By **MONICA SHAW,** Editor

Charting a specialties course

A press rebuild on Glatfelter's No. 7 paper machine at Spring Grove, Pa., allows the flexibility to produce a variety of specialty grades and respond more quickly to customers

Many North American mills are familiar with the struggle between strategic goals and available capital as they try to chart a more specialized course for their products. At Glatfelter's Spring Grove, Pa., mill, spending in the early 1990s was heavily focused on environmental projects, including a $160-million pulp mill upgrade. While necessary to meet regulations, this outlay delayed major projects on the paper machines, including a press upgrade for the No. 7 paper machine.

Installed in 1956, the No. 7 paper machine had benefited from previous headbox and former projects, but the original four-nip press had been in need of major upgrades since the early 1990s. The machine primarily produces envelope, greeting card, digital printing grades, labeling, and other specialty products.

By 2002, Glatfelter was able to seriously explore replacement of the press with shoe press technology. According to Dan Fuhrman, senior project engineer at Spring Grove, there were three reasons that solidified the need for investment.

"First of all, we had done everything we could to extend press life, and we wanted to modernize and to improve product quality," Fuhrman describes. "Secondly, to be the global supplier of choice for specialty papers and engineered products, we needed the flexibility to make multiple, customer-specific products. Finally, we wanted to improve profitability through cost reduction, quality improvement, and revenue enhancement."

Glatfelter's new Metso press section and auxiliary equipment were installed in June 2006. Since that time, the No. 7 paper machine has been successfully progressing along its learning curve and has met the goal of improving machine flexibility while maintaining or improving sheet quality. Also, the paper machine is now faster and uses less steam, among other achievements.

Members of the Glatfelter rebuild team included (l-r) Petteri Halme, paper technology manager (Metso); Dan Fuhrman, senior project engineer; Mike Bortner, No. 7 paper machine assistant superintendent; Eric Hanson, paper division superintendent; David Bross, electrical engineer; and Kimmo Hirvonen, senior project manager (Metso).

Bottleneck limits business

The No. 7 paper machine received various upgrades over the years as capital became available. In 1988, a new Valmet fourdrinier and an Escher-Wyss headbox were installed. Also, the machine received a Valmet MB SymFormer top wire former in 2000, while the headbox was retrofitted with GL&V dilution profiling in 2004. Other paper machine features include a pond size press, 47 pre-size dryers, 16 after-size dryers, and an eight-roll calender stack.

Still, the original Rice Barton four-nip press (suction transfer, suction first press, inverse suction second press, smoothing press) was in dire need of replacement due to deteriorating condition and performance limitations.

"The press made a smooth, uniform side-to-side sheet, but at very low press solids, running in the range of 35%," explains Eric Hanson, paper division superintendent. "Therefore, it limited our capability to either push capacity or to grow new markets like heavyweight grades, because we physically could not dry the sheet or run fast enough to produce quality product. We only had the ability to run 75% of our headbox production rate on a good day, and we were really limited in our basis weight to less than 125 lb."

Selecting a flexible design

While 2002 was the beginning of Glatfelter's most recent move to upgrade the No. 7 paper machine press section, the mill had considered the idea as far back as the late 1980s when only a conventional press was feasible. Fuhrman says he is glad the mill waited for technology advancements.

"Honestly, I am glad we spent capital in the pulp mill, because the delay allowed time for shoe press technology to develop and move into fine papers," says Fuhrman. "The shoe press could provide a lower manufacturing cost and better flexibility than a conventional roll press."

The shoe press was the technological way to go, but a single shoe press would not provide the flexibility to make a wide breadth of products, as highlighted in press trials on Metso's pilot machine in Jyväskylä, Finland, in 2002. A combination press appeared to suit mill needs, but the project was delayed until 2004.

In December 2004 a class 10 capital estimate for the project was completed. After entertaining competitive bids, Glatfelter awarded Metso a contract in April 2005 to supply major equipment for the project.

"We've had good experience in past projects with Metso, not only with the equipment but with service, and that relationship, combined with the 2002 pilot work, helped us make the decision," says Fuhrman.

Glatfelter chose Metso's Combi-Press design that includes the following major components:

- Suction pick-up/first press
- SymBelt (shoe) second press
- SymRoll crown compensating roll for bottom position of third press and a top roll with a PressGem ceramic cover

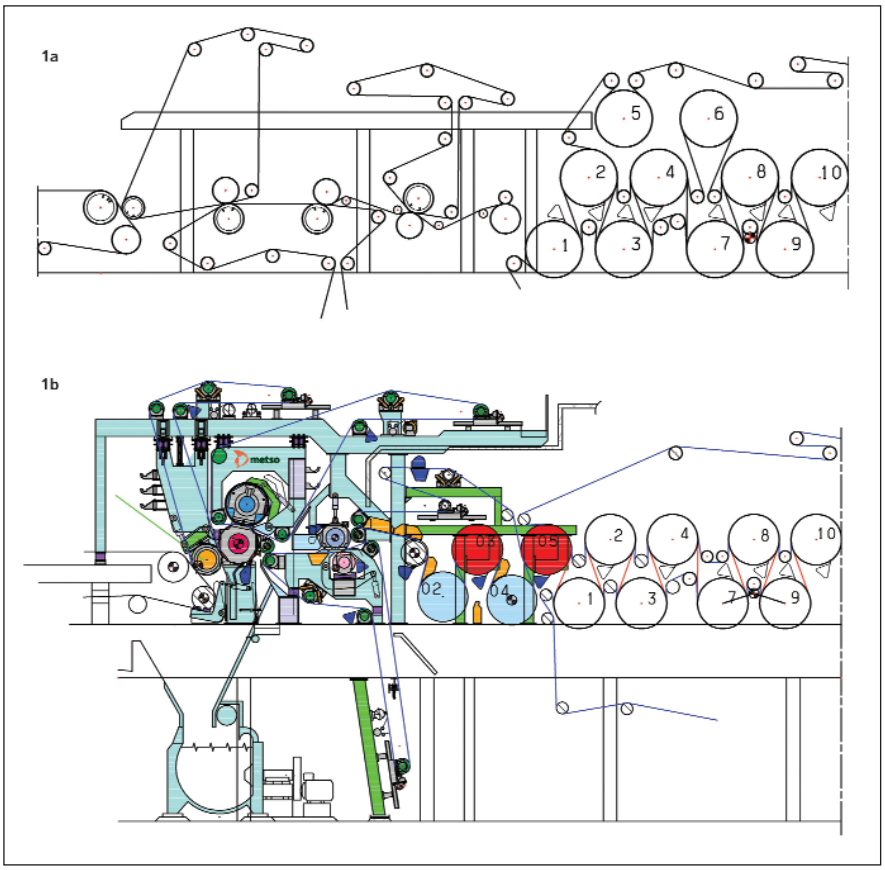
As Hanson describes the press section design: "The wire side of the sheet is against the smooth roll in the first two nips, so you would get a very smooth wire side and a rough felt side. To even the side-to-side, we needed a third press, which basically functions as a lightly loaded, felted smoothing press, to achieve uniform two-sidedness."

To fill the 15 ft-20 ft of space left over from the original press, a UnoRun dryer section of four cans was necessary. This section includes two unheated UnoRolls in the bottom positions and two heated dryers in the top positions, as well as Deublin steam joints and stationary siphons. The drying capacity was not needed and Hanson describes them as "strictly carrier rolls."

For press and dryer section runnability, air systems were also part of the order. This equipment included a press nip blow box prior to the third press and two press run blow boxes after it. Fuhrman says these were necessary to minimize sheet blowing because

FIGURE 1a-b.

Schematic of the No. 7 paper machine's press section before (1a) and after (1b) the rebuild



the sheet would be so dry after the shoe press. Two UnoRun blow boxes and one UnoRun ventilator were also part of the air systems component, as well as a pulper exhaust system, fans and ductwork, and a dryer hood extension.

Glatfelter ordered an OptiCleaner dryer fabric cleaning system because of a prior positive experience with a similar system on another machine. The system is a high-pressure water shower that also utilizes steam. "It offered flexibility to differentiate similar grades where felt cleanliness is a premium," Hanson describes.

A combined couch/press OptiSlush pulper vat and agitator were ordered to replace the existing tile chest and pulper agitator. A PLC-based machine control system was included in the order as were training, installation, and startup assistance. Glatfelter also increased the vacuum system capacity to meet the requirements of the new press components.

Control system upgrades allow the mill to diagnose press problems "within seconds," says Hanson (left), shown with Fuhrman.

equipment

Glatfelter's Spring Grove mill at a glance

Glatfelter's Spring Grove, Pa., mill began operations in 1864 manufacturing newsprint, but production today is focused on specialty papers and engineered products, including book, digital printing, graphics applications, signage, labeling, and envelopes.

Spring Grove is an integrated kraft mill. The facility is ISO 9001 and 14001 certified and includes the following equipment:

- 1 continuous Kamyr digester (pine), 9 batch digesters (hardwood)
- O_2 delignification on both fiber lines with GL&V compaction baffle washers
- D/EP/D bleaching sequence
- 1 Dorr-Oliver fluidized bed calciner
- 1 Ahlstrom recovery boiler
- 5 paper machines (Nos. 1, 2, 5, 7, and 8)
- 1 Rice Barton/BTG blade coater, 1 Black-Clawson gravure coater
- 1 Lamb-Pasaban high-speed precision sheeter
- Co-generating power facilities – coal and wood waste fueled

In with the new

A core team from Glatfelter worked closely with Metso and other contractors to plan the installation so that it took advantage of normally scheduled maintenance outages, with the main installation planned for an aggressive 21-day outage in June 2006.

"We took full advantage of our maintenance outages, and that took a lot of coordination between Operations and Engineering to not only perform regular maintenance but to begin project prep work," says Fuhrman.

Dynamic vibration testing and modeling of the existing machine foundations and structural steel with the new loading was completed as part of detailed engineering, which lasted through April. The existing structures were found to be adequate to support the new press section.

Preliminary construction began in December 2005 with changes to the machine vacuum system. This effort was necessary to allow vacuum pumps in the basement and on the mezzanine level to be demolished or relocated, as well as installation of air system fans and hydraulic systems, prior to the main machine outage in June.

Glatfelter began an internal training program for the machine crews in January 2006 that continued through May. This training was beneficial for familiarizing the crews with the new equipment and process prior to Metso's training in June.

In February 2006, project team members visited Metso's factory in Jyväskylä, Finland, to inspect press equipment prior to shipment. Glatfelter also employed a construction contractor, Aycock, to make the trip for the purpose of construction advisement during installation

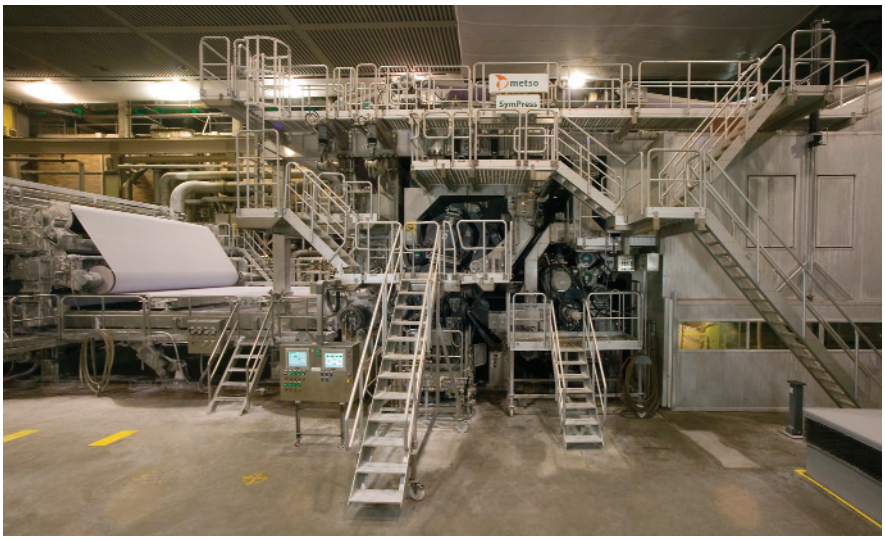
planning. With two internal engineering staff members on the project, Fuhrman says the contractor was critical, especially when juggling both the project and a scheduled mill maintenance outage, which overall "took more internal resources than anticipated." Additional engineering staff was utilized as design was completed and construction began.

"Because of the coordination that the project would involve, we knew a general contractor with direct responsibility for the piping and the electrical as well as the equipment installation was going to be a big benefit," explains Fuhrman.

In addition to contractor personnel, Metso ramped up to about 18 people for the installation and startup phase of the project, sending experts from Finland. "Their team was about the best I've worked with, both in terms of quantity and quality," Fuhrman notes.

The second phase of preliminary construction began in April with installation of hydraulic and lubrication systems targeted for completion before the June outage. A roof opening with a removable cover directly over the press section was installed in May to allow removal of old equipment. Because the new center roll weighed 30 tons, one of three existing machine room cranes was upgraded for additional capacity at that time.

Because the Combi-Press was much more compact than the original section, a UnoRun dryer section of four cans was added after the press, along with a hood extension.



"We actually staged 80% to 90% of the major press components on the floor prior to beginning the outage, bringing them in from street level," says Fuhrman.

The main 24/7 installation phase began as planned on June 5, one week prior to the mill's annual one-week shutdown, with demolition of the old press and pulper chest. Aycock was hired as general contractor and had direct responsibility for all equipment installation, while piping and electrical work was subcontracted.

Two areas of concern during the planning phase had been the condition of the machine ➤

personnel

Building operator confidence

Glatfelter's No. 7 paper machine at Spring Grove, Pa., operates 24/7. To familiarize operators with the new press section, operator training began months in advance of the June 2006 startup.

Formal training by Metso was part of the rebuild package, but internal training began in January 2006 using supplier functional descriptions of the equipment to create general startup procedures. Then, as the mill's automation group worked with Metso to develop displays that Spring, operators were further familiarized with equipment terminology and function.

As the new equipment arrived on the floor in May, operators were able to gain visual familiarity with it. Next came formal training by Metso, which took place prior to and during the June outage. At startup, the operators were well prepared, according to Eric Hanson, paper division superintendent.

"There is a psychological aspect to making paper, and while the operators were nervous, they weren't dealing with a blank slate thanks to months of preparation," Hanson says. "Now that they've gained hands-on experience with the equipment, they are very comfortable with the press. The crews have done an outstanding job running the new press. Their efforts have resulted in new production records along with additional machine flexibility."

Despite the level of comfort, Glatfelter continues to push the No. 7 paper machine as work crews traverse the learning curve.

"We've already increased machine speed 10% and I am confident that our team can get additional production," says Hanson. "It's a matter of building confidence in our crews. We've asked a lot of them already because we are on a steep, steep learning curve, so we try to let them catch their breath before we hit the accelerator again."

sole plates, which were to be left in place, and the time required to demolish the pulper chest. Other than a few areas void of grout, which were drilled and grouted, the sole plates were in good condition. New sole plates were installed as planned over top of the existing plates. The demolition of the pulper chest, requiring eight shifts, consisted of saw cutting the tile and concrete walls into manageable slabs in order to lift them from the building.

The old equipment was removed through the roof by a hydraulic truck crane, while new equipment was brought in from street level and installed with machine room cranes.

"The roof hatch helped create a nice flow, without bottlenecks, for removing the old and installing the new," Fuhrman describes.

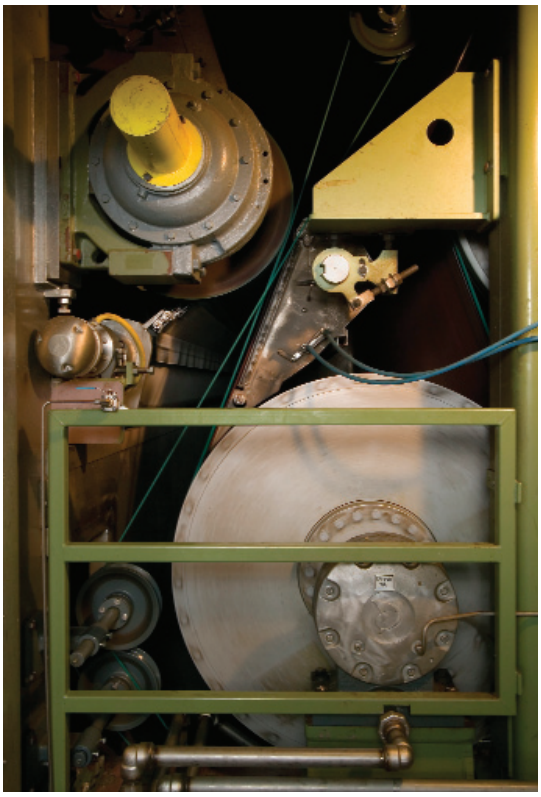
"The Combi-Press is great for runnability because it is so compact, but the downside is that you have lots of tubing and large ductwork in a small space," adds Fuhrman. "We'd have a pipe fitter, electrician, and millwright standing in line to work on one spot and people working above each other, but safety performance was very good."

When major press, dryer, and pulper equipment installations were complete, the final step was installation of the SymBelt roll on June 22. The sleeve was installed on the SymBelt roll on June 23. However with 11,000 ft of hydraulic and lubrication tubing and 8,000 ft of piping to install, startup was still several days away. All systems were ready, and functional testing was complete by June 30.

Taking control

While the No. 7 press section design was critical to meeting Glatfelter's goals, Hanson is quick to point out the importance of the control system upgrades supporting the new

Runnability in the new dryer section is good due to air system changes like this UnoRun blow box.



equipment. The system was part of the Metso package and featured a variety of PLC-based upgrades and DCS changes.

From functional descriptions provided by Metso, Glatfelter's process automation group programmed control loops and generated display screens. Then, Metso Automation came in on several occasions prior to startup, adding detail to the basis built by the mill group and helping to build in diagnostic and help capabilities. This partnership has been critical to the success of the project, according to Hanson.

"Operating the press is the easy part, but it has a tremendous number of interlocks that would be very difficult to troubleshoot without the control work that was done," Hanson describes. "We spent extra there, but it was worth it, because you can find problems within seconds."

Successful startup, operations

Paper was on the reel of the No. 7 paper machine on June 30, with the first official day of production on July 1. The installation and startup had taken 25 days, one day longer than planned in terms of quality paper production, but given the complexity of the project and the congested installation areas, the Glatfelter team was pleased, and Fuhrman says it may have benefited the mill in the long run.

"That extra time allowed us to do a really good job, so we didn't have to go back and tweak many things," Fuhrman describes. "The press runs very, very well, and I think the extra time was worth it."

Fuhrman also attributes the ability to achieve the normal production rate the following day to the extra installation time. For the next three weeks, the mill focused on making the four key performance grades guaranteed by Metso, and then began switching grades and basis weights even more frequently, in line with the machine's daily changeoff schedule. The aggressiveness soon exposed a problem with the drives, which were not upgraded due to budgetary reasons. Vibration was noted at certain speeds and basis weights, causing bolts on the couplings to break.

"We were trying to tune new 2006 motors with 1990 drives, and this revealed that we needed to upgrade the control boards in the drives, which was accomplished during our August shutdown," Hanson explains. "Our drives improved significantly in the press and fourdrinier, and we've had a lot more stability there since August than we had previously."

Glatfelter runs the first press at nip pressures as low as 200 pli, while the second (shoe) press runs from 2,200 pli to 4,300 pli, depending on the application. The third press runs as

low as 190 pli. During the first weeks of production, the mill ran into some issues with the ceramic top roll on the third press.

"We tried to generate as much bulk as possible and took the first press and shoe press nips off the pressure curve, resulting in jamming on the center roll doctor blade and poor runnability," describes Hanson. "We found it was not mechanical, but a matter of center roll filling, which we had not expected issues with so quickly. We were then able to address it with abrasive doctoring."

Overall, Hanson describes the startup as good one. "It may have been tough at first as we pushed the machine, but it has really helped us in the long term," he notes.

Reaping rewards

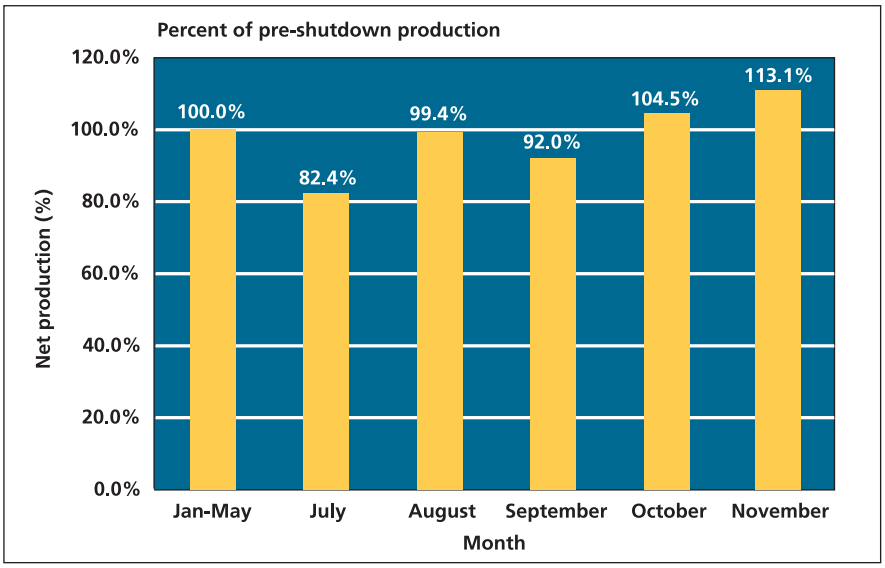
Key objectives of the project were to increase machine flexibility while maintaining quality, which Fuhrman and Hanson agree were met. In addition, the project was expected to deliver cost saving opportunities along with a strategic capacity increase that could together boost profitability. All objectives were in support of Glatfelter's vision to be the global supplier of choice for specialty papers and engineered products.

Results since startup are summarized as follows:

- Sustained paper quality on the key production grades
- Produced papers ranging in basis weight from 45-lb to 150-lb/3,300 ft^2
- Raised press solids by an average of 12%, attaining up to 47.5% as stipulated in performance guarantees
- Reduced steam usage by an average of 40% while increasing machine speed by 8%
- Achieved operating downtime below pre-rebuild levels
- Reduced machine draw by 30%
- Reduced tensile ratio by 17%
- Higher speeds have resulted in improved sheet formation by 10%-25% as measured by MD video formation
- Attained equal side-to-side sheet smoothness
- Demonstrated the ability to improve total sheet smoothness
- Produced heavyweight greeting card grade at 40% lower steam, 19% higher machine speed, and maintained bulk
- Achieved a machine clothing life equal to or superior to pre-rebuild life

FIGURE 2.

Production is now above pre-rebuild levels.



The shoe press sleeve has produced "absolutely no marking," says Hanson, and he attributes this to the low open area and low void volume design. Rather than a more open design for the heaviest basis weight, it is more closed to suit the majority of products. However, at higher basis weights, there is a lot of nip rejection, so the mill will perform a nip scan evaluation at the next downtime to determine if sleeve adjustments are necessary. In addition, the mill is working with suppliers to modify wet felt designs.

The third press runs well, reports Hanson, and the mill hopes to drive improved smoothness with it in addition to uniform side-to-side properties.

As for the new dryer section, Hanson reports that runnability has been excellent – so much so that Operations is ready to convert the remaining first section dryers to UnoRun design. "You know where the end of the UnoRun is and the conventional two-tiered dryers begin, because that's where we have dryer breaks," he notes.

On the eight-roll calender stack, Glatfelter has been able to drop between two to five rolls of calendering. "We're now much smoother out of the press than before, so we have much more flexibility in calendering to make a very smooth sheet when necessary," Hanson explains.

Also, with the steam savings, the mill has the ability to increase electrical power generation and sales.

For the future, Hanson says one major bottleneck for the No. 7 production line is delivering enough stock to the paper machine to further increase speed. Also, the pond size press, performance of dry end pulpers during a break, and handling paper volume at the winder will be challenges, but "none of these are insurmountable," Hanson claims. P&P