



Curbing energy costs through a blower system rebuild

TEXT Kari U Kokkonen

More than 50% of all paper machines suffer from poor vacuum system operating efficiency due to the traditional design of vacuum systems and slow development of felts. By rebuilding the blower system of its PM N9, Hokuetsu Kishu Paper's Niigata mill was able to achieve about 900 kW savings in its electric power requirements.

Papermakers have lately started to pay more and more attention to the energy consumption and operating costs of their paper production lines due to rising energy prices.

One of the places where efficiency losses often take place on a paper machine is the vacuum system. Many mills have successfully carried out liquid ring pump (LRP) system rebuilds in cooperation with Metso, and related payback times have been relatively short. However, not only LRP systems but also blower systems can drift out of their optimal operating ranges as operating conditions change, especially at felt conditioning. Vacuum system dimensioning values that were just right at the engineering stage may have become outdated over time.

Metso has screened the vacuum system efficiencies of more than 80 paper machines. The clear conclusion from this work is that over 50% of all paper machines suffer from poor vacuum system operating efficiency.

A desktop study revealed efficiency losses

One of the many mills looking for ways to lower its energy consumption is Hokuetsu Kishu Paper Niigata in Japan. Its PM N9 is a 10.7-meter-wide Metso OptiConcept paper machine that started up in 2008.

Metso carried out a desktop study of PM N9's vacuum system to investigate related potential for energy savings. Efficiency losses were estimated theoretically at this stage using available DCS printouts and PI diagrams. This study showed that efficiency losses were approaching 1 MW. The main reason for these losses was the same as at many other mills, namely felt conditioning. Because modern dewatering

Hokuetsu Kishu Paper PM N9
Grade: Woodfree coated paper
Basis weight: 68 g/m²
Design speed: 1,600 m/min
Trim width: 9,800 mm

The men behind the vacuum system rebuild (left to right): **Katsumi Tanimoto** (Metso), **Masakazu Okajima** (Hokuetsu Kishu Paper), **Daisuke Fujishiro** (Hokuetsu Kishu Paper), **Gabriel Franci** (MAN Diesel & Turbo Schweiz), **Christian Kolb** (MAN Diesel & Turbo Schweiz), **Arto Heikkinen** (Metso), and **Kei Iwanaga** (Metso). Missing from the picture is **Tuomo Saikkonen**, who was the project manager for Metso.

takes place in nips, felt selection and the conditioning of felts need to be rethought.

Pre-engineering verified the estimates

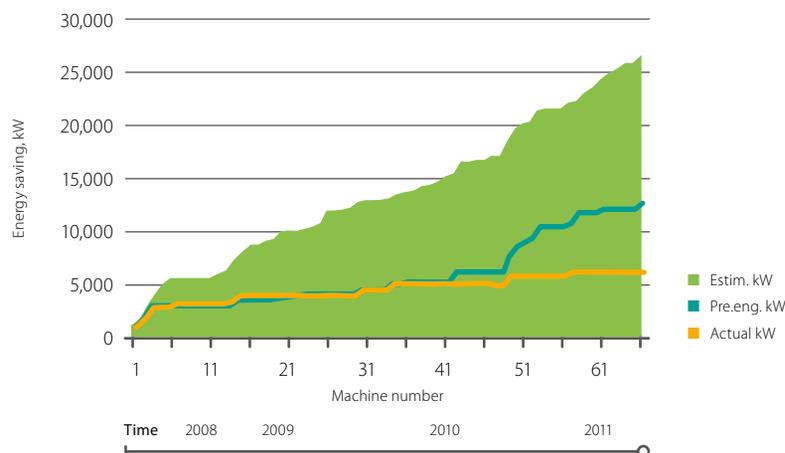
Based on the findings of the desktop study, Metso carried out the pre-engineering of the vacuum system in cooperation with Hokuetsu Kishu Paper and the blower supplier MAN Diesel & Turbo Schweiz.

Theoretical estimations were verified through measurements at the mill. The pre-engineering work included airflow measurements at the machine, verification of efficiency losses and motor loads, as well as comparison of airflows and vacuum requirements against blower characteristics. Recommendations for the required piping and blower modifications were also provided. Based on the results, Metso recommended a rebuild of the vacuum system.

Rebuild – part of an energy savings program

“The target for the blower system rebuild was to save energy by reducing electricity consumption,” says **Daisuke Fujishiro**, Production Engineer, Hokuetsu Kishu Paper. “About two years had passed since the start-up of PM N9, and its operation was stable. We listed up low-efficiency equipment whose actual energy consumption differed from our original estimations, and made a new plan for saving energy. The blower system was one of the most significant items on that list as its electricity consumption is high.”

The rebuild was part of Hokuetsu Kishu Paper’s energy savings program and it was implemented in the course of a scheduled service shutdown in December 2011. It included piping modifications to stop one single-stage blower, speed reduction for a multi-stage blower, overhaul work on blowers, and modification of interlocks and controls in the Metso DNA automation system.



Screening results for potential energy savings available in paper machine vacuum systems.



Efficiency losses in vacuum level control.

Metso’s scope of supply covered all process engineering, as well as modifications to the machine controls and blower gearbox. The rebuild and consequent system start-up were carried out in cooperation with Hokuetsu Kishu Paper and MAN Diesel & Turbo Schweiz.

900 kW of energy saved

Once the rebuilt vacuum system of PM N9 was up and running, the improvement was plain to see. According to Daisuke Fujishiro, the difference in electricity consumption was obvious right after start-up. Electricity consumption was about 900 kW lower compared to the situation at the pre-engineering stage with the same paper machine speed and paper grade, which equates to about 400,000 euros per year.

The vacuums on PM N9 were at the required level, and it was even possible to operate the high-vacuum flatbox at a higher vacuum level than before the rebuild.

“During the first month we fine-tuned the operation of the system based on air flow changes and established the optimal way to operate,” Fujishiro adds.

The biggest benefit has been a notable reduction in energy consumption. “The results were exactly as we expected. Another benefit is that while we used to have two turbo blowers, we now use only one and have another one as back-up.”

A purposeful and attentive approach

Collaboration between Hokuetsu Kishu Paper and Metso was productive. “It was impressive to see how intently and attentively the Metso engineers worked during start-up. I found professionalism in their attitude,” says **Masakazu Okajima**, Planning Engineer, Hokuetsu Kishu Paper. “We had many issues that made us anxious about the project. However, we received good advice from Metso and quickly achieved our goal without any major difficulties.” □

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