Efficiency in the Dryer Section
Pocket ventilation offers great potential

Dear Papermakers!

Just recently the dryer section was the focus of one of our cases. This happens very often whenever energy savings are concerned because, as is well known, nearly 65% of total energy demand comes from drying: It is therefore imperative that, for example, air inflow and outflow are correct in the hood, a place where analysis can often highlight bottlenecks or areas for improvement. This is one measure among many that help papermakers not only to save costs, but also increase productivity which similarly relies heavily on a fine-tuned dryer section. Today we will get down to the details and focus on pocket ventilation: Anyone who approaches this correctly will reap considerable rewards.

My colleague Georgi Slawtschew from our TASK service department analyses dryer sections on a regular basis: **Typically a capacity and bottleneck analysis is prepared.** This is what we did for a long-standing customer, who produces newsprint (40-60 g/m^2) at 1,000 m/min. For a long time now the customer's machine has been regularly measured and successively optimised.

Lasting Improvement

On the basis of measurements made, we **recommended a step-by-step restructuring of the dryer section from conventional to Slalom**. This was tackled over the following few years; first the third, then the fourth dryer group (groups one and two were already running as a slalom). First

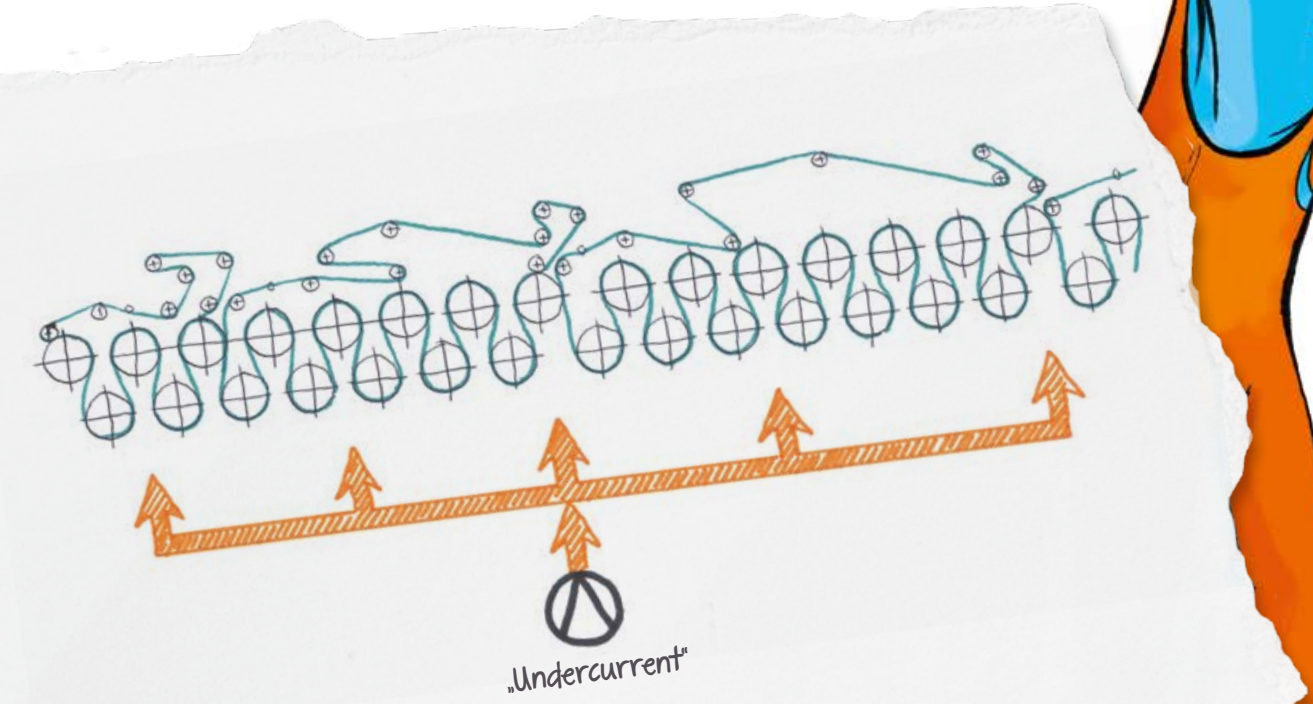

Fig. 1: Unfavourable – "undercurrent"

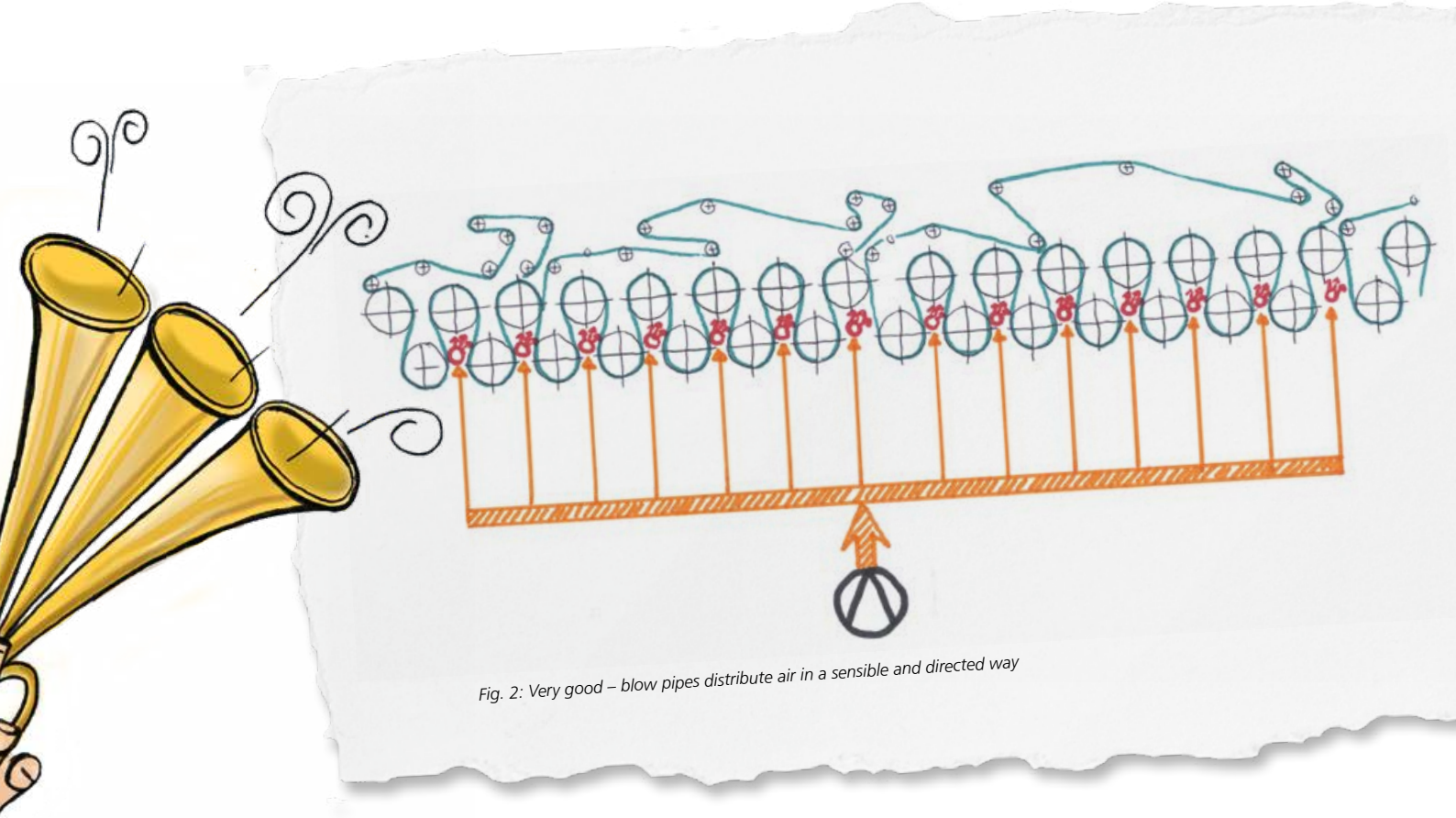

Fig. 2: Very good – blow pipes distribute air in a sensible and directed way

success: clearly improved runnability, visibly fewer sheet breaks – at the same production speed as before! Georgi summarises aptly: **"More productivity, more quality, more efficiency."** However, we had not quite reached the end of the optimisation plan as the air inflow was still directed into the basement as "undercurrent" (Fig. 1). This means it flows past the machine but does not contribute to the drying process.

Blow pipes showing the way

Consequently the drying performance was still not sufficient to be able to produce heavier grades (60 g/m²) at maximum speed. In this case the path to a solution was the use of blow pipes, **which significantly improved drying capacity**. Blow pipes are built into the cylinder pockets, which in many cases means higher productivity and energy savings per ton of paper at the same time – "one measure, two benefits", as Georgi emphasises. This was also the outcome with our local customer, though of course **all the optimisations should be considered as a whole** in this case. In total the Slalom conversions and blow pipe installations extended over a period of several years.

Airflow altered and improved

In the end all pockets were equipped with blow pipes (Fig. 2). Therefore the "undercurrent" no longer flows into the basement, where it is almost completely ineffective – on the contrary: From now on the air is directed where it is really needed **in order to remove the water vapour from the paper sheet as efficiently as possible**. The optimum blowpipe position in the cylinder pockets can be seen in figure 3. Ever since the air has been used in a more targeted way our customer has also been able to produce heavier grades at 1,000 m/min: **The productivity increase amounts to a very respectable 17%**, bearing in mind that installation costs were quite low. In summary this is a long term optimisation which brought the customer millions of Euros of additional turnover.

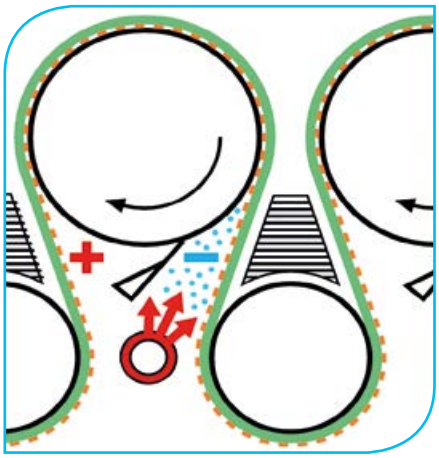

Fig. 3: Optimally placed blow pipe

Great effect

If we look at the details, the customer was able to use one less dryer fabric in the third dryer group and in addition **achieve clearly improved runnability** because (amongst other things) the number of sheet breaks was reduced. The same applies to the second part of the dryer section restructuring (fourth group). If you calculate additional turnover referred to above, it is in theory possible to **add some millions to the top line**. However, this is not always so straightforward, which is why calculations of economic efficiency vary considerably in practice: "The best way to approach this", Georgi makes clear, "is to **look at every machine for what it is: unique**." And, naturally, if every paper machine is different, the numbers will always be relative. Nevertheless, an increase in economic efficiency of 17% can be said to be an impressive argument on its own. A sample calculation "that can truly be regarded as a good example", says Georgi. →

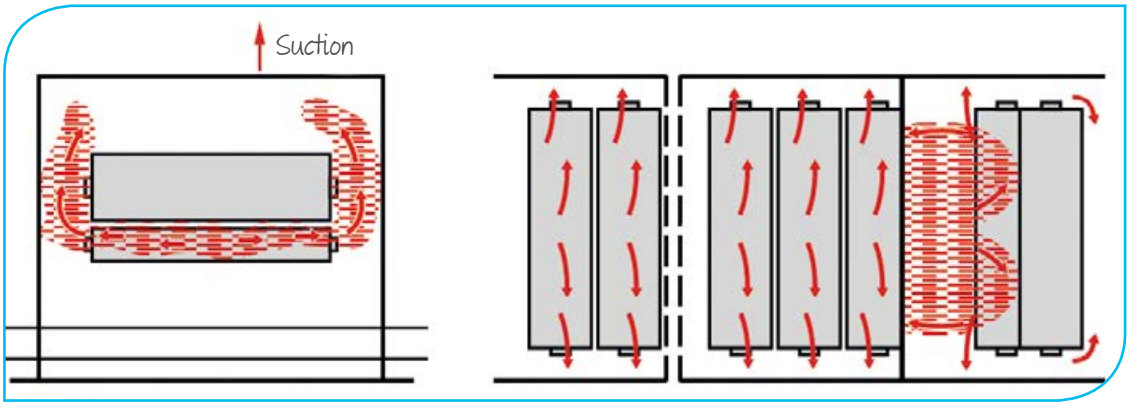

Fig. 4: Recommended air flow from the pockets

Using blow boxes

As a general principle we can state: **Slalom groups and optimal pocket ventilation are almost always beneficial.** Blow pipes are not always necessarily needed, as other techniques have been effective. In the case of slalom groups blow boxes, for example, are a sensible alternative: These are, like blow pipes, placed behind the doctor, so that the air in the pockets is distributed evenly – **from the middle of the machine to both front and drive side** (Fig. 4). An accumulation of moisture towards the machine centre is therefore avoided; the sheet is also better pressed to the dryer fabrics. And a stabilised sheet, as you well know, dear colleagues, **significantly and effectively reduces possible sheet fluttering**. Many practical benefits, one source: optimal pocket ventilation. A further example demonstrates why – as so often – uniformity is crucial.

Moisture: a most important detail

A customer sent for Georgi and myself in order to measure and evaluate the status of his pocket ventilation. Fig. 5 shows the TASK log including all relevant parameters. On this paper machine blow boxes were installed only in the pockets under cylinders 30, 33, 36, and 38. This gave an uneven result in terms of ventilation: In places where the pockets are ventilated **the absolute moisture is lowered by 38%** – a significant reduction. Looked at the other way round: The pockets that are not ventilated contain much more moisture. In conclusion: the blow boxes make it possible for **more water to be absorbed and transported away in these pockets**. This is as obvious as it is important if we compare Fig. 5 with a different machine configuration.

Uniformity as a benefit

The dryer group that you can see in Fig. 6 shows blow boxes in all pockets. Visible at first glance: **Everything is even.** Both the dry air and the dew point temperatures are very regular. As a result this also affects the water absorption capacity of the air in the pocket. This means in practice: **Air flow from the middle of the machine in all pockets towards both edges.** Furthermore, the lower moisture content of the air in all pockets leads to higher water take-up capacity: "In summary, **very effective removal of the evaporated water from all pockets**", as Georgi states. Target achieved in this case too, because an optimum CD moisture profile is, as everybody knows, a key quality characteristic across all paper grades.

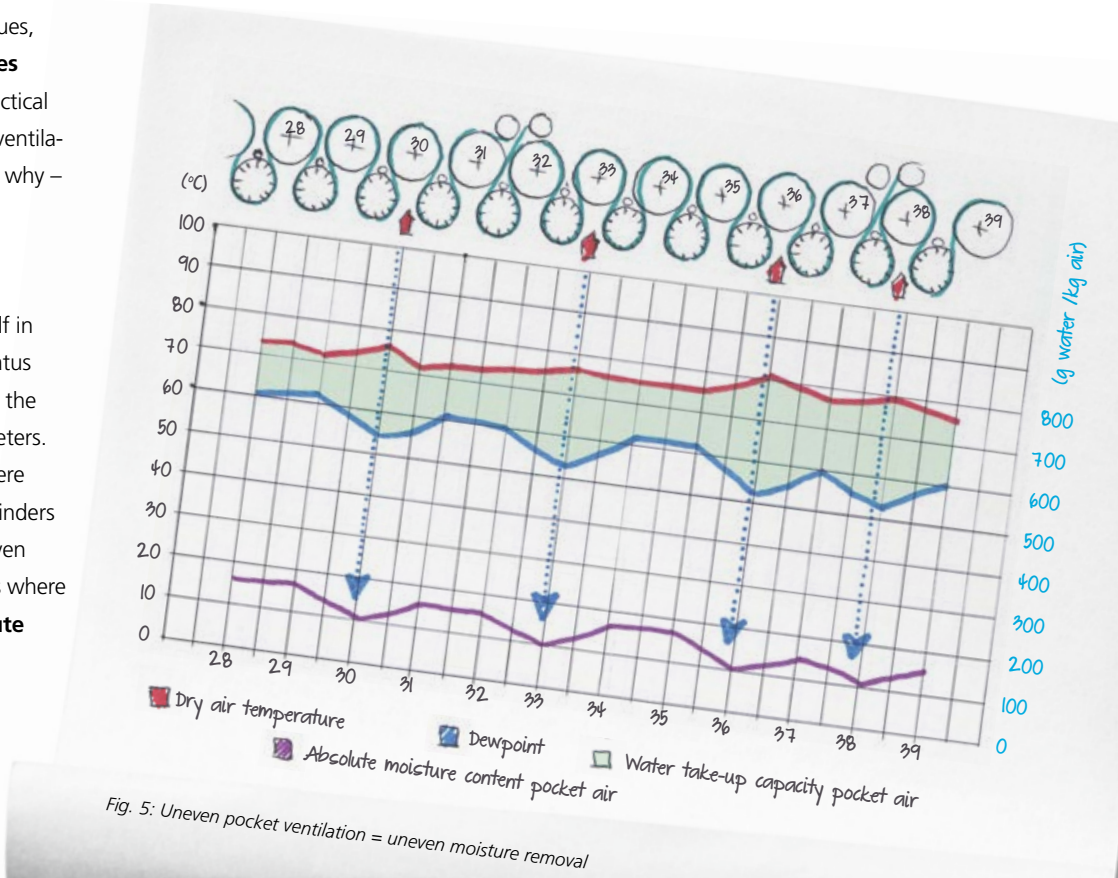

Fig. 5: Uneven pocket ventilation = uneven moisture removal

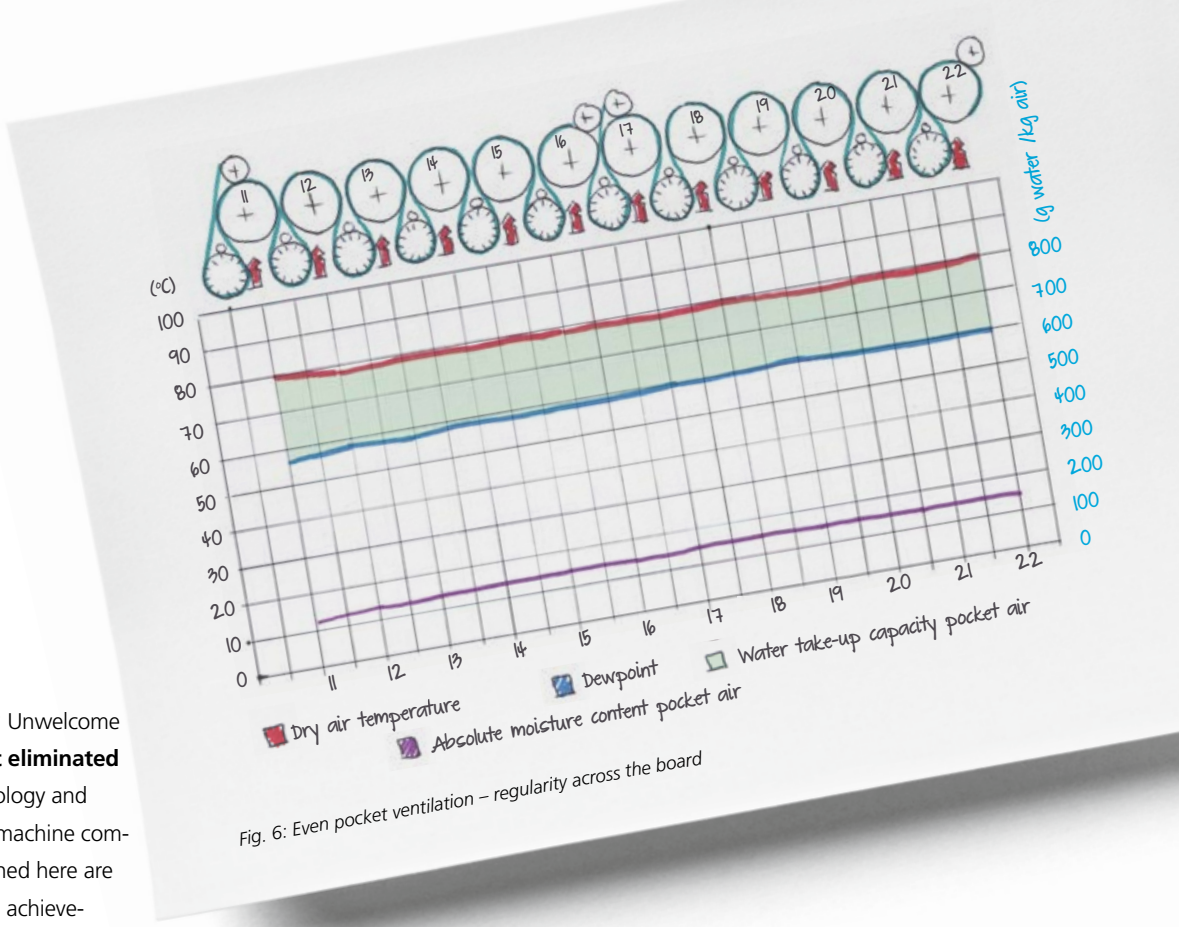

Fig. 6: Even pocket ventilation – regularity across the board

The process is crucial

Who does not recognise them? Unwelcome wet streaks that **can be all but eliminated** with the use of the right technology and appropriate adjustment of the machine components. The examples mentioned here are certainly convincing as practical achievements, but they are all based on a process that always starts with measurements, since the appearance of moisture streaks can have more than one cause. This is why my TASK colleagues and I always recommend: **Let us create facts first by means of measurements and only then think about optimisation and restructuring.** This creates certainty, and simplifies assessment and evaluation.

Air doctors as an option

The same was true in the third case that Georgi and I are reporting on here. A customer opted for air doctor technology, a space-saving alternative which can be considered a **combination of doctor beam and blow box** (Fig. 7): "Air doctors are very well suited to both conventional and Slalom positions", Georgi concludes. Besides optimal use of space in the pockets air doctors have the advantage of directing the **supply air directly into the wedge between the exiting sheet and the cylinder** – leading to an evening out of the vacuum created. This also applies to conventional groups.

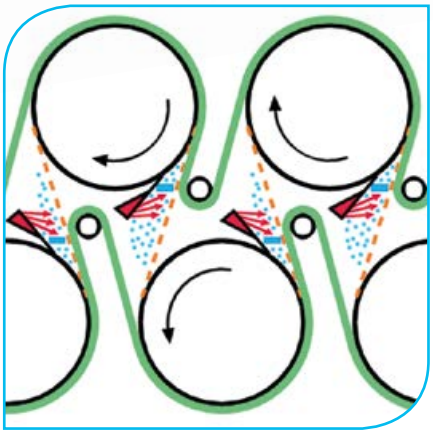

Fig. 7: Air doctors in cross section

Overall benefit for paper technologists

No matter whether blow pipes, blow boxes or air doctors are chosen. No matter how the dryer groups are constructed. No matter whether you are concerned by sheet fluttering, edge cracks or uneven moisture profiles: Just call us – Georgi, all other TASK colleagues and I are happy and ready to be of service by taking measurements that will help **make your dryer section perform as effectively as possible**. More efficiency, less energy consumption, better product quality: It's worth it.

Greetings from your colleague

Paper Pete