatively new TMP plant, had planned to rebuild and install the machine at one of its mills in Australia, with the TMP plant going to a mill in New Zealand. Plans for the paper machine subsequently fell through, and when Donohue purchased it from F-C, some of the machine had already been shipped to Australia, while other sections, especially rolls, were at various refurbishment locations throughout North America.

Unlike when buying a new machine from a manufacturer and having the components sequenced into a mill, most components for PM 8 were shipped all at once via a dedicated ship (contained only the machine) from Vancouver down the Pacific Coast, through the Panama Canal, and into the Port of Houston. Trucking it 100-plus miles up to Lufkin was a major task and quite a sight.

After retrieving remaining machine parts from Australia and recovering rolls in refurbishment shops on the U.S. west coast, in Wisconsin and the Carolinas, as well as dryer drums in Washington, the complex, massive reconstruction job began. It was “like a giant erector set that someone had thrown away the directions for,” Moody Smith, superintendent, value added manufacturing, says.

Components such as piping had to be taken out of some 500 crates and spread on the ground, following match marks to figure out the reassembly scheme. Fortunately, the mill was able to use the services of the same person who directed original construction of the machine as well as its subsequent disassembly at Vancouver.

An erector with Beloit at the time, Dick Moe was contracted through Beloit to direct the erection at Lufkin, and later hired by Abitibi-Consolidated to finish the project when Beloit went bankrupt. Thus, the same person directed erection of the machine twice, as well as its disassembly in-between.

Moody explains that Beloit went Bankrupt about the time that Lufkin was beginning the project and had ordered the rebuild by Metso. Fortunately, Metso acquired the industrial rights and drawing archives from Beloit and was able to field service both the old and new for PM 8.

Altogether, a lot of detective work, ingenuity, patience, and luck were involved in getting the PM 8 puzzle put together from pieces scattered literally around world. But, thanks in large part to the careful inventories of Fletcher Challenge and the help of the machine’s original erector, every component was eventually found and put back together.

By the time Abitibi-Consolidated acquired Donohue in April 2000, erection of the machine in Lufkin was well underway. Pilings for the project had been driven in September 1999, and pouring of concrete began soon afterward. The machine was reassembled and upgraded for SC production by Metso, mainly onsite, and in late summer a year after Abitibi-Consolidated took over the mill, the new PM 8 started up successfully and on schedule.

The machine now in operation at Lufkin is truly a combination of the old and new. Most of the framing, rolls, and dryer section are still vintage Beloit Bel Baie III, while the rest of the machine is latest technology Metso.
adjustments, and gain some operating experience with them. To make an SC product from southern pine fiber, it was absolutely essential to eliminate shives and have the highest quality furnish possible, he notes.

**PM 8 Modernization**

No. 8 PM is a 369” wide Bel Baie III unit that was completely rebuilt by Metso Paper for production of SC and groundwood specialty grades. The wet end was outfitted with a new headbox and the forming section was overhauled to not only streamline it for value-added production but also to eliminate the wet end misting problems typically associated with Bel Baie formers.

The old Beloit ConverFlo headbox was replaced with an OptiFlo dilution controlled headbox with consistency profiling, dry weight control, and an IQ dilution CD profiler. The headbox produces excellent CD dry weight, filler, and fiber orientation profiles, essential ingredients for total profile management within the supercalendering process. Kajanni RMi low consistency analyzers were installed to measure the fiber and filler consistencies of headbox flow and wire water. These units also provide automatic control of the retention and break time filler in the process.

The forming section was rebuilt into an OptiFormer roll and blade type gap former, which produces more symmetric Z-direction sheet properties, especially the filler distribution, and added dewatering capacity. Addition of a HiDry fabric conditioner and rebuild of the former ventilation system were designed to improve overall former cleanliness and reduce misting.

The old Beloit Tri-Vent press section was rebuilt by Metso and modified by removing the fourth press and replacing it with a SymRun four-drum dryer group, equipped with VacRolls and SymRun HS Blow Boxes. Metso fitted a new ceramic cover on the center press roll along with a double doctor. A PressRun Blow Box was installed in the press-to-dryer transfer.

Currently there are 39 total dryers in the dryer section, arranged into one single tier (the new SymRun group) followed by three single-tier and three double-tier groups. This section of the machine is basically the same as it was originally except the steam and condensate system was rebuilt to have DriCompact stationary syphons and steam joints, thermocompressors, separators, and valves. A VIB AirTech remoisturing shower was added in the fourth dryer section, which, along with a VIB rebuilt steam box in the press section, is used to control final moisture profile of the sheet. The original Gold River dryer hood was rebuilt by Enerquin.

The six-roll OptiLoad calender is located at the end of the dryers. It has four effective nips, where the paper web is pressed against a hot steel roll. Depending on the grade being produced, a maximum loading of 2,430 pli can be applied in every nip. Three different grades are made on PM 8 by varying the temperature and linear load on the supercalender, along with furnish properties.

The original Beloit reel was rebuilt to an OptiReel unit with an air doctor and secondary center wind assist. The new 48-in.-dia reel spools are “beefed-up” versions of the old reel spools to handle the additional weight of supercalendered papers compared with newsprint. In fact, all
frames in and around the dry end had to be “beefed-up” to handle the heavier weight spools and paper. Water-jet tail cutters are used at the end of the machine.

The old Super 1 winder configuration was rebuilt into a Metso WinBelt type having a web threading splicer and a new windup section. The slitter section was supplied by GL&V. ABB rebuilt some of the drives and installed new AC drives on the calender and winder.

The entire paper machine is equipped with integrated DCS and QCS supplied by Metso Automation. A new PaperIQ measuring frame was installed after the OptiLoad calender, for online measurement of basis weight, moisture, ash, color, opacity, brightness, and gloss on both sides of the sheet. Retention and consistency monitoring on the wet end was also provided by Metso Automation, along with a rebuild of the existing paper testing facilities.

All quality controls are performed by Metso Automation’s Damatic XDi system. CD basis weight is controlled by IQDilution, CD Moisture is handled by the aforementioned VIB rewet shower, and CD gloss and caliper are controlled by the OptiLoad Sym Z rolls and three VIB steam boxes. Defect detection (spots, holes, streaks shives, wrinkles, etc) is provided by a Metso Parsytec system. IQTension control is used before and after the calender stack. A Sensodec 6S system provides online runnability and condition monitoring. Metso also supplied the machine’s break monitoring cameras.

New and rebuilt pumps for PM 8 and elsewhere were provided by ITT Goulds. Cutler Hammer supplied new switchgear, valve refurbishing was handled by Fisher, and Abbot Machine rebuilt the Herkules roll grinder. Startup machine clothing was provided by Weavexx.

As part of the project, a new roll handling system connects PM 8 to the existing mill complex. This flexible, high capacity conveyor system, also supplied by Metso, separates, marks, and moves roll sets from combined narrow rolls to jumbo rolls in three different levels, from winder to warehouse.

**Online Supercalendering**

Online, multinip supercalendering was just coming into use when the decision was made to go to value added grades at Lufkin. The cost advantages of online supercalendering, compared with traditional offline finishing, were significant, despite the challenges of such a new application.

Effective control of the OptiLoad for maximum performance, however, has taken some time. Longval says that “Metso has been with us every step of the way. We currently have the most up-to-date control software for the OptiLoad, and are ahead of the curve in terms of implementing the latest technology.”

Longval adds that Metso recently installed a “black box” on the OptiLoad that feeds real-time operating information directly to Finland and the Metso Future Care facility in Atlanta, Ga. With real-time information from the black box and other areas of the machine, Metso control and process specialists are helping the mill progressively optimize PM 8.

“We’ve been going back to some of the basics on how the technology is being applied and how it’s functioning in regard to our specific paper machine. We’re looking at reliability issues and making sure that we ramp-up on our productivity curve, which we’re on at this time,” Longval points out.

Stevens says that, with the help of Metso, the mill and the company’s corporate engineering department have been able to pinpoint and prioritize some of the OptiLoad control issues. Metso, he says, has committed additional resources and an “action plan” has been developed to “help us systematically go through and resolve these issues.”

“We’ve made some very positive progress,” Stevens continues. “Most of the software and process changes are taken
care of now, and we’re currently working through some of the mechanical issues. Last month, for example, we installed new mirror-finish thermo rolls on the calender, which gives us better gloss. Higher gloss lets us back off a little on calender loadings on some grades, which in turn gives us a corresponding bump in brightness, which then allows us to reduce the more costly calcined clay ratio in the sheet.”

Longval and Stevens emphasize that one very important key to efficiency on PM 8 is the flexibility of the online OptiLoad calender. It can be loaded and unloaded and temperatures increased or decreased to produce the gloss and other properties needed for the various grades produced on the machine. The target gloss for Abical SC-B, for example is 35, which is attained by running about a 2,400-pli loading on the calender nips.

**Wet End Optimization**

Longval says that an Abitibi-Consolidated wet end chemistry expert has been working with the Lufkin mill recently “to fine tune” the chemistry and wet end operations of both No. 8 and No. 2 paper machines. “The way we’re operating now, we have no pitch problems at all on No. 8 machine, and our production is ramping up to corporate standards of efficiency and quality, which, I can tell you, are very high.”

Attributing at least some of the mills’ success to the quality of fiber going into its processes, Longval points out that “for someone coming from Canada with a background in forest engineering, I’m very impressed with the quality of fresh pine fiber available to the Lufkin mill, and the quality of SC papers that are being produced on the No. 8 machine with such fiber.”

Stabilizing pH and temperatures in the process is critical to controlling pitch and deposition problems on the machine, both Longval and Stevens point out. “De-coupling” pitch control from pH control has “helped a lot,” Stevens notes. “We were previously using alum for both pitch and pH control. But now we’re using an organic acid to stabilize pH while continuing to use alum to control pitch. This has reduced the swings in pH, and along with it the swings in wet end retention we were experiencing earlier.

“We’ve been working closely with both the kraft and groundwood mills to stabilize pH in a much tighter range. This settles down pH swings on the machine, which is critical to controlling pitch deposition problems,” Stevens says. New instrumentation being installed in the pulp mills to automatically control chemical applications, he notes, will be tied to real-time production data, and will further stabilize furnish from the pulp mills.

“The work we’ve been doing lately has resulted in a much tighter pH range of furnish coming from the pulp mills. We’ve also been able to lower pH in the thick stock tanks to the 5.2-5.4 range, which means we don’t have to use as much acid to trim the machine,” Stevens explains. Headbox pH on PM 8, he adds, averages 4.8.

“Overall, we’ve been doing a much better job of holding filler in the sheet” Stevens concludes. “We’ve seen dramatic reductions in our alum-aluminate usages as well as similar retention aid reductions.”
Advanced Waste Treatment System

In 1968, a waste treatment plant was installed at the Lufkin mill, replacing a two-stage, 110-acre pond system that had been in operation since the mill started up. The 1968 plant consisted of primary clarification and secondary treatment with an aeration basin.

According to Charles Hughes, environmental coordinator, “that plant has done a good job for the mill over the years.” He notes that during those years, Lufkin had some of the lowest limits of all southern kraft mills, operating down around the 2,900 lb of BOD5 level. Recently, however, Texas changed its way of modeling the Angelina River, effectively reducing the mill’s limits by 75%.

To meet these stringent new limits, the mill expanded its already efficient waste treatment plant with an additional secondary aeration basin and a tertiary fabric type of filtration stage, that along with other modifications and upgrades make this one of the most advanced paper industry waste treatment operations in the world. Expansion and upgrading of the plant was a $15 million project.

“To our knowledge the fabric-type disk filter system we now have in our tertiary waste treatment stage is the first such application in the pulp and paper industry. It’s doing an excellent job of ‘polishing’ the final effluent, reducing solids by about 50%,” Hughes points out.

The new closed wastewater cooling system has three non-contact heat exchangers that indirectly lower effluent temperatures without generating any air emissions and associated community odor problems.

Started up in mid-May, followed by a three-week mill shutdown in June, the expanded plant has not been in operation long enough to thoroughly assess its performance, but Hughes says that based on initial indications, it will easily meet the new limits of 1,016 lb of C-BOD with 1 mg/l of ammonia. With the new regulations for Lufkin becoming effective June 1, Longval says the mill now has, by far, the most stringent effluent limitations for a semibleached kraft mill in the southern U.S., and possibly the whole country.

To handle flow surges due to flash flooding commonly experienced during the spring and early summer months in east Texas, an equalization basin was installed to provide surge capacity. Also during summer months, the existing aeration basin would sometimes run hot (110° – 115° F), exceeding the ideal temperature (98° –100° F) for biological activity.

To prevent these temperature rises, a new non-contact, indirect cooling system was installed. With this closed system, all mill wastewater passes through three heat exchangers, which receive clean cooling water from a new cooling tower. The cooling water and effluent never mix, and since there is no atmospheric exposure, no emissions or community odor problems can occur.

As Hughes explains, the new, 2.5 million-gal secondary aeration basin is the same size as the existing aeration basin. It has fourteen 75-hp floating aerators, and the existing basin has 10 stationary aerators, with six new 100-hp floating units being added during the upgrade project. As part of the project, the two existing secondary Eimco clarifiers were also rebuilt.

The tertiary soft-filtration stage, supplied by Aqua-Aerobic Systems (also supplied aerators for the new secondary and existing basins), consists of a series of 72 fabric disks (6 cells of 12 disks each) in an approximate 30-ft x 60-ft open structure. Hughes describes the fabric covering the disks as “similar to shag carpeting.” The filtration system is easy to operate and easy to maintain, with no moving parts, Hughes says.

Final effluent from the tertiary filtration stage is discharged to the Angelina River at an average flow of 15.5 million gal/day, which has been reduced from around 20 million gal in recent years. Solids from waste treatment go to a sludge dewatering plant and then to landfill.