By **MONICA SHAW,** Editor

Best of both worlds

Bowater converts its No. 4 newsprint machine at Calhoun, Tenn., to a coated hybrid sheet using kraft and TMP pulps for a strong, lightweight, and attractive alternative to uncoated freesheet

These days, the word "hybrid" invokes a best-of-both-worlds' flavor for any product it describes, encouraged by SUVs that offer fuel efficiency and brawn, among other depictions. Such is the case for Bowater Incorporated's new BowHybrid, a freesheet hybrid paper that blends bleached kraft pulp with bleached thermomechanical pulp (TMP) to provide high strength, bulk, and opacity at lighter basis weights.

Bowater's new grade began running on the No. 4 paper machine at its Calhoun, Tenn., mill this past July and has been well received by customers, who were the ultimate motivation for converting the No. 4 machine from newsprint to the new grade.

"Our customers were looking for a wider breadth of products, and they told us they wanted a cost effective, lightweight, high bulk uncoated freesheet type product – a market segment we weren't totally covering," says Jim Colwell, director of marketing for Bowater. "We then began looking at which assets within our mill system could produce such a product."

The search ended at the Calhoun, Tenn., mill, which had a capacity in 2004 of 495,000 mtpy of newsprint and 223,000 mtpy of low bright mechanical specialties on five paper machines. Bowater wanted a way to offset the quick decline in newsprint consumption. With its kraft, mechanical, and deinked pulping operations, Calhoun offers the "flexibility to produce several different grades of paper," says William Morris, Bowater's senior vice president, Coated and Specialty Paper Sales and Marketing.

After extensive technical and market research starting in 2004, the company developed BowHybrid, made from a mixture of TMP and kraft pulp. The sheet is also lightly coated, and Calhoun received technical expertise in developing and running the grade from Bowater's Catawba, S.C., mill.

Converting the 150,000-mtpy newsprint machine to the same tonnage in the new grade required extensive upgrades to the stock approach system, headbox, and former, as well as a new coater and coating kitchen. For the brighter sheet, a new bleach plant was also needed, comprising about a fourth of the $80 million slated for the project. Extensive training of mill personnel was another major consideration (see sidebar, p. 30), but vice president and Calhoun mill manager Walter Brunson reports that employees "understand how important the success of this project is to Bowater and to our mill."

With conversion to the value-added freesheet grade, Bowater is continuing the expansion of its product line. Since 2000, the combined tonnage sold as coated and specialty products has nearly tripled to 1.7 million short tons.

As Bowater's advertisement conveys, BowHybrid boasts bulk and brightness at light weights.

Manufacturing to match markets

Newsprint consumption by U.S. daily newspapers has declined in the last five years. In conjunction with this decline, newsprint suppliers have converted to value-added grades, with Bowater responsible for five of the eight most recent transitions (Table 1). According to *Pulp & Paper Week* estimates, more than 1.23 million tons of newsprint capacity has been converted to value-added grades since 2003.

Morris says that direct mail is an area of great promise for the new freesheet hybrid family due to the sheet's light weight and strength. According to RISI's latest North American Graphic Paper Forecast, direct mail is the primary driver of the "other commercial printing" category that accounted for 3.12 million tons out of the 14 million tons of uncoated freesheet (UFS) consumed last year. Other end uses for BowHybrid include catalogs, flyers, and commercial printing.

"Due to its targeting and measurability, we think the direct mail market will continue to grow," says Colwell. "While it is a significant

consumer of uncoated freesheet, there are postage-cost challenges ahead that will demand lower basis weights. So, we looked at the capability Calhoun could bring for making a high-bulk lightly coated product that would better suit advertisers' needs, and it all came together with the No. 4 paper machine. This effort matched marketing with production, creating a nice fit."

Composing an appealing sheet

To exploit the Calhoun mill's pulping capabilities and better serve customers, Bowater's freesheet hybrid contains TMP for bulk and opacity and kraft pulp for brightness and strength. Using higher yield mechanical pulp means a 42.5-lb BowHybrid product uses around 40% less wood fiber than a 50-lb UFS, providing cost and environmental benefits. The sheet is about 60% kraft / 40% mechanical, on average, but Bowater declines to comment on the split between hardwood and softwood furnish.

The BowHybrid product is available in 40-lb, 42.5-lb, 45-lb, and 50-lb basis weights and in two finishes – a smooth and a vellum. Bowater says its 42.5-lb BowHybrid vellum sheet has the opacity, caliper, and performance of a 50-lb traditional UFS product (Table 2). The smooth sheet has a coatweight of 3 lb-3.5 lb/side, while the vellum has 1 lb-2 lb/side. According to Bill Litzenberg, Calhoun manufacturing services manager, the coating is a "true coating since we use two binders (starch and latex) and a special pigment."

In times past, customers may have balked at a product with mechanical pulp for more sophisticated applications like direct mail, but those days are no more.

"We're finding that customers are less concerned about the sheet's technical makeup and more concerned about how it looks, feels, and performs," says Morris. "Ten years ago, the fact that it's a 60/40 blend may have been a real barrier, but to today's customer it's more about how the advertiser responds, as well as cost advantages such as postage savings, surface yield, etc."

One question that arose in development of the freesheet hybrid was the move to 92 brightness by major UFS players. After extensive customer interviews by the marketing and sales team, Bowater stuck with 84 brightness for the new product, which is sold in rolls.

"We didn't run in to any customers demanding the higher brightness," says Colwell, "and depending on the end use, some customers saw the 92 brightness product as too bright and too heavy on the eyes – not warm enough. Based on these interviews, we stuck with our original product specification of 84 brightness."

Selecting the right equipment

To produce a high-quality hybrid sheet, Calhoun's No. 4 newsprint machine required extensive modifications, as well as a coater and coating kitchen. In addition, the mill's existing TMP bleach plant would not be able to support the additional bleaching requirements, so a new plant was needed.

No. 4 modifications: Installed in 1958, the 252-in.-trim No. 4 Beloit paper machine received former and headbox upgrades in the 1980s, but nothing to the extent of the 2006 rebuild. Prior to selecting the latest equipment, Bowater ran pilot trials of its hybrid base sheet formulation with two paper machine suppliers, as well as its own trials with CIC in Montreal and on another paper machine at the mill. Voith was ultimately selected as the supplier for the paper machine portion of the project.

On the No. 4 paper machine, significant ➤

TABLE 1.

North American newsprint conversions to value-added grades (2003-2006)

Company	Location	Capacity (tons)	Date	Comments
Bowater	Catawba, S.C.	330,000	Q2 2003	Grade switch to coated mechanical on No. 3 paper machine.
Bowater	Calhoun, Tenn.	110,000	Q2 2003	Nos. 1 and 2 paper machines. Switch to UCM.
Abitibi-Consolidated	Alma, Que.	250,000	Q3 2004	No. 14 paper machine. Conversion to Equal Offset.
Bowater	Calhoun, Tenn.	80,000	Q2 2004	No. 1 paper machine. Swing all production to UCM.
Irving Paper	St. John, N.B.	145,000	Q1 2005	Exit production on Nos. 1 and 2 paper machines. Conversion to SC.
Abitibi-Consolidated	Belgo, Que.	110,000	Q4 2005	Switch to Hi-Brite.
Bowater	Catawba, S.C.	n.a.	2003/2005	Move some capacity on Nos. 1,2, and 3 paper machines to CFS, UCM.
Bowater	Calhoun, Tenn.	200,000	Q2 2006	Convert No. 4 paper machine to freesheet hybrid plus grade shift on swing paper machine.

UCM=uncoated mechanical. SC=supercalendered paper. CFS=coated freesheet.
Source: Company reports, *Pulp & Paper Week*.

changes were made to the stock approach system, including replacement of stock screens with more modern Voith type MSA screens with 0.010-in. slots and modification of piping inside the machine silo for improved sheet quality. A new MasterJetII headbox with ModuleJet dilution technology was added along with a new dilution water loop on the wet end.

Former changes were extensive due to the demands for a high quality base sheet to support sophisticated printing and graphics needs. On the former, Brunson reports that "everything touching the sheet is new" including a new Voith DuoFormer D with controls to adjust drainage to the top side of the sheet. The vacuum system is existing, but all of the foil boxes, the tri-vac unit, and all of the ceramics have been upgraded. "Basically, all we saved on the former was the frame," he adds. "Everything on the former is geared to minimizing variation and maximizing surface properties."

The press section changes were less substantial and included upgrading from granite to ceramic rolls and closing up draws for improved reliability and efficiency. Bowater decided to maximize the tonnage as much as possible with the new design's dryer system, leaving a new shoe press as a future option.

"Budgeting and timing played into the

rebuild training

A workforce in transition

Bowater's vice president and mill manager at Calhoun, Walter Brunson, is quick to point out how well Calhoun personnel stepped up to the task of making coated paper. However, this transition was not without much work and study by those employees, as well as a receptiveness to change.

Finding the right personnel: According to manufacturing services manager Bill Litzenberg, the Calhoun mill has upgraded work systems along with capital expenditures since 2002. The $80-million BowHybrid project marked the first major spending in the paper mill in a decade, so the mill benefited from the work, training, and skills development from previous projects.

The normal machine crew consists of seven for the No. 4 paper machine and stock preparation. One additional position was added per shift with the freesheet hybrid product to unload chemicals and operate the coating kitchen. Bowater's union workforce is represented by United Steelworkers' Local 5-899. To determine the employees best suited for the coated paper machine, the mill assessed those in the newsprint line of progression using competency-based training about eight months prior to startup of the rebuilt No. 4 paper machine. This training required demonstration of work skills.

"This was a real transition for those from a traditional line of progression to performance-based work systems, but the operators really responded very well," Litzenberg says. "This training and evaluation method, administered through a local college, helped demonstrate whether employees would be successful in the rest of their training journey."

Training extensively: The next phase of training included computer-based training modules that covered "a lot of information that we would expect only a process engineer to know 10 years ago," says Litzenberg. "The modules transferred that knowledge using visual aids to the operators, so they gained a good fundamental understanding of the equipment and processes for the rebuilt paper machine."

Computer-based training preceded the actual classroom training that involved suppliers. It was self-paced and involved tests for comprehension, providing a foundation that made classroom training, conducted primarily by Voith, "much, much more effective," says Litzenberg.

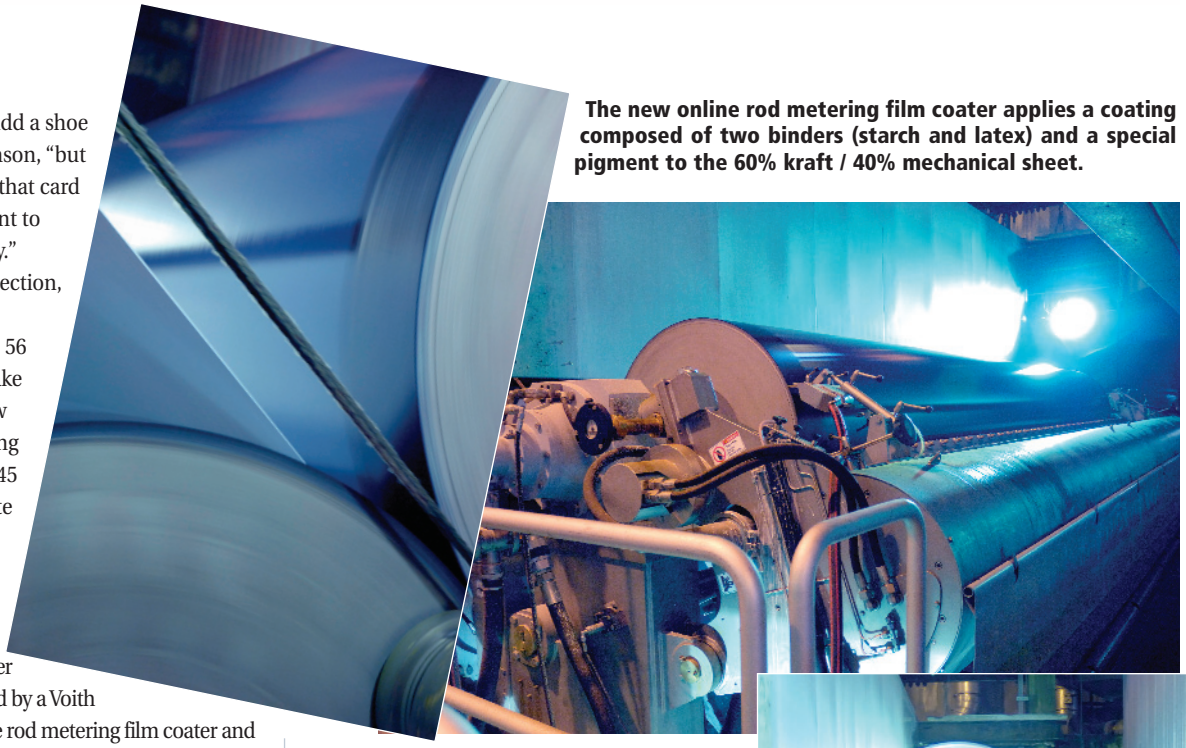
To augment classroom training, selected Bowater personnel were assigned as "area champions," responsible for being the most knowledgeable about the equipment in each area of the machine such as the headbox, the former, or the coater. The champion worked in conjunction with the Voith process expert when the area was addressed in the classroom. "Our goal was to assure that we had Bowater personnel on site with proficiency in each area of the machine so that the operators had a resource they could go to with questions during commissioning and after startup was over," Litzenberg adds.

One interesting development that occurred during the training phase for the No. 4 paper machine conversion was traditional maintenance workers also undergoing the self-paced and classroom operational training. "In the end, both the operators and maintenance workers really had a good understanding of what they were about to accomplish," Litzenberg explains.

Coping with change: The beginnings of the erasure of boundaries between maintenance and operations is just one indication of how the Calhoun workforce is coming to recognize that everyone must be more capable to remain competitive, says Brunson. "We all embrace the idea that we must do things differently," he adds.

The realization has come from being "extremely candid" with the workforce about the decline in newsprint demand, says Brunson, which has been easily conceivable given past downtime situations.

"Our workforce recognizes the tremendous investment Bowater has made with this project, and they understand that the future of this facility depends not just on equipment, but how well we run it," Brunson describes. "I think this recognition showed in their test scores, classroom participation, and the startup's success. They really believe we can turn the site around with this project."



The new online rod metering film coater applies a coating composed of two binders (starch and latex) and a special pigment to the 60% kraft / 40% mechanical sheet.

decision not to add a shoe press," says Brunson, "but we can still play that card later on if we want to increase capacity."

In the dryer section, Bowater had to remove 11 of the 56 dryer cans to make room for the new coater and coating kitchen. "Those 45 cans really dictate what machine capacity is today," Brunson comments.

The main dryer section is followed by a Voith SpeedSizer online rod metering film coater and a coating kitchen by GAW and sourced through Voith. This is similar to those on the Catawba mill's No. 3 paper machine (*Pulp & Paper*, February 2004, p. 22), although there is no IR dryer or air turn after the coater. Instead, after the coater there is a gas-fired dryer followed by two dryer cans salvaged from the main section teardown.

Next comes the calender, which was transitioned from 6-roll stack to a 4-roll stack that has 3 nips based on pilot trial results. Since the startup, however, Bowater has chosen to include fly rolls to reduce calender cutting and sheet barring.

One of the reasons for choosing the No. 4 newsprint machine for conversion to the BowHybrid product was its relatively new winder, a Jagenberg model installed in 2000. However, as part of the project, winder draws were modified to make them more compliant.

Bowater also installed 12 ABB drives to support various pieces of new equipment, including the modified dryer sections and all of the new rolls associated with the coater, after dryer, and calender.

New bleach plant: The new Metso bleach plant at Calhoun is designed to bleach an additional 420 mtpd of TMP production over the mill's existing 360 mtpd, bringing the overall onsite production to a total of 780 mtpd.

"With the new bleach plant, we wanted to accomplish two things," explains Brunson. "We needed it for the furnish on the rebuilt machine, and we also wanted to use some additional peroxide in other uncoated mechanical grades we make here on the No.

TABLE 2.

Comparison of a 42.5-lb BowHybrid sheet with 50-lb UFS

Base Sheet, %	UFS Typical 50 lb Product	BowHybrid Vellum 42.5 lb	BowHybrid Smooth 42.5 lb
Bleached Kraft Pulp	100%	~ 60%	~ 60%
Bleached TMP	---	~ 40%	~ 40%
Coating, lbs/side	Sized	1 – 1.5	3 – 3.5
Caliper	3.8	4.1	3.4
CD Tear Strength vs. UFS	100%	85 - 95%	85 – 95%
Brightness	84 - 92	84	84
Opacity	91	93	92
Four basis weights available: 40#, 42.5#, 45#, 50#			

1 and No. 2 paper machines.

The new plant has two stages of peroxide bleaching, and Brunson describes it as having a "high bleaching efficiency at a low cost." The first stage is medium consistency (MC) at 10%-12%, and the second is high consistency (HC) at 30+%. Residual from the HC stage is used in the MC stage, and the mill can also use a small amount of fresh peroxide in the MC stage if necessary. The mill's existing plant uses peroxide as well, but is only a single MC stage capable of a maximum 72 brightness.

"We're using the pulp from both plants as cost effectively as we can in our various products, from 65 to 85 brightness, utilizing various blends of the peroxide," Brunson describes.

Backtender Bill Adsit inspects and cleans the coater roll prior to closing the coater heads.

On the former, mill manager Walter Brunson reports that "everything touching the sheet is new." He also notes that the upgrades were "geared to minimizing variation and maximizing surface properties."

Constructing and starting up

For the paper machine project, Bowater awarded AMEC out of Atlanta, Ga., an EPC contract. Construction occurred during a 40-day shutdown beginning in April, with start-up occurring on May 29. The machine room for the No. 4 paper machine was able to accommodate the new equipment fairly easily, says Brunson.

"We actually had space in the finishing and shipping area for the coater and kitchen in an area formerly used to store spare parts and finishing material," explains Brunson. "On the paper machine, the challenge was to take out the dryers and put in the coater."

Control loops for the new equipment were a combined effort between the mill, AMEC, and the various suppliers. All loops and control screens are available through the mill's main DCS.

At the May 29 startup, saleable uncoated mechanical paper was made within three hours, with first-quality tonnage made at the 12-hour mark. The mill continued making uncoated paper until July 3 to make sure the equipment was aligned and functioning properly.

After the initial coated production on July 3, product was expedited to eight customers for feedback, which was positive. By the second coated run, the mill "was basically open for commercial business on all heat-set offset printing applications of BowHybrid," says Brunson.

"The pressrooms were great to work with,

breaking into schedules to make sure we had press time, and we had field quality assurance folks there for the runs," Brunson explains.

After the conversion, the Bowater team relied heavily on Catawba for product testing, with visits from that mill's quality assurance group.

Currently, the No. 4 paper machine is running at Voith's guaranteed design speeds on the prescribed startup curve. On newsprint, this machine ran at a top speed of 3,300 fpm. The converted machine's design speed is 3,225 fpm on 40-lb and 2,720 fpm on 50-lb BowHybrid.

To support the need for brighter pulp, the bleach plant started up in mid-April, just prior to paper machine startup. Construction took less than 11 months from equipment award to commissioning of the new system. In addition to the bleach plant equipment, the mill also purchased a training package from Metso, which provided computer-based training as well as conventional classroom training for operations and maintenance. Since the crews already operated the existing bleach plant, they were somewhat familiar with the new process, so training was not as intense as that for the No. 4 paper machine. According to Litzenberg, the plant is meeting expectations on capacity and brightness and is now in the optimization phase.

Introducing the new product

To introduce and sell the new hybrid freesheet product, Bowater used traditional avenues such as press releases and print ads, but its most successful tactic has been a "sell-the-sellers" approach, says Colwell. With this approach, marketing and sales joined forces to target key customers.

"On sales visits, we took marketing representatives in addition to those in sales to provide more emphasis than a traditional sales call, and our goals were to position the product family and to introduce its unique characteristics," Colwell describes. "We trained key people for the sell-the-seller approach, and we tracked questions and interest for each call, adjusting our approach incrementally."

"We're finding that customers are less concerned about the sheet's technical makeup and more concerned about how it looks, feels, and performs," says William Morris (far right), senior vice president, shown here with (l-r) marketing director Jim Colwell; vice president Daniel Haight; and No. 4 paper machine superintendent Dan Muller.

Within three weeks of startup, Bowater had printed samples in the hands of its sales force.

"We have found that offering a unique product makes customers like doing business with us better because they have more options as their business needs change," Colwell describes. "From a sales and marketing standpoint, offering that flexibility has been our focus because we cannot always predict what direction customers will move next."

Gaining momentum

Further pressroom trials verified the customer benefits of the BowHybrid sheet, and Bowater has been pleased with its performance.

"We are tremendously satisfied with the product," Morris comments. "BowHybrid is unique in that, even at lower basis weights, it performs well in demanding post-press finishing and converting direct mail applications."

By using TMP, BowHybrid requires less fiber, making it more environmentally sound than freesheet, but Bowater could further enhance this quality by adding de-inked pulp.

"I think it's fair to say we would look at a recycled version because some customers ask for it," says Colwell, "but that's down the road."

With the No. 4 paper machine at full capacity, the mill will produce 65% specialties and 35% newsprint. Is there any chance there will be more conversions from newsprint at Calhoun?

"With five different pulp furnishes including kraft, TMP, and recycled fiber, as well as its strong paper-making culture, Calhoun is one of Bowater's sites that is well-positioned to develop new products for our customers' future requirements," says Morris. P&P