UNLOCK THE ENERGY POTENTIAL

A thorough review of drying strategy on a tissue machine can pay handsome dividends.

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Better drying performance should be a key target for all tissue producers. In times of rising energy costs and pressure on margins, the benefits of improved drying can make a tangible difference to a mill's fortunes. In developing TT Drying Optimisation for Energy Saving (TT DOES), we have investigated strategies for critical areas of the tissue machine which can contribute to greater efficiency and higher output if required.

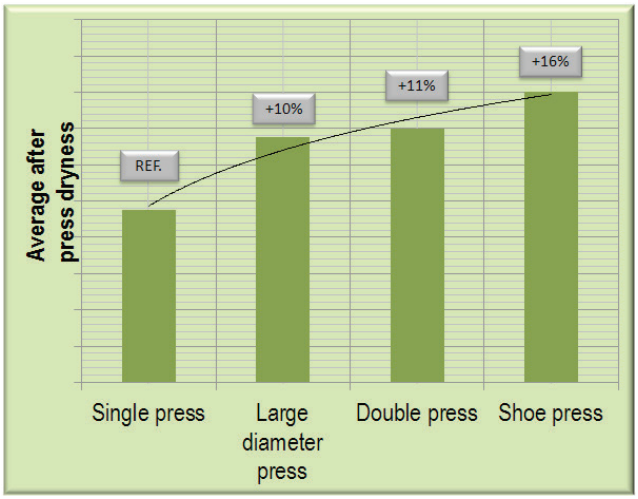
Our broad conclusion is that, depending on priorities, most tissue producers have the option either to increase output for the same or less specific energy input, or to maintain the same level of output but sensibly cut energy consumption. But most revealing is the technological approach that achieves these aims. The key components in drying are the yankee dryer and the hood, which are an inseparable team. Hood drying requires up to 30 percent more energy per Kg of water evaporated than Yankee drying, so as a starting point, it is in general beneficial to process maximising the drying potential of the Yankee, possibly by considering a larger diameter unit, and then specify the hood according to production priorities and local conditions especially in terms of available energy sources.

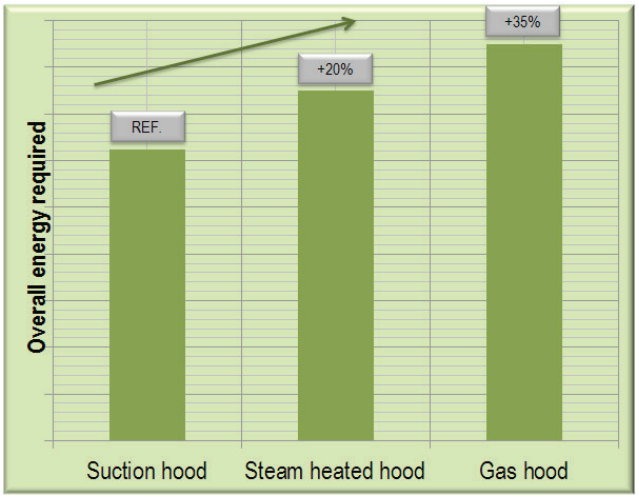
Yankee progress

We have established from long experience that the Steel Yankee Dryer (TT SYD) can deliver more heat with the same steam pressure inside than its cast iron counterpart.

Recent research has taken the TT SYD's performance to a higher plane, thanks to the design achievement of an optimum ratio of the height, width and pitch of the dryer's ribs as well as of the shell thickness which has increased the overall heat exchange capability at a given steam pressure, while strength and therefore safety is maintained or increased. Further factors to optimize Yankee performance include head insulation, which can reduce steam energy loss by up to 6 percent.

The shell integrated design, the selection of water-proof and





heat-resistant insulation panels, accompanied by stable containment of this insulation material, are essential factors to guarantee the maximum effectiveness of the head insulation. Given the optimum Steel Yankee Dryer, it is the hood which completes the picture in the drying section. Choice of hood is not straightforward, because there are many options.

Local energy availability and individual production requirements are critical parameters when specifying the hood, and the options need to be understood.

From a simple suction hood to gas-heated, the best solution will vary from mill to mill.

Gas is the most effective fuel for drying, although in some cases, steam is the only available source of heat. Gas hoods are now far less challenging than in the past, and the benefits

in terms of flexibility of capacity and overall efficiency make them an attractive proposition. Bear in mind also that it is easier with gas to keep the hood system clear of fibre build up than with steam.

The benchmark: recover the heat

The benchmark for all tissue making operations should be that it makes no sense to let the hood's exhaust simply heat the atmosphere. Heat recovery should be the starting point in planning any new tissue machine or rebuild, and it can be broken down into four main categories: R0, R1, R2 and R3. Establishing at the outset which of these categories applies to the mill in question helps to focus the heat recovery strategy.

R0 heat recovery is only applicable to a gas hood. In this case, the exhaust air from the hood is used to generate fresh steam via a recovery boiler, which delivers additional steam to the Yankee.

This solution has to be estimated with great care according to the hood specific working conditions.

R1 represents air-to-air heat exchange within the hood system, by which heated exhaust air is utilized to pre-heat the fresh air before the exhaust to the atmosphere occurs. R1 is the standard form of heat recovery which is utilized when working with a steam-heated hood.

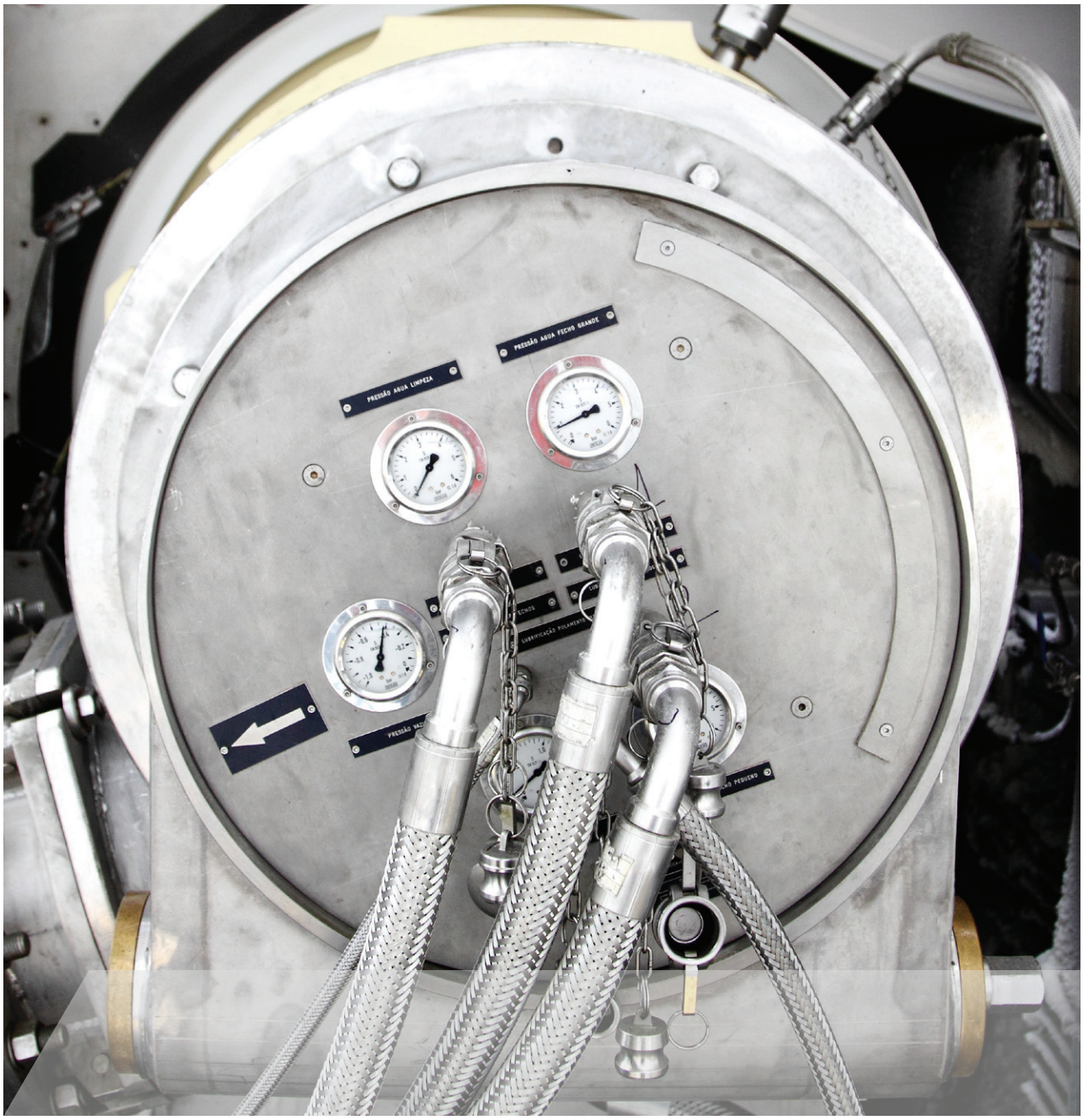
R2 and R3 are typically applicable to gas-heated hoods. R2 is normally based on an heat exchange air-to-water which contributes to hall heating and ventilation systems within the mill. This provides a way of heating buildings through recovered exhaust heat, although it is climate and season dependent. R3 heat recovery involves the installation of a heat exchanger which is used to heat process water. An example of its potential benefits, R3 could be used to keep process water at higher temperature levels to be used for dilution water, machine showers, approach flow circuit, and this could increase the machine's performance because of higher drying efficiency. Maintaining also the process water balance temperature at a certain level improve the final sheet formation.

Stability and balance

These four categories give a broad overview of the possibilities for heat recovery in tissue production, but the difference between good and excellent performance is all about stability and balance. Even using conventional equipment, it sometimes may be possible to increase overall energy efficiency by some points percent. Strategies to achieve this include optimising the balance between Yankee and hood drying, and between the contribution of the dry and wet ends of the hood. Stability of the process is another essential optimisation factor: achieving uniformity of dryness, with reduced peak-to-peak dryness variation in the sheet, allows the system to be set for higher overall dryness which requires less energy to maintain and will also result in less rejected paper.

One solution which is has also been applied is the gas or steam hybrid hood, in which the degree of heating contributed by the hood, and in different sections of the hood, can be easily varied, from zero (suction only) upwards.

Typically a hood will blow steam or gas-generated hot air in the wet end, while in the dry end, the hood's role is limited to suction. This is a good solution where energy reduction is a priority, with reasonable drying capacity, and in combination with proper heat recovery systems. Actually for reasons



mentioned, the best solution for energy efficiency is to dry with the Yankee alone with the hood just providing suction. But to respect a mill's needs both for energy efficiency and output, a hybrid solution can be ideal.

Finally the steam hood, can also use recovered heat in the form of condensate from the Yankee, just as the hood's exhaust air can heat incoming air, to keep efficiency at a high level.

The ideal balance between Yankee and hood will depend on the grade of tissue in question in terms of drying capacity. For low basis-weight products such as toilet and facial tissue, the wet-end-only heating concept is generally fine, where the dry end of the hood merely acts as an exhaust system, just keeping the air temperature high enough to avoid water droplets inside the hood.

You can even use this set up for heavier grades, if you are prepared to sacrifice some speed.

Other factors may affect efficiency in drying, such as hood cross nozzle box design, hood operating distance to the yankee surface, hood frame stability at temperature (up to 650°C). Continuous R&D developments are being evaluated in this regards to achieve better machine performances.

The role of the press section

Despite the importance of the Yankee dryer and hood, the contribution of press section should not be underestimated, nor indeed that of the headbox and former: the final result is always attributable in part to the nature of the pressing process, and the initial formation of the sheet. So we need to take a step backwards in the process to review the pre-dryer areas.

The headbox is where the cross direction profile is created, so factors such as turbulence and fiber build up need careful management and fine-tuning, as do the convergence angle on

the headbox slice and the free-jet length. It is all about optimum fiber distribution thru microturbolence and monitoring this factor is essential for efficiency, quality and runnability.
Extending the press section effectiveness can provide more consistent and higher dryness. Beyond the basic format of a single suction press, the options to increase dryness out of the press section include creating a double press, increasing the diameter of the suction press or ultimately utilizing a shoe press, which offers the greatest nip width of all.
Bear in mind that a 1 percent increase post-press dryness can lead to a reduction of overall drying energy consumption of up to 4 percent, so the press section is an important part of the drying picture.

In our experience, tissue manufacturers are becoming more interested in energy and quality rather than just out and out speed and capacity. It is more widely acknowledged today that it is better to run a tissue machine at lower speed and produce great quality with maximum efficiency, than operating at high speed but with less efficiency. It is net tonnes or actual output which matters rather than theoretical capacity. In this regard, speed itself can be a distraction, when it is overall efficiency that is the most important figure, as a measure of net energy consumed per tonne of product produced.
Whatever a tissue mill's circumstances and ambitions, the optimisation of drying performance is always an exercise which will pay back.

NEW MILLTECH YANKEE HOOD AND AIR SYSTEM FOR WEPA CASSINO TISSUE MILL

Lucca, 18th November 2013 - Milltech, the Lucca-based supplier of advanced solutions for drying to the tissue and paper industry, owned by Toscotec, started up a new SMART e^{MT} Yankee Hood complete with Air system and Heat Recovery, at Wepa Cassino tissue mill in August 2013. This investment allows Wepa to achieve significant improvements in production and consumption, while offering the best solution for a safe, quick installation within the existing machine.

The SMART e^{MT} Yankee Hood, designed in accordance with the best available technologies, uses multiple heat recovery stages to recover exhaust energy.
With this important new upgrade the Cassino mill can now optimize the production cycle and achieve a real improvement in paper quality, while decreasing energy consumption and environmental impact. Wepa Cassino is located in the Centre of Italy, close to Rome; it is part of Wepa Group - a leading company in tissue manufacture.
The mill is an important and modern facility, which is completely integrated with a 5,600 mm width tissue machine, converting lines and automatic storage system.
Its capacity is more than 60,000 t/year.

Milltech, which has formed part of the Toscotec Group since 2012, specializes in machine hoods, dust extraction systems, Yankee steam and condensate systems and energy recovery. Its main purpose is to maximize the use of modern technology to minimize energy consumption throughout the drying process.
Milltech's keen eye for customer service and expectations, is in the tradition of all Toscotec companies.

MILLTECH