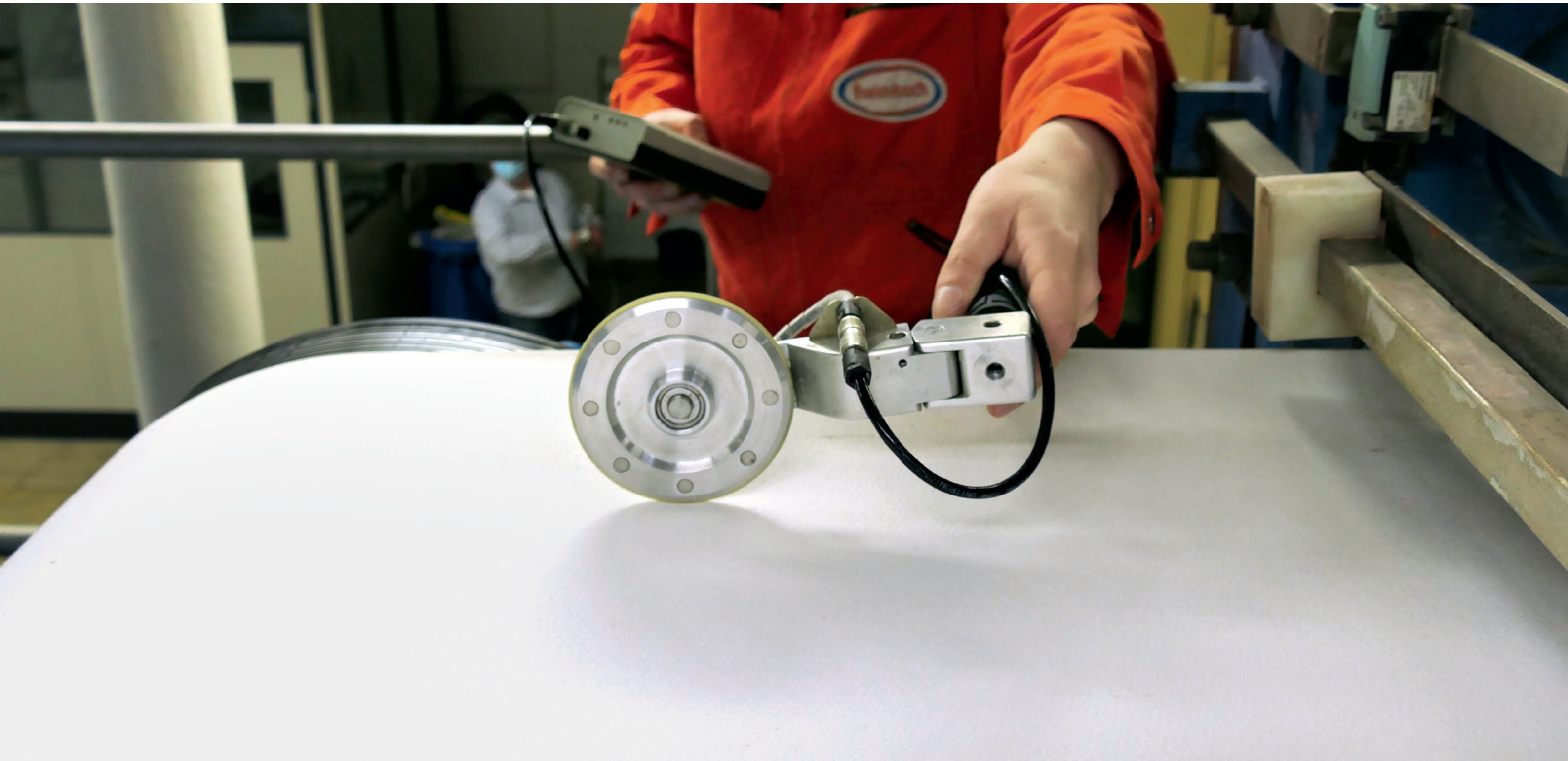


The Optimisation of Sheet Transfer



Are open draws limiting your machine speed?

In this era of falling demand for graphic papers, the older machines are closing, leaving behind only the most profitable units. Some are being converted to produce packaging papers, aiming to follow the growth offered by e-commerce. So, the competition in that sector is also getting tougher and the risk of overcapacity is obvious.

No matter which paper or board grade you are producing, the need to be competitive is more essential than ever. The best way to ensure the paper machine's efficiency, competitiveness and profitability is to raise production with less energy cost. That means maximising paper machine uptime, as well as the volume of output during that uptime. But how do you balance those out? Raising output usually means running the machine faster, but higher speed increases the risk of sheet breaks. Running more slowly to ensure stability can increase uptime, but it can also reduce total output. Both can make a paper machine less competitive. However, this is a problem that can be solved.

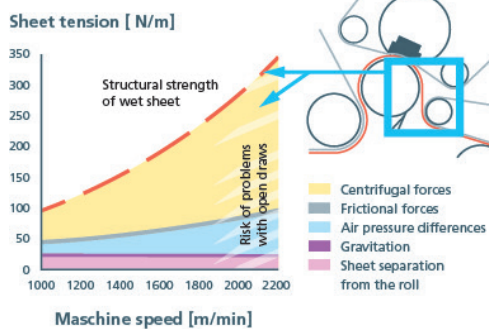
Run faster or longer?

When you increase your output volume by raising paper machine speed, sheet tension will usually be increased too. But if the wet tensile strength can't handle the increased sheet tension, this can cause sheet flutter and breaks, as the paper is transported from the forming section towards the dryer section.

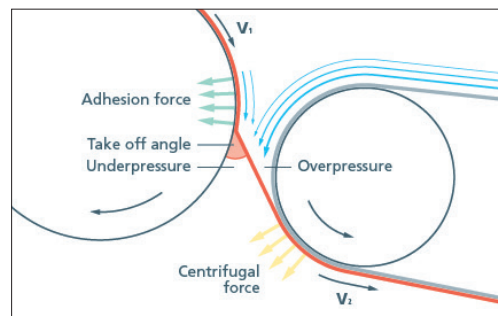
Higher speeds multiply the challenges of the sheet transfer and make it necessary to have better control of the sheet. The answer to these stability challenges is to make sure that the paper sheet is well supported by machine clothing and paper machine elements, to optimise the sheet transfer.

There are usually no real problems from the headbox through most of the press section, because the paper sheet is supported by the paper-machine fabrics and felts. However, problems can arise after press section in machines that have free/open draws with no paper-machine clothing. These can come as early as the transfer from a third to a free-standing fourth press or from the final press into the dryer section. In these cases, there is a risk that the fresh, still-wet paper sheet – unsupported by paper-machine clothing – will break due to insufficient tensile strength. This not only makes it impossible to raise operating speed any further, but it may even be necessary to operate the paper machine at lower speeds, to ensure runnability and the paper quality.

Transfer - Speed: Sheet tension



Additional influences on tension and transfer



Tension troubles

There are multiple reasons for needing higher sheet tension, including (usually) higher machine speed and speed differences between rolls/cylinders. In turn, sheet tension and the related sheet transfer are influenced by a wide range of factors, including centrifugal forces, friction, air pressure, gravity, adhesion and tensile strength, which themselves are often influenced by stock make-up, paper grade, basis weight, moisture content, roll surface, suction zones, blow boxes, air curtains, fabrics and felts.

The problem is, many of these factors suffer in open draws, which also necessitate higher sheet tension. Also, the high tensions required at high machine speeds can cause structural damage to the still wet, unprotected paper sheet, and that can cause problems downstream, either on the paper machine itself or at the converting and printing stages. But as mentioned previously, there are solutions to this.

The best of both worlds

The good news is, it is possible to avoid many of these problems, while actually reducing sheet tension, at the same time as increasing machine speed. This involves reducing or eliminating the variable tension-intensive factors from the long list mentioned, to optimise the transfer of the sheet between different sections of the paper machine.

Of all the options, the most effective one is reducing open draws: the fewer open draws a paper machine has, the better the runnability and product quality. To put it extremely simply, open draws can be reduced or eliminated by repositioning rolls closer to each other, as well as possibly also replacing guide rolls with suction-transfer rolls, where necessary.



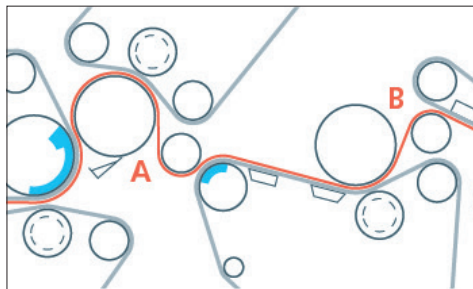
Efficient dewatering in the press section is another effective option. Higher dryness increases the web strength and reduces draws, which means fewer breaks, i.e. more production and better paper quality.

Where open draws cannot be reduced, balancing the running conditions mentioned previously can help to ensure the sheet is transferred as safely as possible through any open draws. If an open draw is unavoidable, a plain fabric roll can also be replaced with a vacuum roll. The positioning of previously-existing vacuum sections can also be optimised. This prevents loss of vacuum, facilitating sheet transfer from roll to roll, as well as keeping the sheet securely in contact with the fabrics and preventing any unintended free movement, which can risk creasing the sheet.

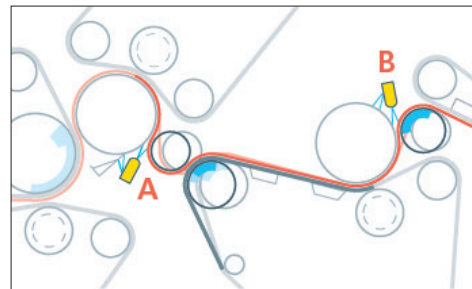
In many of the cases mentioned, an air curtain can also help to release the sheet from one roll to the next, as well as lubricating and cleaning the rolls.

These solutions are already in wide use across the paper industry, at mills that have successfully – and safely – increased their production. The illustrations show how open draws have been reduced and eliminated on a wide range of different machine configurations.

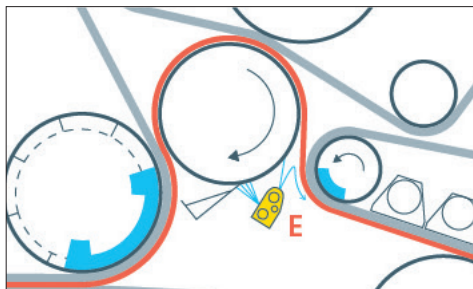
Paper sheet with two open draws



Paper sheet with significantly reduced draws



Paper sheet with one open draw: Protected transfer



Do you want to maximise the potential of your paper machine? To find out how, start a conversation with Heimbach.