

Press section audit

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INTRODUCTION:

Paper machines are sensitive giants. As complex as the various machine configurations are, the parameters that influence productivity are just as varied. It is often the small details that make the difference or can decide the quality on the reel. Heimbach offers section or machine audits, which can be carried out for a specific section or for the entire paper machine, depending on the task at hand. The following article provides a general overview and recommendations for the press section.

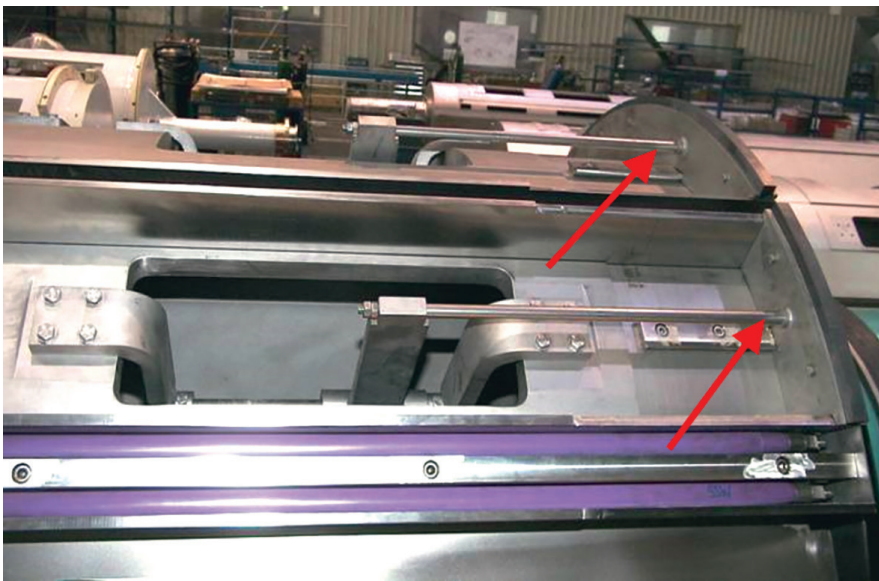


Figure 1: Format setting suction box.

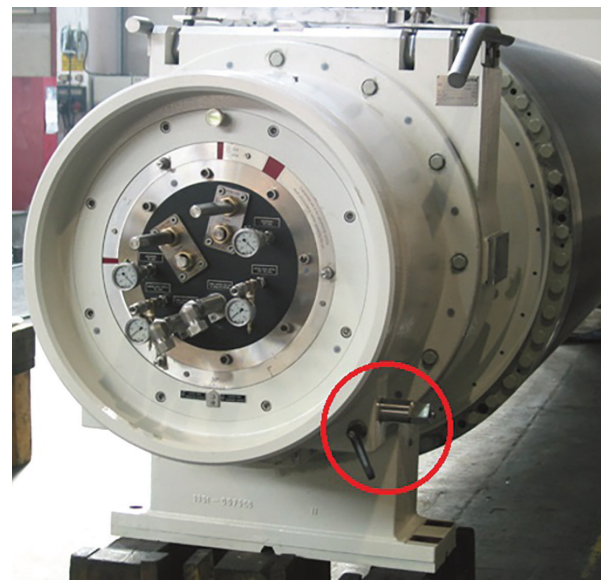


Figure 2: Adjustment mechanism for suction box.

Mode of operation and characteristics

As the paper web passes through the press section, water removal is essentially generated by means of mechanical pressure. In the course of this process the water is stored temporarily within the press felts or in the open area of roll covers. This water is then removed via one of the assembly types described below.

There is no single or blanket answer to the question of whether nip or Uhle box dewatering is more suitable. In the case of high speed machines the laws of physics speak against the use of felt suction boxes as there is simply not enough time available. In machines with lower speeds felt suction boxes can prove to be more efficient. As a rule, the two modes of action complement each other.

It is important to know that the method of dewatering will have an effect on the service life of the felts, energy consumption and paper quality.

Assemblies

The machine frame usually has a cantilever system, so that endless felts can be installed relatively easily. The roll arrangement in the press section usually comprises several positions, each consisting of one or more presses and various lead rolls.

A single guiding roll and single tension roll is used for each felt position; an additional spreader roll tends to be used when machine working width exceeds six metres.

Pick-up and suction press rolls have a format setting (Fig.1) as well as an adjustment option for the angular position of the suction box (Fig.2).

Press Nips

A loading mechanism (usually hydraulic or pneumatic) can be used to control the contact pressure of the individual press nips. If crowned rolls are not sufficient to cover the load range, deflection compensated rolls are employed. Soft covers of press rolls, when running with the felt, can cause an increased dwell time in the nip and store the water to be discharged as it passes through.

Doctors and savealls drain the water expressed from the nip out of the press. The water volumes exiting the felts is drained through the vacuum system by suction boxes. Low pressure showers and edge spray nozzles create a lubricating film between the felt and the suction box. High pressure showers help to maintain the permeability of the press felts. The vacuums of the different suction elements can be controlled by an appropriate system. Transmitters are used to monitor dewatering flows online (Ecoflows, for example).

Sheet transfer by pick-up roll

Correctly set end deckles are a pre-requisite for correct functioning of the roll. Only then can the web be reliably and successfully transported into the press section via the pick-up felt, while the two edge trims run with the forming fabric through to the pulper. The angle of the suction box must be adjusted so that the pick-up zone is perfectly in contact with the forming fabric during production (Fig. 3).

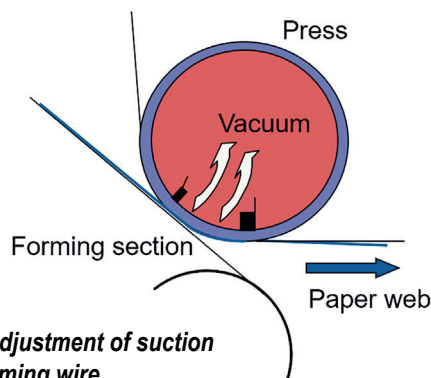


Figure 3: Adjustment of suction zone to forming wire.

There is usually a doctor with a lubricating shower on the back of the roll, which must be regularly checked and cleaned. Some pick-up rolls have an internal HP oscillating shower to clean the suction holes. Meanwhile, below the pick-up roll, a guide roll manoeuvres the bottom felt to the paper web. The felts are partially saturated with water prior to the nip, so that pressure builds up rapidly upon nip entry. As a result of this squeezed-out water flows freely into the open area of the rolls. At the exit point of the nip, part of the water on the underside of the felt is now thrown off the roll (Fig. 4a + 4b).

Figure 4a: (Below) Good nip dewatering

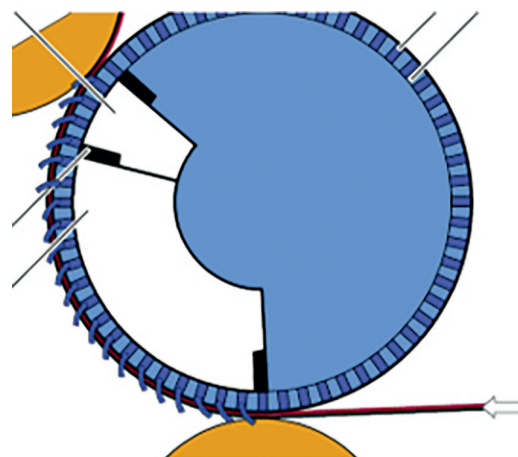


Figure 5: Suction zone setting suction press roll.

Characteristics of the 1st press

Due to the substantial volumes of water present in this position, and dependent of course on the type of paper being produced, the felt design, roll cover, doctor and saveall must be precisely positioned and matched.

Felt type selection, conditioning and vacuum settings on the felt suction box and suction press roll influence both the dewatering and the running behaviour of the paper web.

The suction press roll is usually equipped with a high-performance cover and has a second press nip with a hard centre press roll. The suction box must be at the correct angle in the run direction in order to cover both nips (Fig. 5 above).

A steam blow box is frequently located on the outside of the suction press roll between the first and second nip to increase sheet temperature. By using saturated steamwater, viscosity in the paper web is reduced making dewatering more efficient in the subsequent nips. When a zone-controlled steam box is incorporated, the cross machine profile of the sheet can be regulated.

Correctly adjusted end deckles ensure that no leakage occurs and that steam passes through the felt into the suction box. Otherwise, this could cause damage to both felt and roll cover. Furthermore, precisely aligned deckle positioning prevents the edges of the sheet from being negatively affected (Fig. 6 above right).

Figure 4b: (Below) Insufficient nip dewatering.



Practical Tip

Press felts perform best with an optimum saturation level of around 50% water content relative to felt weight. So for example, if the felt weight is 1600 gsm the water content before entry into the nip should be around 800 gsm.

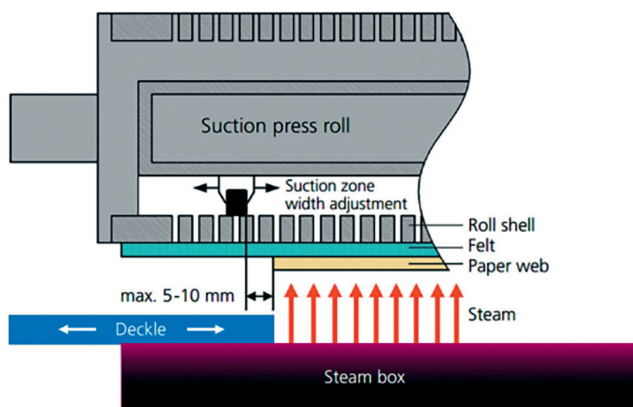


Figure 6: Correctly positioned deckles on the suction press roll.

Critical point: Sheet release from the centre roll

The centre press roll generally has a ceramic cover with well-defined roughness and hydrophilic properties. The third press tends to be designed as a shoe press with grooves in the belt providing the storage volumes necessary for water to be successfully discharged. With the aid of a shoe press it is possible to create an enormous impulse, which in turn allows the sheet to have the highest possible dry content on leaving the press section.

Of great importance in the context of sheet transfer into the dryer section is the double doctor system installed on the centre roll. On the one hand this acts as a dynamic seal that prevents fibres from passing through and thus causing breaks. On the other hand, the interaction of the lubrication and cleaning spray pipes, and first and second blades ensures a constant Ra (roughness) value of the roll surface – usually with Ra values between 0,6 and 1,0. If these conditions are respected, there is nothing standing in the way of reliable sheet transfer with minimum web tension and subsequently low break frequency.

Single 4th press – with bottom felt only

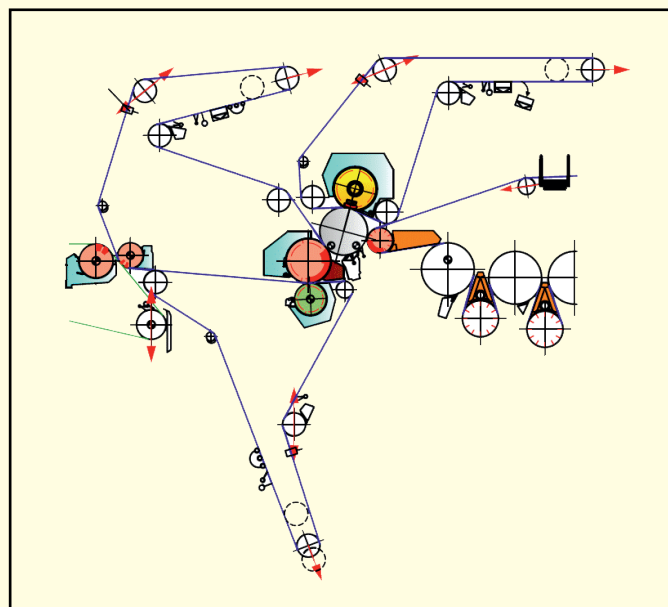
The bottom roll has a hard, grooved cover. This creates high maximum pressures in the nip with the aim of achieving an even greater dry content after the shoe press. This construction, with its hard nip and design, means that vibration can occur. The vibration can be dampened by re-tensioning the felt.

Tandem shoe press with transfer belt

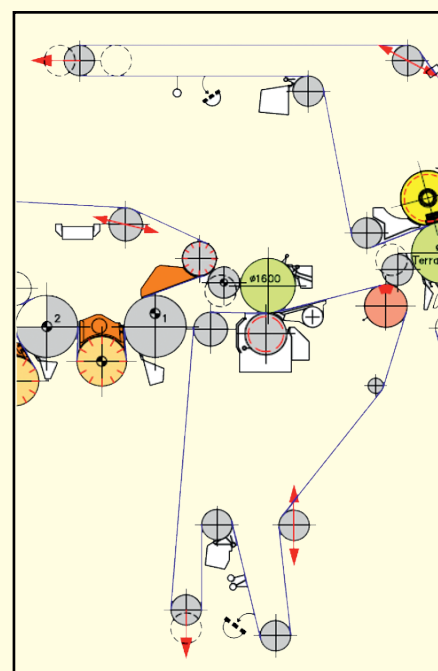
Two successive shoe presses are able to generate a very high press impulse which can create the necessary conditions for high dry content at the exit of the press section with a closed run. As there is no longer any free sheet tension during transfer into the dryer section, higher production speeds can be reached.

In the run-up to a section audit, the Heimbach TASK team defines tasks and objectives together with the customer. Some of the aspects that are important in the press section have been explained in this article. Other issues such as cleanliness and maintenance of dewatering elements also play a key role in terms of efficiency in the press section.

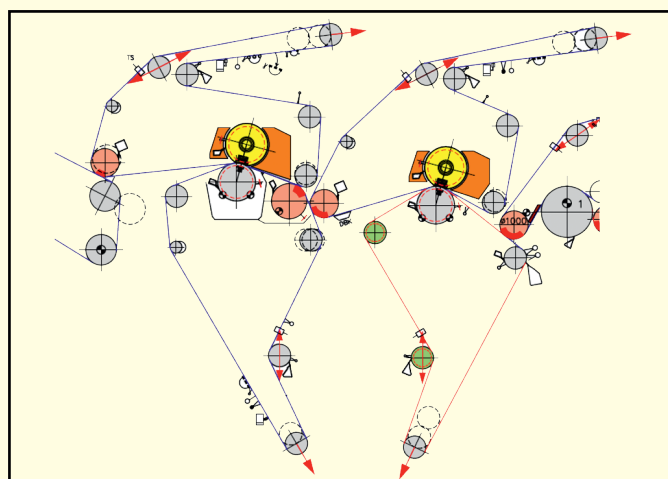
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Tri-Nip with 3rd shoe press.



Single 4th press – with bottom felt only



Tandem shoe press with transfer belt