Heimbach-TASK
Catalogue of Services

task.
Technical Assistance,
Service and Know-how

wherever paper is made

heimbach

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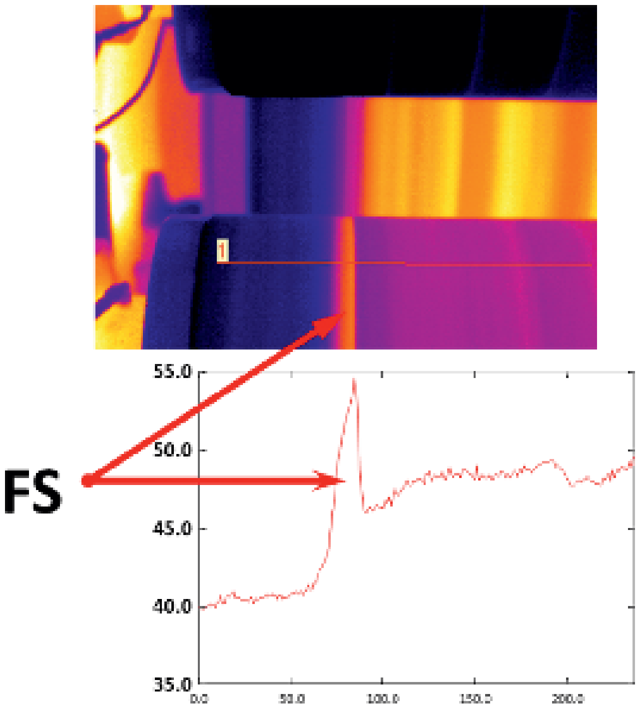
Catalogue of Services

Contents

1. Thermography

Thermography allows contactless registering and subsequent visual presentation of temperatures. The camera measures the infrared radiation emitted from an object and allows the surface temperature to be rendered in color. Surfaces with little emission, such as bare metals, reflect significantly more heat radiation than they emit and therefore are not suitable for capturing by an IR camera/sensor.

There is often a connection between temperature and moisture profile of the paper sheet, particularly in the dryer section.
If there is a blow box operating in the machine it may be helpful to take it out of use for the duration of the measuring process as it could interfere with any problem areas.

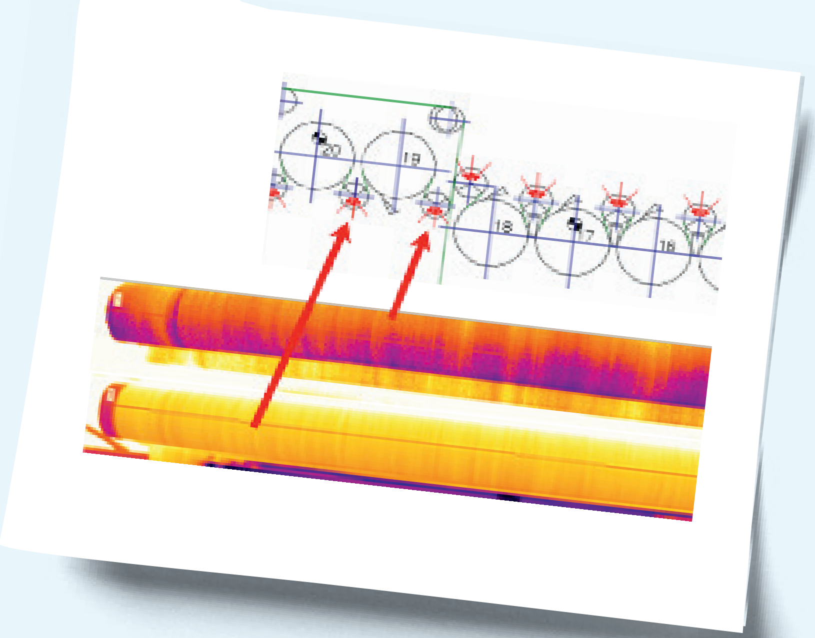


As a rule, starting at the reel spool, images are taken, tracking the error in the machine. In the area of the forming section no temperature difference between high and low dryer contents is detectable most of the time, as fibres and water still have the same temperatures at that point.

Prerequisites:
Stable operation
Optimal conditions: After a planned shut, starting-up without blow box

Time frame:
1-2 hours for measuring in the paper machine at stable production
4-5 hours for analyzing the data and potential re-measurement, including provision of a preliminary report

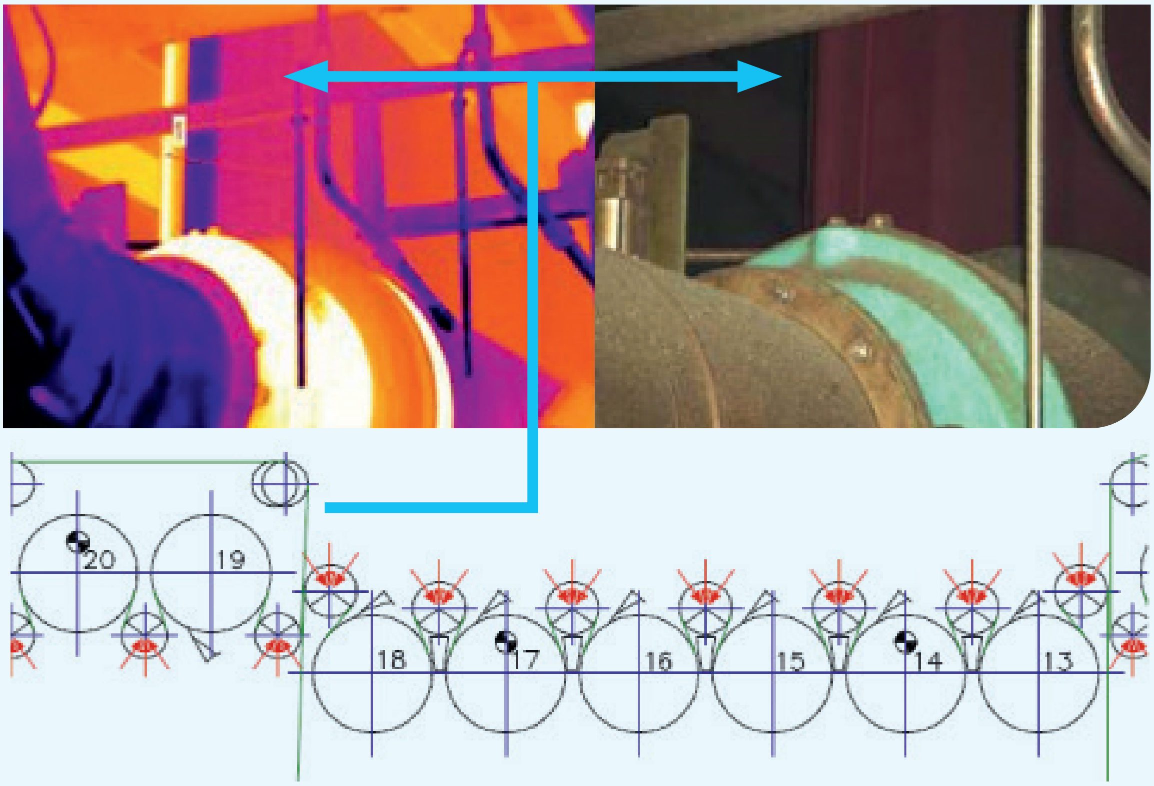
Customer benefits:
- No interference in production (contactless measurement)
- Saving time
- Analysis of profile problems
- Analysis of problems with sheet edges
- Identifying bottlenecks



Case study thermography:

A customer complained about increased moisture at the sheet edge at the front side, which forced him to reduce the machine speed by up to 50 m/min for some grades. Heimbach-TASK carried out a thermography measurement, starting at the reel-up. The wet edge was clearly visible up to cylinder 19. Before this cylinder the temperature was distributed evenly across the sheet width.

Then the clothing was checked more closely, and the cause of the wet edge of the sheet could be determined. The dryer fabric, which ran in the slalom group from cylinder 19 onwards, was contaminated with oil at the front side edge. The fabric lost its tension and therefore also its pressure in the oily area, compared to the rest of the sheet width. In addition to this the air permeability of the fabric was different because of the oil contamination.

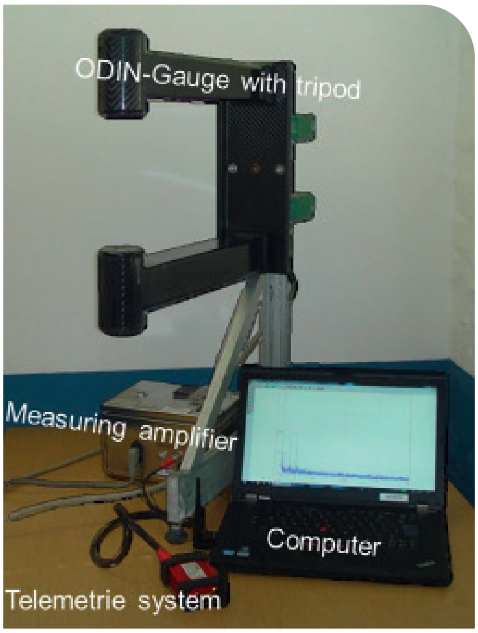


During the next machine shut the oil leak was found and sealed. Furthermore, the cylinders and vac rolls were cleaned at the front side in order to remove the oil residue. After that a new dryer fabric was installed and the machine was re-started. After the start-up phase no wet streak was detectable. Thus, the machine achieved its full production speed once again. In the following month this speed increase meant increased production of 100s of tons. Moreover, the lifetime of the dryer fabric was extended considerably.

2. MD mass variations analysis – ODIN

The term "barring" refers to markings that occur in the paper sheet in cross direction. Mostly it means ***variations in mass****. Often these mass variations cannot be detected by the online diagnostic systems because their scanning rates are generally too low, even during point measurement. This is why we measure such mass variations with our mobile ODIN system (scanning rate 3000 Hz).*

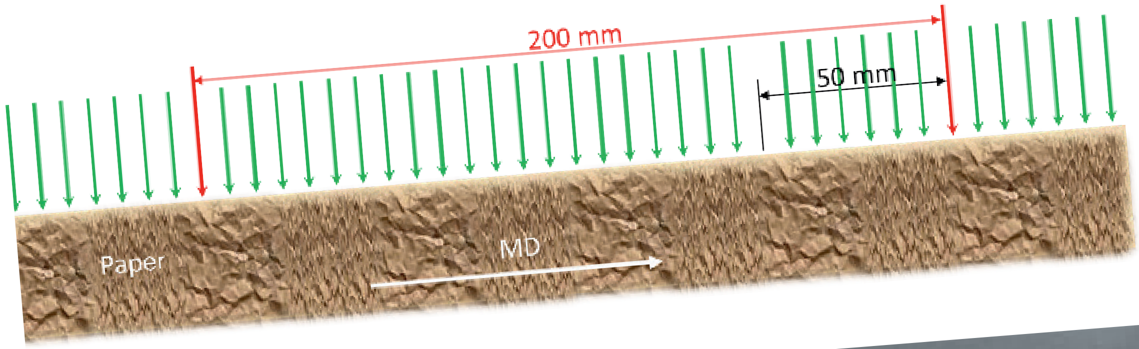
These series of measurement start before the roll-up. Subsequent measurements are carried out at all accessible positions in order to localize the root cause.



Prerequisites:
During the entire measurement the machine speed must remain constant and the paper sheet must not be too opaque (lighter than 130 g/m^2).

Time frame:
The time frame can only be calculated roughly and is based, among other things, on the data obtained during measuring. If these overlaps strongly and several causal factors must be taken into consideration the time required can vary accordingly.

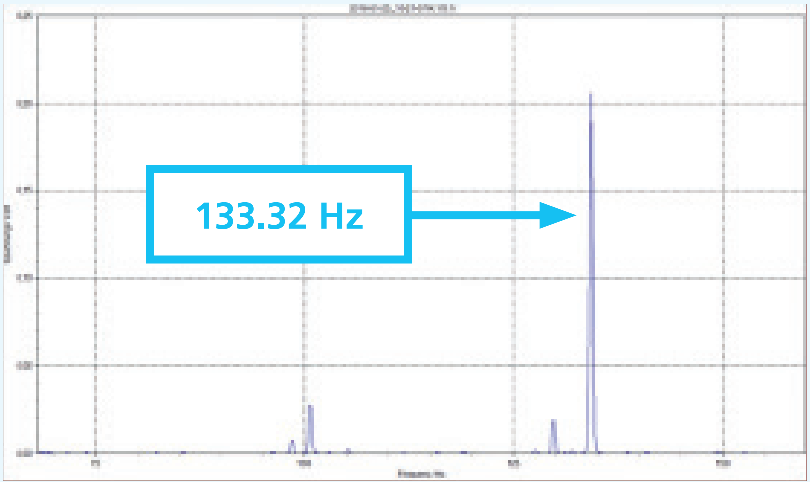
Customer benefits:
- Early detection of damage to aggregates or machine elements
- After localizing a defective component, the customer has important information available for more efficient planning of repair shut offs
- In cases where barring prevented an increase in machine speeds we were, as a rule, able to successfully service the machine in order to make an increase possible again



Case study ODIN:

A customer complained about barring in the paper sheet that repeated every 50 mm. The scanning rate of the on-line scanning equipment (100 Hz) is able to measure variations, but in this case only every fourth. This could have led to the conclusion that an interfering frequency was the cause, although here this does not determine clearly the root cause of the problem. The scanning rate of 100 Hz, at a machine speed of 1200 m/min, means that the scanning equipment achieves a measuring point at every 200 mm only. The ODIN measuring system scans the sheet at 3000 Hz, which, at this speed, means: Every 6.6 mm a measuring point is achieved. Moreover, this measuring system is mobile and therefore able to localize the original source of the problem.

By using the ODIN fork barring was detected immediately before the reel-up (133.32 Hz). Following that it was also found in front of the calendar, in front of the size press and immediately behind the headbox. Therefore, the likelihood of the causal factor being found in the approach flow system was very high. The TASK team followed the stock against the flow direction. Before the headbox a pulsation damper was situated, which, however, could be excluded as causal factor: It does not contain any rotating parts and is therefore unable to cause any interfering frequencies. In front of the pulsation damper there was a pressure screen. Here a rotating frequency of exactly 33.33 Hz was measured.

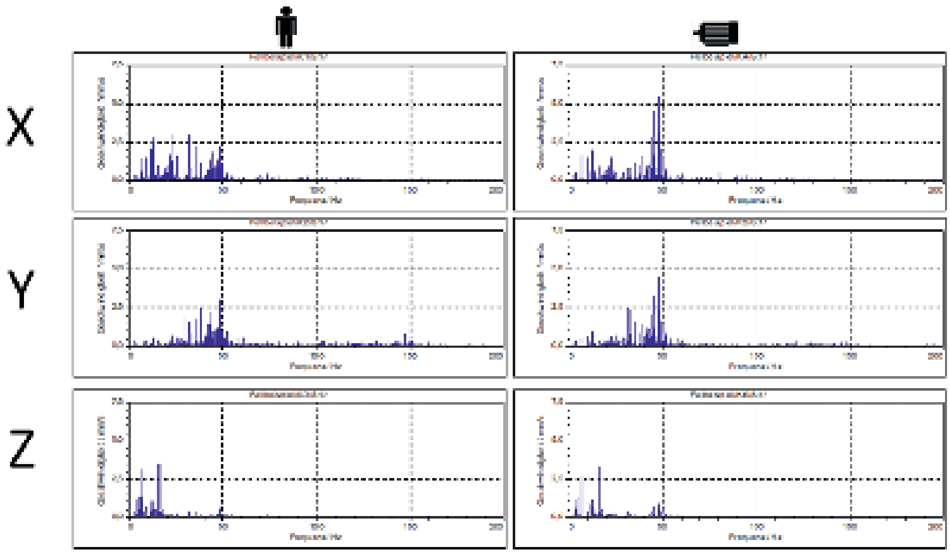


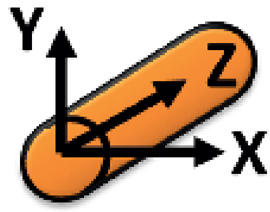
The technical specifications of the vertical screen showed that the rotor had four blades. This meant: Rotating frequency (33.33 Hz) x 4 blades = 133.32 Hz!

According to this the screen must clearly be the cause of the barring! Such an error pattern can be caused by wear and tear as well as by deposits. Subsequently the customer took a closer look at the problem.

3. Vibration measurements

The triaxial acceleration sensors used by us pick up the horizontal, vertical and axial movements of a rotating component at the same time. The raw data (vibration measurement) of the acceleration sensors are transmitted to the computer via telemetry and are processed by its software.





Thus, a graphic representation of the FFT is possible (see diagram). The acceleration sensors in the press section are primarily attached to the bearing housings of the rolls. Every measurement takes place simultaneously at the front side and the drive side of the respective roll.

Prerequisites:
Constant machine speed during the entire measuring process

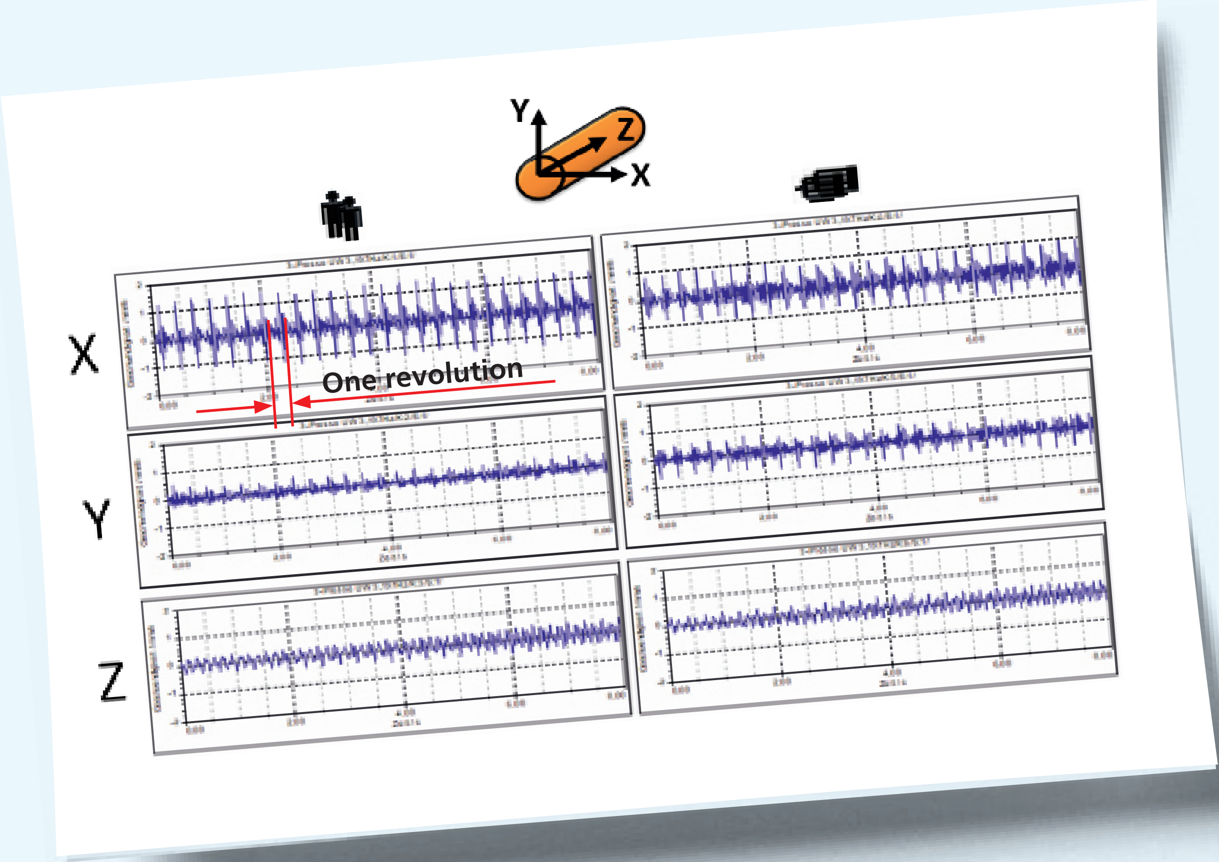
Time frame:
A half to one whole working day should be planned for the measurement. More accurate information is not possible due to the complexity of measurement and analysis.

Customer benefits:

- Early detection of damage to aggregates or machine components
- After localizing a defective component, the customer has important information available for more efficient planning of repair shut offs
- In most cases where variations prevented an increase in machine speeds this could be sorted out after successful servicing

Case study vibration measurements:

A customer noticed very intensive vibration in his press section but was unable to localize the root cause. We carried out a vibration measurement. We put the acceleration sensors one after the other on the bearing housings and recorded the vibration velocities of each press roll in the press section. Additionally, the rotational frequencies of the rolls, by means of IR sensor, were measured in order to match the timings of the interference signals to the rotating parts of the machine.



The time signal of the press belt in the shoe press showed clearly that once per rotation the belt swung/shifted horizontally. This led to extremely strong vibrations in the entire press section. The next day the belt was removed and checked. It was damaged on the inside over an approximately 30cm long area, which made the press section to vibrate once per rotation.

After examining the shoe, a new press belt was installed. During re-measuring – with the new belt – no significant vibrations were detectable.

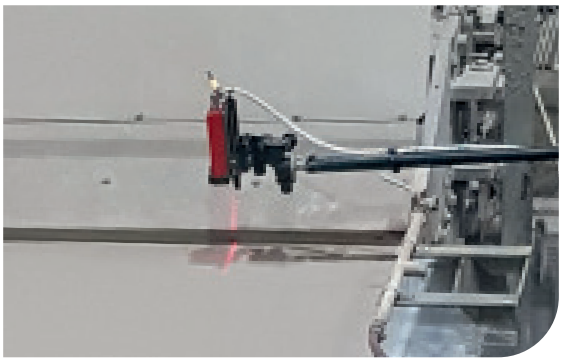
4. Speed measurements

Speed wheel:

In order to determine surface speeds of rolls, fabrics, felts, etc., an inspection using the highly accurate length and speed measuring wheel is sufficient. The measuring wheel used by TASK contains a special rubber cover which ensures that there is hardly any slippage occurring between measuring wheel and material (such as wet fabric).

IR sensor:

Another possibility for speed measuring is determining rotational frequencies of the material. For further calculation of speeds accurate information on diameter or length of the material is necessary.



Laser:

Nearly all level surfaces can be measured with this method. Measurements of round machine parts can be conducted from a diameter of 900 mm upwards. This measuring system is also suitable for examining jet velocity and with it the **jet-wire-ratio**. Only a measurement on a gap former is not possible.

Prerequisites:

Constant machine speed, safe access, the diameters of rolls must be known

Time frame:

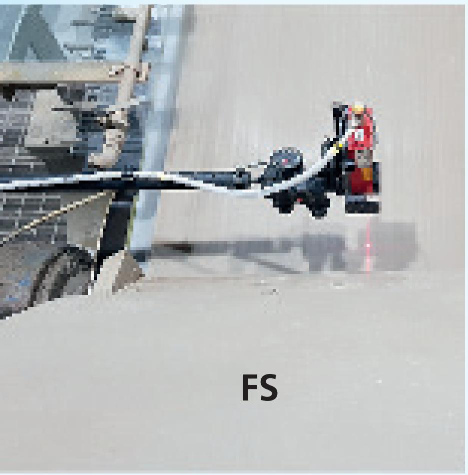
Checking all speeds in the forming and press sections takes approximately one working day

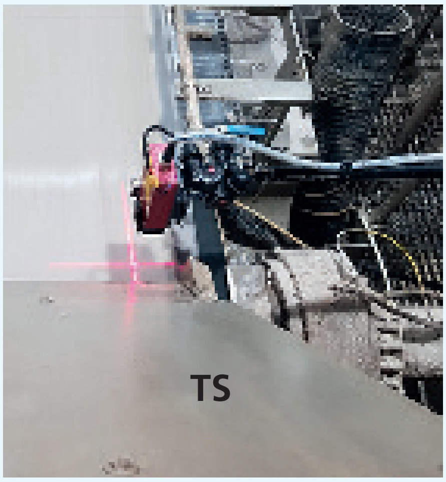
Customer benefits:

- Determining all clothing speeds
- Identifying speed differences between the groups (can be the cause of sheet breaks)
- Synchronizing of the roll frequencies/speeds in order to avoid increased wear of clothing or rolls
- By determining the real jet velocity, the paper quality can be optimized through fibre orientation (jet-wire-ratio)
- Comparing jet velocities on front and drive side
- Examining programming and control of the head-box-pump

Case study speed measurements:

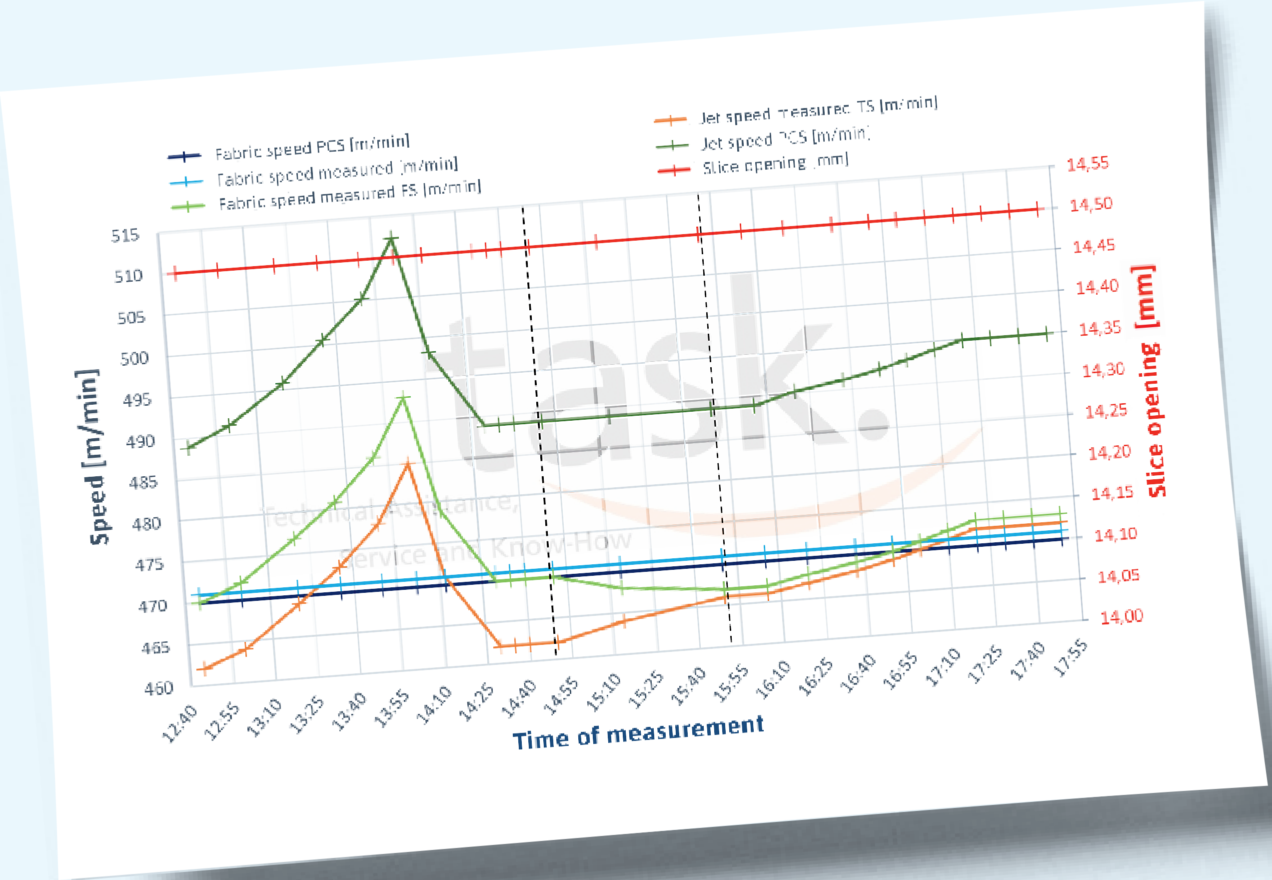
A customer noticed quality differences of the sheet across the machine width. He had detected that the fibres on the front side were orientated more strongly in cross direction than on the drive side.





After we had measured the speeds of clothing and rolls in the forming and press section, we set up two lasers in order to measure the jet velocity in parallel on front side and drive side. It became obvious very quickly that the jet on the drive side was approx. 8 m/min slower than on the front side. In addition, the jet on the front side was 19 m/min slower than shown in the PCS.

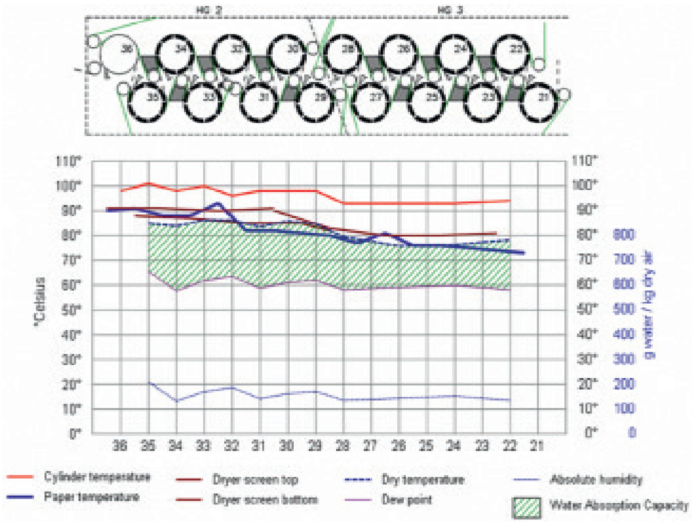
As a test we changed the jet velocity in the PCS in order to see whether the measurement would show the same result. This worked perfectly *(see diagram: 12.40-14.30 hours)* and meant that the control of the headbox pump and the corresponding programming in the PCS were functioning. At each setting the difference between the jet velocity shown and measured was identical. We then looked for the cause of the variation between front side and drive side. There had to be a pressure difference in the headbox which could in all probability only come from the cross-flow spreader. And that is what we found. The return flow was too restricted. We opened this return flow slowly, and the jet velocities of front side and drive side started to converge. When the return flow was opened fully the difference between front side and drive side was only 1m/min *(diagram: 14.50-15.50).* Subsequently we increased the jet speed so that the customer was once again able to produce even paper quality. Then (*from 18.00 onwards)* we changed the slice opening of the headbox incrementally in order to see whether the jet speed remained constant, which is what it did. Therefore, by the end of the day we had established: the customer only needs to program an offset *(22 m/min)* and the correct jet speed would be displayed in the PCS.



5. Dryer section analysis

The objective of a dryer section analysis is to check the conditions inside the dryer hood by measuring pocket air conditions and the surface temperatures of clothing, paper sheet and drying cylinders. The dew point as well as the relative and absolute moisture are worked out from dry and moist air temperature.

To achieve this, measurements are taken at approximately 50cm from the front side of the paper sheet. Measuring the cylinder temperatures provides information about the course of the heat curve in terms of the necessary uniformity of the temperature increase as well as about potential irregularities (such as "flooded" cylinders). It also allows statements regarding superfluous warming of the clothing in a slalom group by e.g. inner cylinders. It is necessary to keep an eye on the temperature of the paper sheet in order to avoid problems such as fibre deposits at the first few drying cylinders. Generally, a uniform increase of the cylinder temperatures and therefore also those of the paper sheet should happen. Too much of a difference between the two will lead to fibre plucking and even to complete rupture of the paper sheet. In the diagram you can see dry temperature, dew point and absolute air humidity. The difference between dry temperature and dew point is marked by hatching. The larger the difference, the higher the water absorbency of the air and the faster the moisture can be evacuated.



Prerequisites:

In order to carry out the measurement and to ensure high quality results a stable machine speed with constant production is required. The hood should be loaded as highly as possible.

Time frame:

One working day should be planned for the measurement. This time frame also includes a preliminary report, which will be discussed on site.

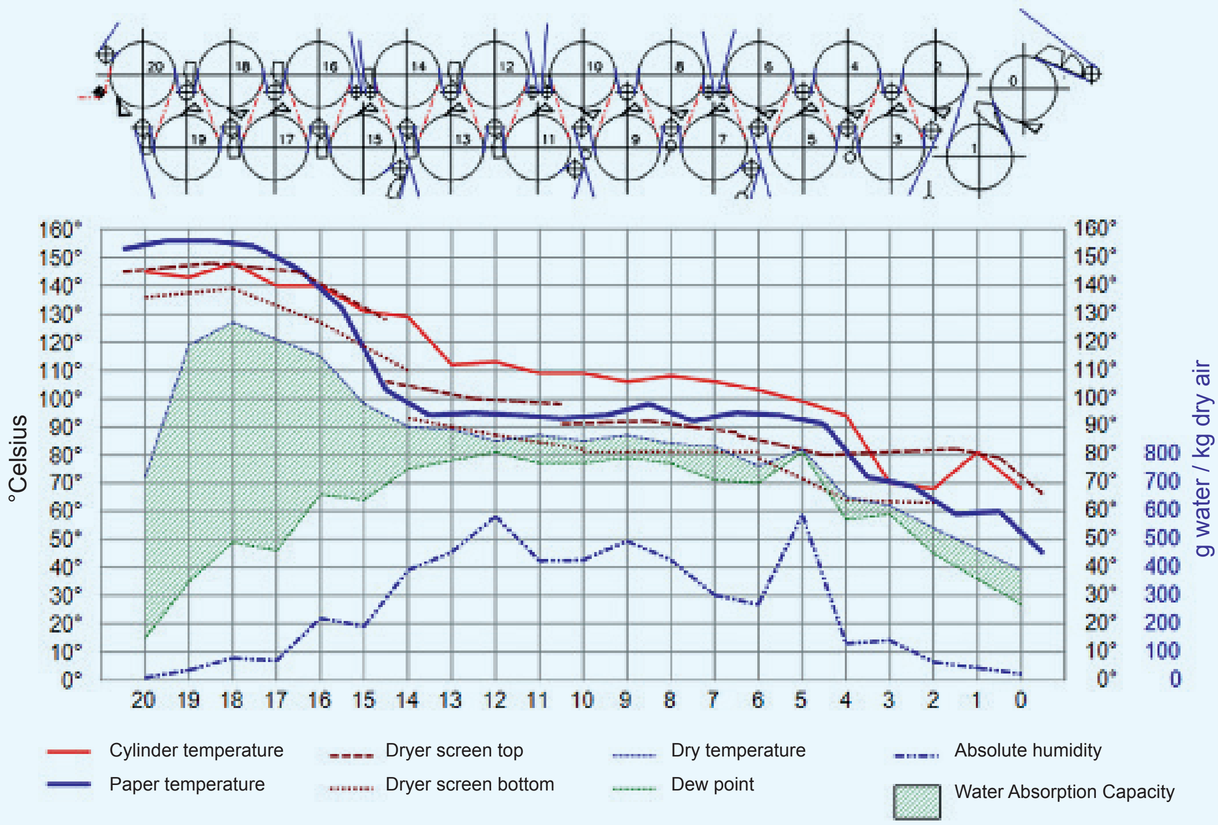
Customer benefits:

- The inspection provides a reliable information about the status in the dryer section.
- The measurements can provide information about possibly existing bottlenecks and/or drying problems.
- The diagram representing the values measured shows clearly any problem in the dryer section.
- In particular when a hood and heat exchanger balance is conducted in conjunction with a dryer section analysis, optimising potentials for more efficient energy use and/or energy savings can be pointed out.

Case study dryer section analysis:

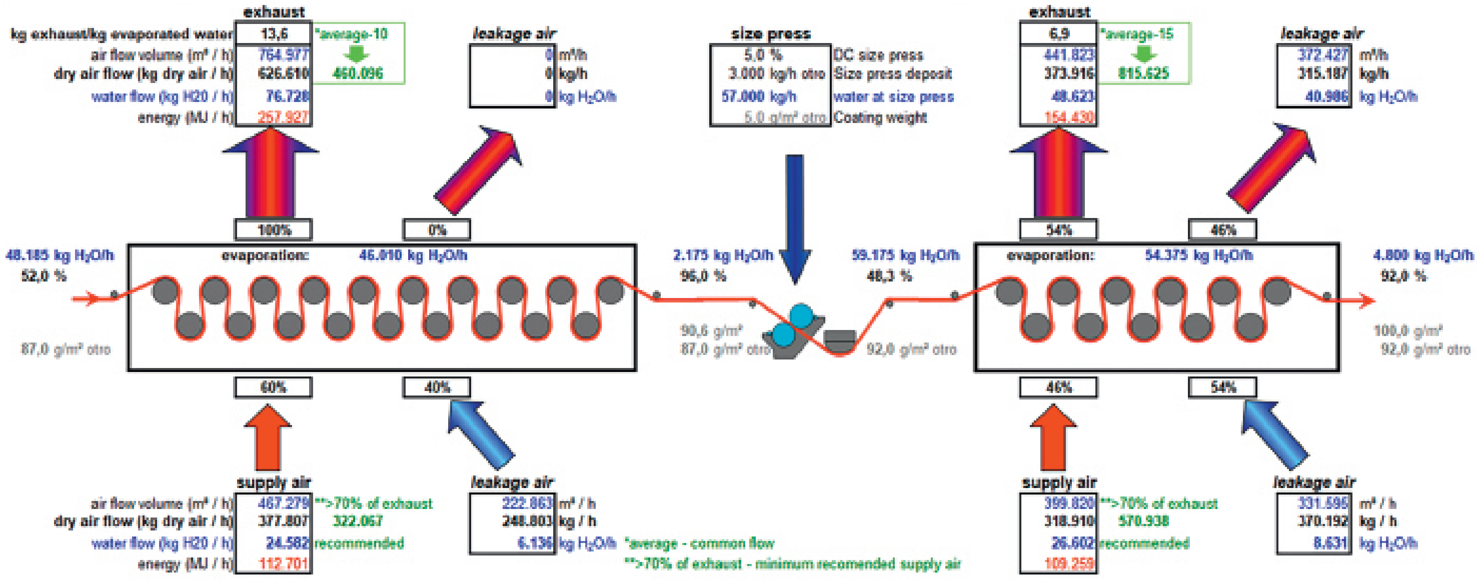
A customer requested a dryer section analysis because he wanted to optimise his machine in terms of speed. He specifically asked for this measurement because he himself had identified the dryer section as a bottleneck area within his process. The machine to be examined was a decor paper machine: This was evident by measurement value display of the dryer section, which indicated a higher paper temperature than cylinder temperature from cylinder 16 onwards.

We found that the dryer section was running at maximum capacity, meaning that the water absorbency of the air was under 10°C for the first 13 cylinders. Additionally, the clothing temperatures were very close to the dew point; for cylinder 5 even below. This meant there was great danger of condensation of the water vapor in the pocket air to reach the clothing and consequently to remoisten the paper. However, there was an area in the hood where enough hot air intake was available *(Cyl. 15-20).* Underneath cylinders 0-12 we found an "undercurrent" which clearly was not very efficient. Unfortunately, this undercurrent did not reach the cylinder pockets where it was needed, because of a large extent it moved past the paper sheet on both front and drive side and ended up as exhaust air. When the hot air of the undercurrent is directed straight into the cylinder pockets of the first 13 cylinders the water absorbency is increased enormously. In this way the machine speed can be increased without increasing energy costs for the ventilation of the pockets. Therefore, our recommendation is: "Replace undercurrent with efficient pocket ventilation". This is achieved very well by using blow pipes or blow doctors.



6. Hood balance

When balancing a dryer hood the quantity of water to be evacuated is calculated. However, to be able to evacuate it an appropriate air volume is needed. Experience shows on average that this air volume is around 10 kgs dry air per 1 kg water (pre- dryer). Depending on paper grade and production output the evaporation rates vary. Therefore, a hood balance should be performed at the production output that yields the highest evaporation rates in the dryer section.



Prerequisites:

During the measuring process a stable machine run without changes to the production (speed, grammage, etc.) is necessary. In order to achieve the best possible results of the measurements the hood should operate as closely to maximum capacity as possible.

Time frame:

To conduct the hood and heat exchanger balance we recommend a dryer section analysis (see page 12). For conducting both these measuring processes two working days in total should be planned with two service technicians each.

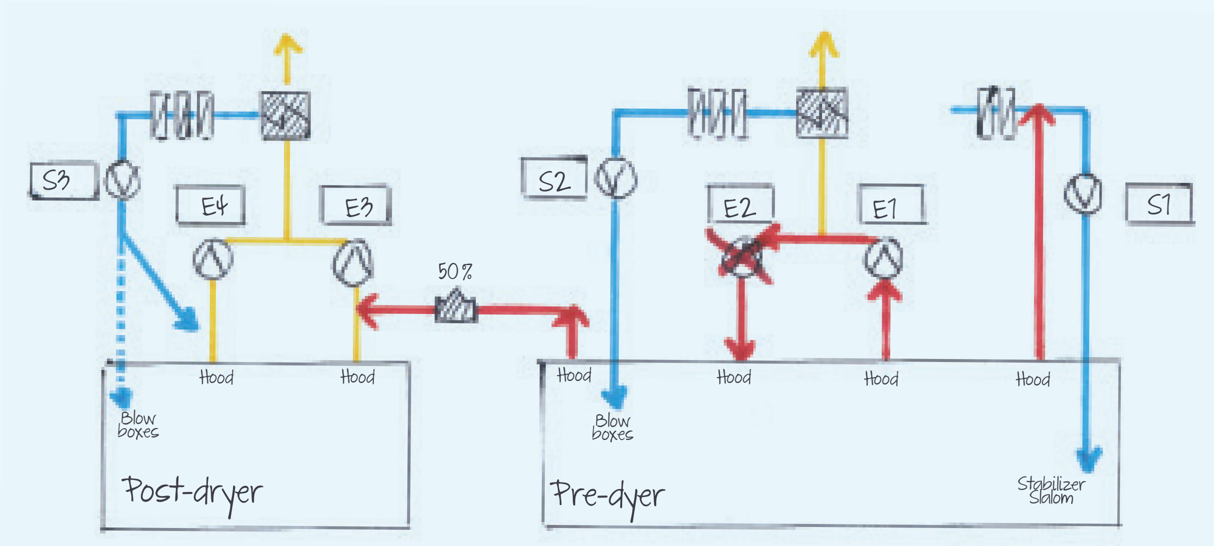
Customer benefits:

- Analysis of conditions in the hood system
- Representation of energy losses
- Recommendations for optimising the hood system
- Demonstrating opportunities for saving energy and possible production increase

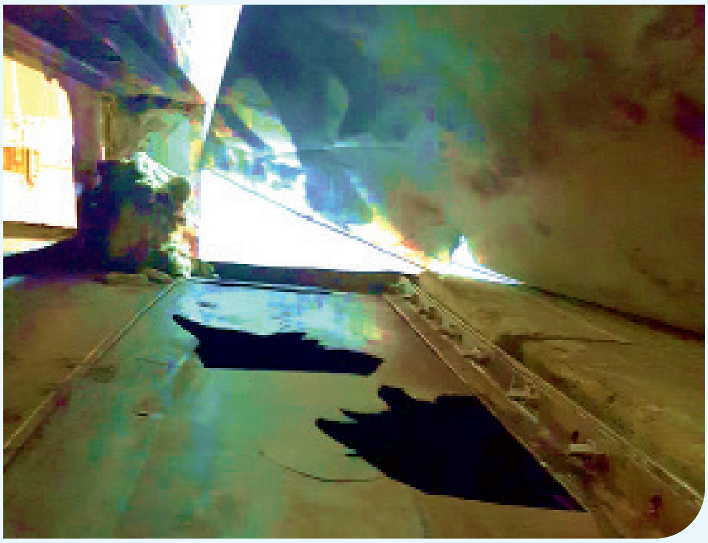
Case study hood balance:

A customer's machine had been running more slowly for a short time because, according to the customer, the paper sheet would have become too moist otherwise. Therefore, TASK conducted a hood balance (as shown in point 6.). This hood balance showed clearly that something was not right with the exhaust ventilation of the pre-dryer. For one thing this exhaust air was very moist and for another it did not reach the air/air-heat exchanger. As even repeated measuring did not make things clearer we took a closer look.

One of the exhaust ventilators of the pre-dryer section turned in the wrong direction. How was this possible? The drive belt for power transmission from motor to fan was torn. The airflow, evacuated by the other exhaust air ventilator, pushed it in the wrong direction. This meant the air was not transported outside but was returned into the dryer hood. The hot, moist air was circled around rather than evacuated.



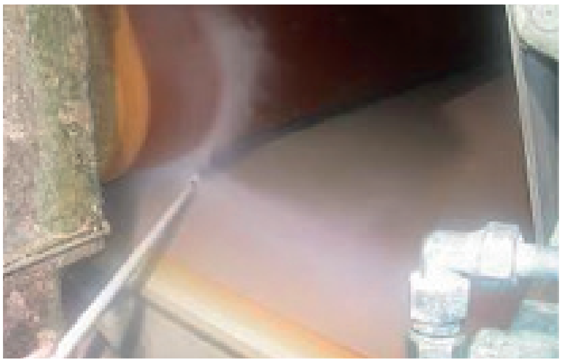
This effect was intensified by the design of the exhaust duct, which impeded air extraction. Therefore, the heat exchanger did no longer work efficiently, and the hot air intake became noticeably colder. As a result, the paper sheet dried more slowly, and the customer was forced to reduce the machine speed considerably. And this with increased energy use! Matters were made worse by two very large holes in the air intake duct of the post-dryer, behind the air intake fan. This meant that a large part of the heated, dry air intake was evacuated into the hall.



The drive belt of the exhaust ventilator of the pre-dryer was replaced and the holes in the air intake duct of the post dyer were closed. After this short shut time it was possible once again to start up the machine at its usual production speed.

7. Airflow analysis

Visualization of air flows is achieved by introducing mist plus photo and video documentation of the now visible air flows. In order to find root causes for uncontrolled, or unwanted air flows, for example, measurements of the air speeds are conducted.



Prerequisites:

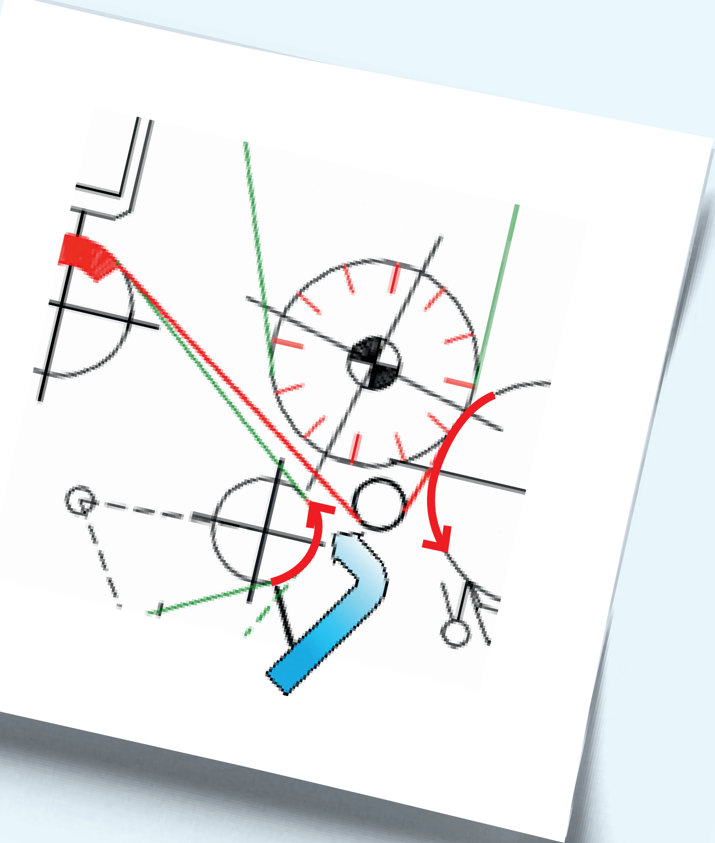
Only access to the respective machine section and permission to introduce oil-based mist must be ensured. The solutions we use are non-toxic and are used at public events for example. Paper quality is not reduced in any way.

Time frame:

The time required depends on the extent of the sections to be checked and is therefore determined individually.

Customer benefits:

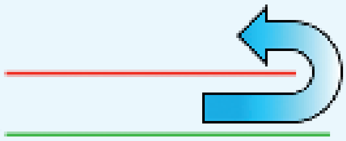
- Information about air flows that can lead to profile problems, defects in the paper or even sheet breaks
- Information about the ventilation system in the dryer section, including improvement potential



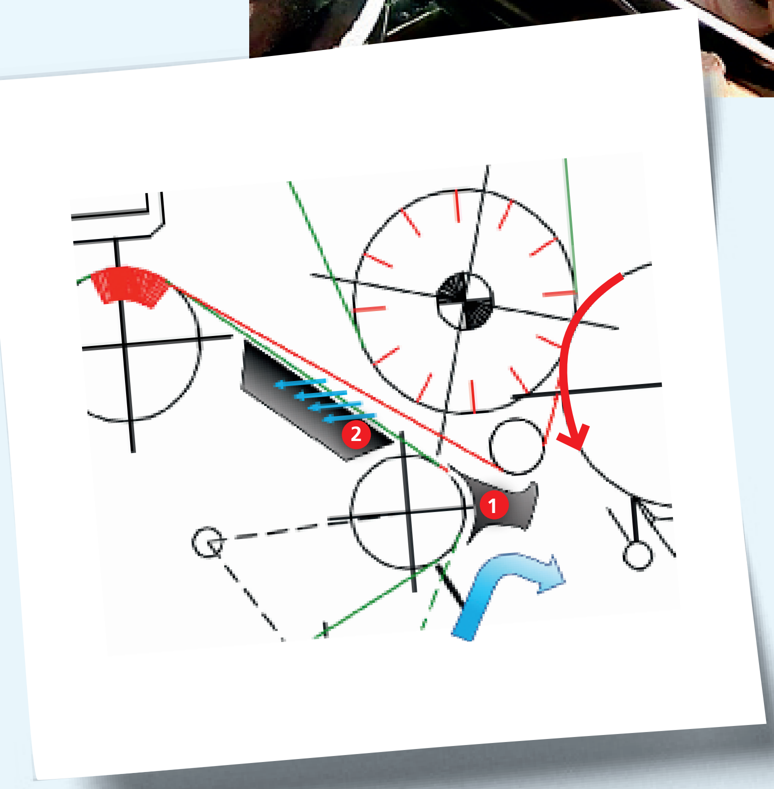
Case study airflow analysis:

A customer had problems with sheet flattering between the second and third press. TASK had to find out why the paper sheet ran so unevenly at this point and to submit suggestions for a solution. Initially the air speeds under, next to and above the sheet were measured.

The measurement led us to believe that the bottom felt of the third press transported a large amount of air between felt and sheet. This air then flowed out on both front and drive side between felt and sheet and led to the sheet edges' considerable "flattering".



In order to visualize this belief and therefore also to prove we then made the airflows visible with the aid of a misting machine and documented them with a video camera. It became clearly visible that air flowed between felt and paper sheet in the direction of the front side.



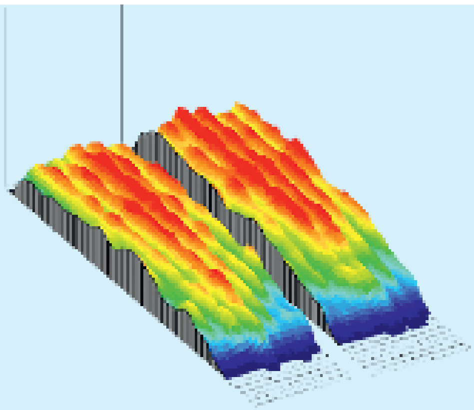
This air was drawn back into the machine, around the paper edge, over the sheet, and thus produced the problematic edge flattering. The following measures to resolve the problem were suggested:

1) Install an air deflector directly next to the felt lead roll and thus direct the airflow against machine direction.

2) Install a "suction tube" under the felt in order to suck the airflow through the felt and at the same time keep the sheet on the felt.

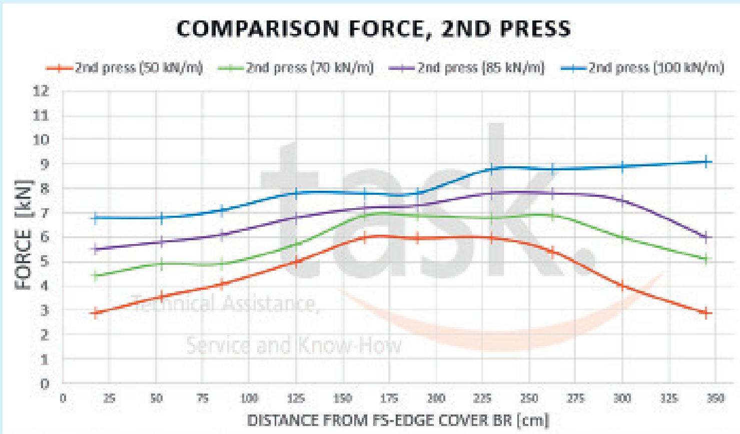
8. Electronic nip profile measurements

In order to examine presses Heimbach uses special single sensors that are inserted next to each other in the nip. Force and contact area are measured and nip length, pressure distribution and line force calculated from that. This measurement is often repeated with different settings in order to achieve clear information about force distributions and the related nip lengths.



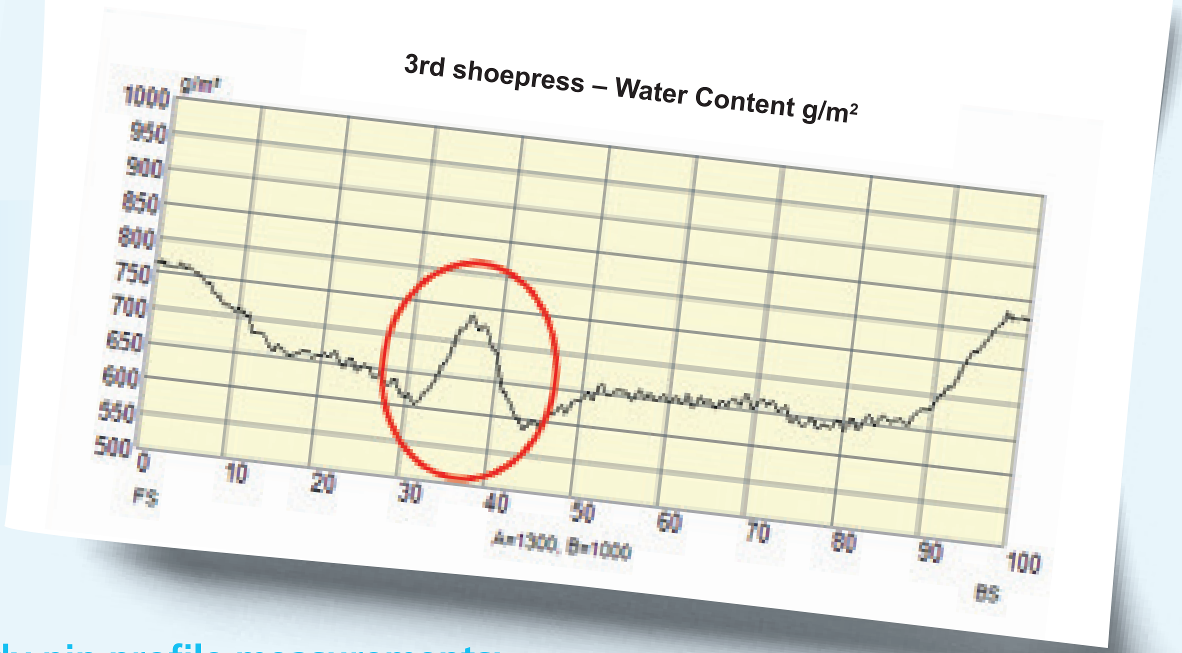
Prerequisites:
For the measurement the machine must be shut. During the measuring process a machine operator should be in attendance to release the press locks when machine is shut. The press roll temperature should not be above 50 °C. If necessary the customer must provide appropriate safety equipment.

Time frame:
The time required for conducting nip profiles depends on the number of sensors in the nip to be sampled. The more closely a nip needs to be checked, the more sensors must be inserted and sampled individually. Also, delays may occur in terms of access to the press. There should be an individual briefing prior to conducting this work. In normal circumstances the time required including preparation is approx. 1-2 hours per nip.



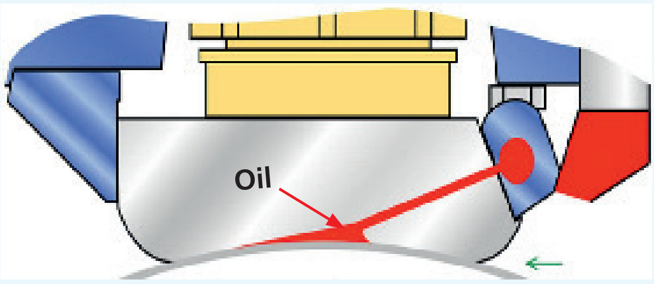
Customer benefits:
Creating a nip profile can provide insights into a variety of causes for problems in the presses. In conclusion, the following information is represented:

- Force and pressure distribution in the nip
- Nip length across the machine width
- Line force across the machine width and as an average
- Comparisons of the different settings



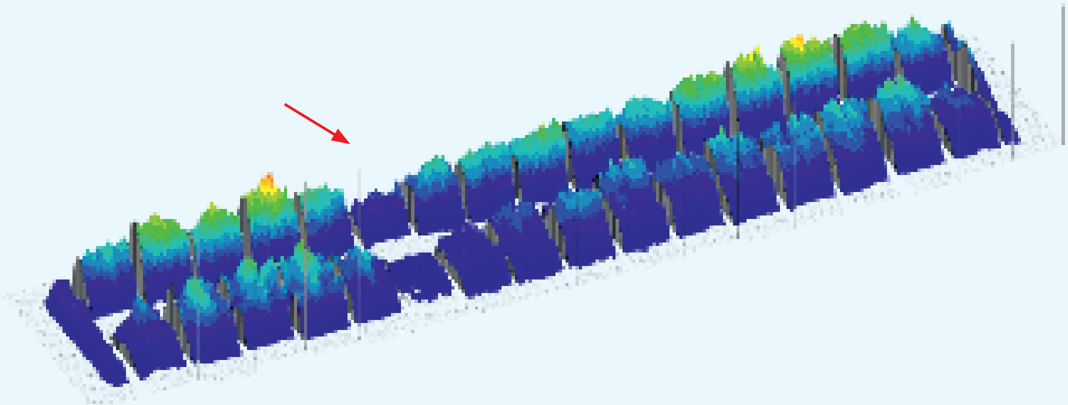
Case study nip profile measurements:

A customer complained about a wet streak in the sheet having occurred for approx. 2 weeks. The root cause could not be explained. The Heimbach HOME Service measurements showed increased water content in the corresponding place of a felt. This felt only ran through the nip of a shoe press. And it was this shoe press TASK were asked to investigate.



The shoe in this press was interrupted in the running direction of the machine. At this point pressure was created with oil *(red in the diagram)*; this means the lubricant for the inside of the press belt is introduced directly into the shoe during operation. However, the oil could not be introduced in shut mode, which also concerned the nip profile measurement, because the press belt would have been saturated with oil.

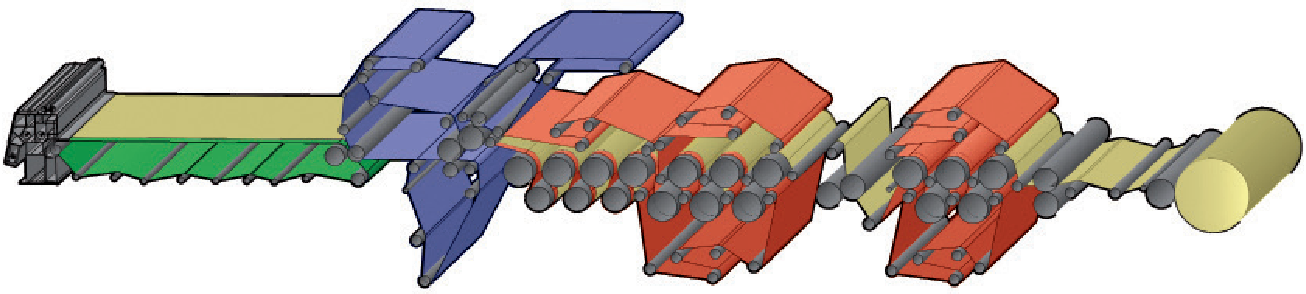
Therefore, the measurement was conducted without oil pressure between shoe and belt. Subsequently the relevant calibration data were added to it and evaluated. The force distribution in CD showed conclusively that hardly any force arrived in one location in the nip. The 3D representation of this force distribution illustrates this visually.



Therefore, it became clear that the wet streak in the sheet originated in the shoe press. In order to gain more accurate information, the customer had the press removed and checked by the manufacturer. It emerged that the shoe was warped. The customer suspected that a broken felt in the PM was responsible for the deformation of the shoe in this way. The pressure pistons of the shoe press were checked, and a new shoe was fitted. Moreover, a new felt was installed and the machine was restarted. The wet streak that had been visible before in paper and felt had disappeared.

9. Section and machine audits

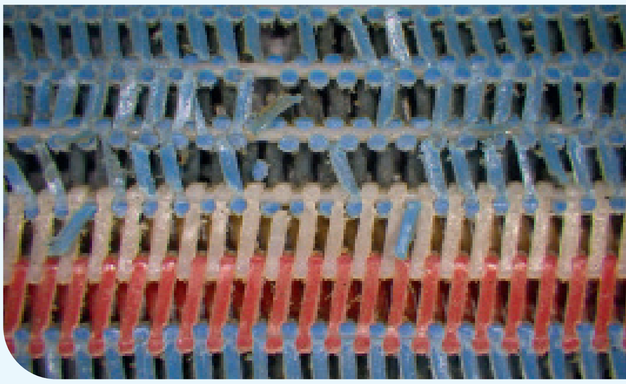
Prior to a section or machine audit, the objective is defined between TASK and the customer (eg troubleshooting, start-up support or optimisation of the performance). Our highly qualified and experienced engineers then create an action plan with recommended measurements and further procedures. Depending on the problem, the respective section or the complete paper machine is examined. This can be done both during machine stops or during running production. In some cases, complete machine audits can be more cost-effective than combining different individual measurements.



10. Consultation/Troubleshooting

For TASK troubleshooting means targeted search for causes of a specific problem. Not every error detection needs expensive measuring technology. The causes for defects can be found in settings, processes or installations which are required of course, but can also lead to problems.

Case study troubleshooting:



A dryer fabric had to be exchanged every three weeks because it had abraded or even almost fallen apart across the entire surface area. The customer knew that the culprits were three corroded lead rolls. However, for us the question was why it was only those three lead rolls that were corroded in the entire dryer section.

The dryer fabric in question – an unfilled spiral fabric – had been fitted in the third drying group. In the second drying group there were cleaning modules, on which we concentrated as a first step. We suspected that the spray mist from these cleaning modules was carried by the dryer fabric and was therefore transported to the guiding rolls. But the question remained: Why only those three guiding rolls? When the paper sheet broke we found the solution to the puzzle. Every time a sheet broke the cleaning modules switched on automatically. However, the collection tray of the upper cleaner was defective and the water ran directly onto the lower cylinder of the third drying group. This is why the spiral fabric distributed the water onto the three lead rolls in question, which, as a result, corroded much more quickly than usual. The customer repaired the collection tray, fitted three new lead rolls, and the dryer fabric achieved its planned lifetime once again.

Technical Assistance, Service and Know-how = TASK

11. Your contact to the TASK team

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Technical Assistance,
Service and Know-how

Stand 4/2023 Reserve technical changes.

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