As an experienced engineer, an inquiring mindset drives Pierre Thériault, Capital Project Manager at Cascades Containerboard Packaging (formerly known as Norampac), and his team to perform at the highest level. And as one of Canada’s leading corrugated packaging producers and the sixth largest in terms of total capacity in North America, Cascades Containerboard Packaging is producing results.

One of the company’s four strategic priorities is modernization of core operations through strategic investments, and the recent $26 million new corrugator line at its Drummondville, Quebec plant is evidence of solid progress in this area. The latest addition is a 110-inch BHS Speed Line corrugator with a design speed of 1500 ft per minute supported by an advanced corrugator steam system. Says Thériault, “We wanted a steam system with enough sophistication and flexibility to run at the high speeds of the new corrugator.”

As production line speeds cross the 800 ft per minute threshold, traditional corrugator steam and condensate systems utilizing steam traps begin showing their limitations. This is...
especially noticeable when condensate behavior inside the roll changes from cascading to rimming. When this occurs, the heat transfer coefficient drops nearly 90% and the average roll surface temperature by one-half. The insulation effect of rimming condensate significantly limits the heat energy inside the roll from being transferred through the roll to the medium and the liner prior to bonding.

Technologies developed for heat transfer applications on paper machines are being reconfigured and optimized for corrugators. These technological advances, utilizing novel concepts such as recirculating steam jet thermocompressors, axial Turbulator® bars installed inside centrally-heated rolls, and rigid syphons to rapidly evacuate condensate using blow-through steam control, are showing meaningful results and addressing some of the more critical challenges found with higher speed corrugating.

The ThermoMax steam system at the Drummondville plant incorporates all of these elements using a PLC-based system and modern interface. According to Thériault, “The ThermoMax software and graphics make it easy to know the complete picture and details. In just seconds, operators decide upon an action to take, if necessary. Or simply compare with our own history. Confidence to leave things alone or fine-tune comes from certainty. “If we need to change the steam pressure, depending on speed, for example, adjustments happen very quickly,” he continues. “When we want to speed up, the ‘Speed Track’ feature manages it, which is ideal. Heat transfer through the roll and to the medium and liner is critical, especially for the glue application we need to control. The time of the bond is milliseconds
and at higher speeds, bonding becomes even more of a challenge using conventional systems. Typical problems, including fluff outs and blisters, are virtually eliminated. With the Kadant ThermoMax steam system everything is more consistent and start-up is fast.”

Because centrally-heated rolls, also known as plain-shell rolls, go into and out of rimming depending on the condensing load, roll speed, and several other variables, operators typically adjust machine speed to compensate for the resulting heat transfer instabilities. The ThermoMax steam system eliminates the instability and ensures maximum and reliable heat transfer regardless of the board combination being produced.

Adds Guillaume Perigny, Systems Development Manager with Kadant, “Cascades now automatically controls the differential steam pressure and blow-through steam flow across certain rolls. The resulting highest possible heat transfer and temperature uniformity assures higher reliability and less maintenance than any conventional steam trap system. Best of all, operators see the system operating in real time and so do we using a remote connection for support if required. Remote access and trending capability can lead to quick resolution of problems, minimizing lost time and production.”

To ensure the rolls are consistently transferring the required heat, the condensate depth inside the roll is controlled using a rigid stationary syphon and blow-through steam flow control. Properly controlled condensate depth maximizes the performance of the Turbulator bars so that roll surface temperatures are consistent and maximized across all weights produced, regardless of the line speed.

According to Mike Soucy, Vice President Systems Technologies at Kadant Johnson, “Carefully sized orifices are used to manage the blow-through steam flow from each roll, and thermocompressors are used to recompress the blow-through steam so it is recirculated into the steam system. Knowledge of the syphon flow characteristics and condensate behavior is highly valuable in closed-loop system design and something most corrugator steam system designers overlook or do not have access to.”

Escaping Old Traps

Having no steam traps removes the mystery of finding a faulty trap, which used to be time-consuming and costly for the Drummondville team.

“With traps you know they will fail eventually,” comments Line Lambert, who heads up maintenance at the Drummondville plant. “Before, it was always a challenge to find the one that failed. While we hunted for the problem, we were consuming more steam and creating serious issues elsewhere. Having no steam traps rids us of persistent operational problems and maintenance costs.”

What does the steam system do best?

Distributing steam efficiently to each steam-heated component of the corrugator line for rapid startup, fast response to weight changes, and consistent heat transfer with a high degree of visibility into the system operation are the core capabilities of the system.

The ThermoMax system is a fully-automated steam system providing reliable and maximum heat to liner and medium at speeds from 250 to 2500 fpm. The PLC-based system controls differential steam pressure and blow-through steam across each roll to achieve the highest possible heat transfer and temperature uniformity across the roll, with high reliability and performance. The graphical interface of the system allows operators to quickly diagnose any set-point deviations and most issues are resolved without operator intervention.

NEXT GENERATION SYPHONS AND ROTARY JOINTS MEAN LESS MAINTENANCE, BECAUSE SYPHON PIPE FAILURES ARE ELIMINATED.
“The Kadant system is less expensive to operate than the old trap system because we were continuously chasing failed traps that were venting steam and over-pressurizing our high-pressure receiver. Lower energy costs are not proven yet, but I expect this to be the case,” says Thériault.

The corrugator’s hot plate section is divided into three control zones, each equipped with a pressure control loop on the steam supply. Each zone also has a Kadant Johnson Liqui-Mover® condensate pump returning condensate to the high-pressure receiver eliminating all steam traps from the condensate return system and the need for a low-pressure condensate return line to the boiler room.

As part of the project scope, a Kadant-supplied PLC control system was included with the corrugating line and provides high visibility into the steam system operation. Supervisory logic is included to manage the system at the most efficient operating point. The logic optimizes heat transfer for improved bonding, extends the system range, and improves the overall energy efficiency of the system. In addition, Cascades chose to include the boiler room in the PLC system to provide high visibility of the deaerator and high-pressure receiver, including associated pumps.

**Steam System Training**

Kadant Johnson provided steam system training for Cascades’ operating personnel so they could quickly ramp up to proper and efficient operation.

Thériault places a high value on properly trained and able operators who can identify and promptly address problems impacting production or efficiency. “Trained people recognize when a system is working well and when something goes wrong. This system gives the personnel the ability to see and understand how the system works with simple screens and values. Experienced maintenance personnel can use the screens and history to troubleshoot and see what happened up to a couple of days before. When the team can rapidly restore full optimization, we’re all ahead — including our customers.”

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