

Energy savings through a new vacuum system concept

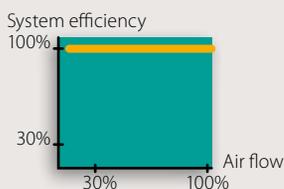
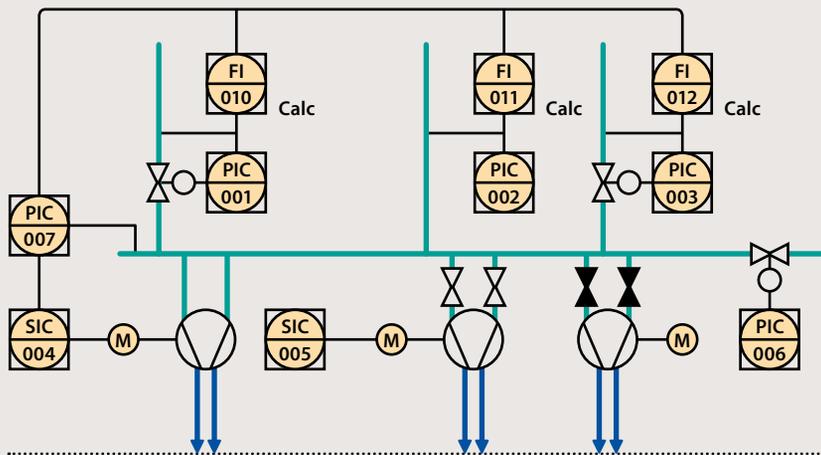
The main weakness of a traditionally designed liquid ring pump (LRP) vacuum system is its poor energy efficiency under varying operating conditions. The Burgo Verzuolo mill in Italy was able to radically improve the energy efficiency and controllability of its vacuum system in a recent rebuild of its PM 9.

TEXT Kari U Kokkonen

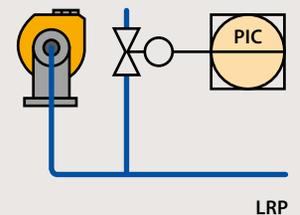
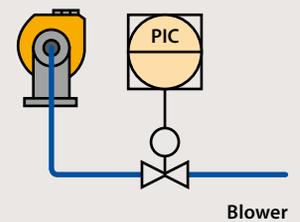
In 2009, Burgo Verzuolo and Metso signed a cooperation agreement with a target of improving the runnability of the OptiConcept LWC machine and ascertaining the potential for saving energy. Several process improvement studies were carried out, including a vacuum system energy efficiency survey.

The mill decided to rebuild PM 9's vacuum system in two stages. In the first, the vacuum controls and pump connec-

All in controls in MCS Pat.pend.



Metso's new vacuum system improvement concept (patent pending). Applicable on all vacuum systems with LRP pumps, regardless of machine supplier.



Efficiency losses in the PM vacuum system.



Satisfied start-up group after the successful vacuum system improvement. From the left: **Maurizio Vassallo** and **Enrico Crida**, Burgo Verzuolo; **Matti Huhta**, **Arto Poikonen** and **Diego Blua**, Metso; **Fabio Monge**, **Massimo Botta** and **Adriano Mina**, Burgo Verzuolo.

tions were modified. The second stage, featuring new variable speed drives, will take place later as the operation of the vacuum system must be followed for at least two felt life cycles in order to estimate the additional energy saving potential.

Immediate energy savings reached

The air flows from PM 9 were measured during the pre-engineering period, and the system efficiency losses were estimated to be over 1 MW.

In September 2010, the existing LRP system was modified according to Metso's

new vacuum system concept during a two-day shutdown. Metso was responsible for the process engineering, automation field equipment and DCS system software modifications, while the mill carried the responsibility for the piping materials and installation. Press section web threading was improved at the same time.

The results achieved through the rebuild were soon visible. Energy savings of 775 kW were achieved immediately, and, with further optimization, the overall savings can exceed 1 MW. The mill has also reported improvements in the controllability and stability of the vacuum system. □

LRP system modification at Burgo Verzuolo PM 9

Metso's scope: process engineering, automation field equipment and DCS system software modifications

Energy savings	775 kW
Potential after optimization	1 MW
Improved system controllability and stability	

Metso Felt Permeability - what is the new concept about?

Paper basis weight and pulp characteristics have a strong impact on the air permeability of the paper web. The required turndown ratio of the vacuum system can be as high as 1:2 on many machines.

Also, the requirements for felt conditioning have rapidly changed during recent years. Many mills with fast-running paper machines have turned off at least some of their Uhle boxes and operate them at a lower vacuum than originally designed. Fast-running machines also often use nip dewatering, which requires different kinds of felts.

Felt conditioning requirements.

Felt air permeability has a major impact on the vacuum system capacity requirements. In order to estimate these requirements in all operational conditions, it has been necessary to develop a correlation between felt air permeability in a laboratory environ-

ment (CFM) and in operation.

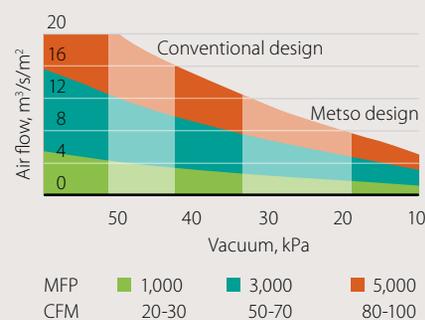
Metso calls felt air permeability in operational conditions MFP (Metso Felt Permeability). Traditionally, air flow requirements have been estimated based on the slot speed at the Uhle box, but the new MFP makes it possible to estimate vacuum requirements more accurately than before.

The main reason for efficiency losses in a PM vacuum system is the vacuum level control. In a conventional LRP system, the vacuum is controlled with bleed air, but equal losses can also occur in the blower systems when there is a lot of variation in the air flow from the PM.

In order to improve the vacuum system efficiency at varying operating conditions, the vacuum system concept and control philosophy can be updated with a new Metso vacuum concept that enables significant energy savings.

Many fast-running paper machines

have turned off at least some of their Uhle boxes and operate them at a lower vacuum than originally designed.



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