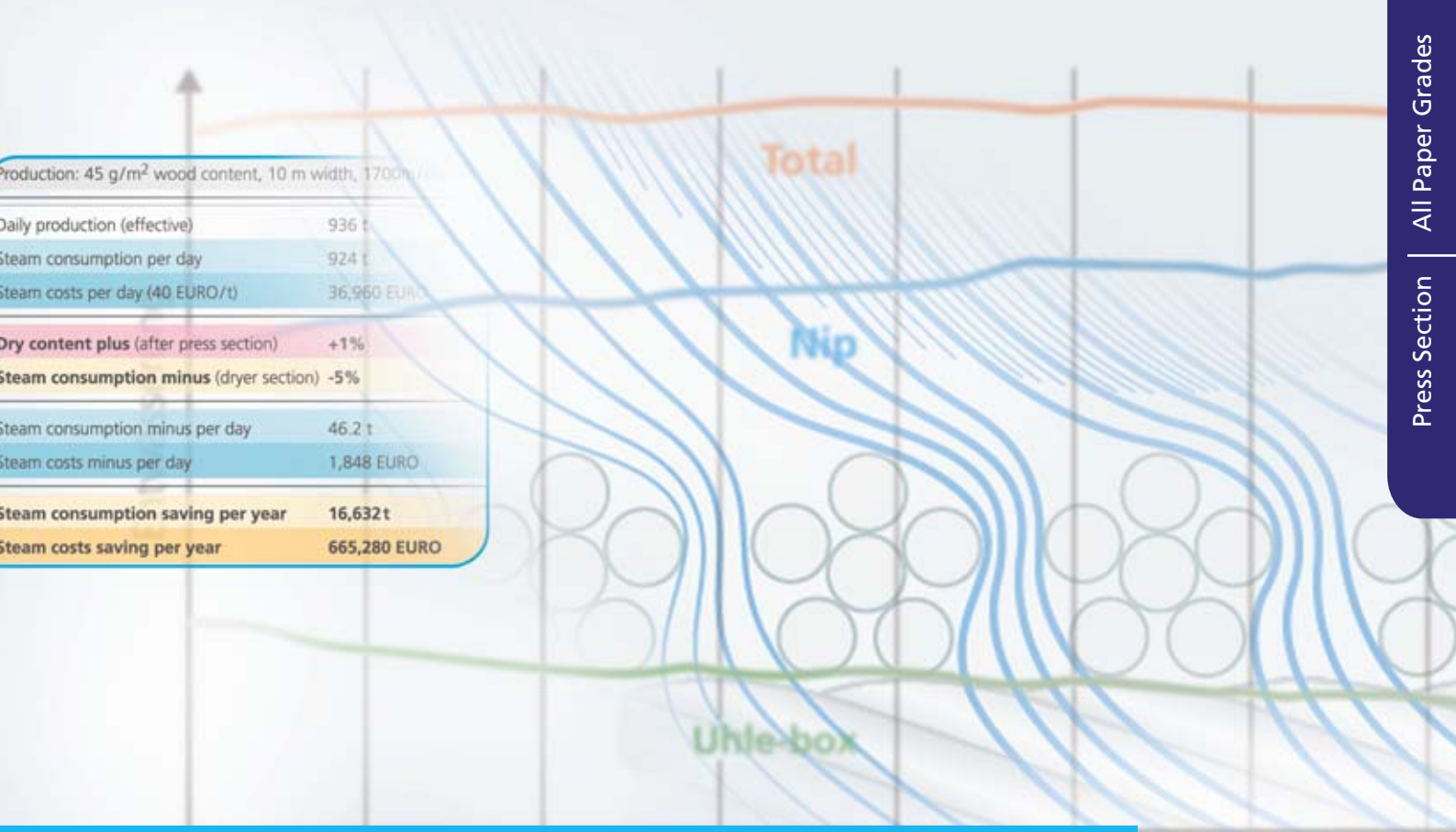

Press Release

"Energy saving" – the contribution of the press felt

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"Energy saving" – the contribution of the press felt

Preface

The ecological and economic effects of world wide energy consumption are well known. The following article describes ways to reduce these effects on the paper machine. Here Heimbach refers to possibilities relating to the construction and installation of clothing – in this case particularly press felts.

Obviously there are also possibilities for energy saving with forming and dryer fabrics. Relevant sources of information on these from the Heimbach Technology Pool are listed briefly at the end of this article.

The subject of energy consumption in the paper machine inevitably puts the dryer section in the foreground. The following contribution will, however, highlight connected energy-relevant factors in the field of press dewatering and press clothing. Their significant energy-saving potential are perhaps not yet, or not yet fully, recognised, since their success is only "indirectly" recognisable and measurable. Example: the "indirect" influence on steam consumption in the dryers or on power consumption by vacuum pumps and drives.

The fact that "energy saving" also means "cost saving" is unarguable. The contribution of Heimbach press felts is to combine both factors simultaneously with an improvement in paper quality.

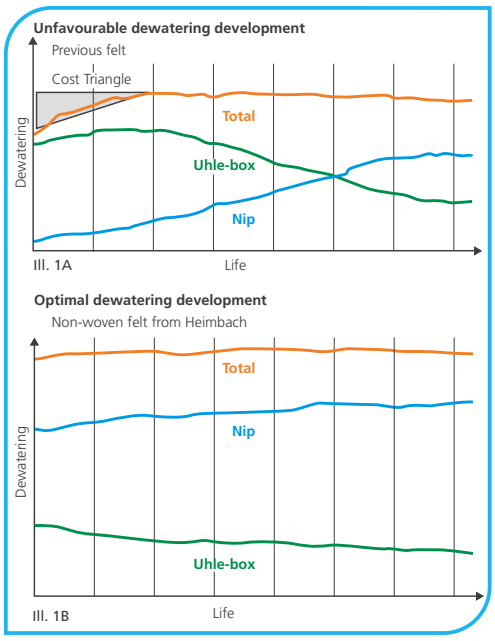
Facts on dewatering

Already in the start-up phase of a paper machine a substantial amount of energy can be saved. In very many cases press felts require 2-3 days to develop their dewatering potential. In the case of the measurement shown in Ill. 1A (newsprint) only Uhle-box dewatering could be achieved in the start-up phase owing to the large void volume of the (woven) felt installed. The Uhle-boxes operating at high vacuum levels are removing most of the water from the felt at a reduced start-up speed. As a result the felt is entering the press nip with too low saturation and the dewatering pressure in the nip is insufficient to remove the high water volume (saturation and the sheet) from the felt immediately after the nip. Instead the inadequately saturated felt merely "enriches" the water volume from the sheet. This remains in the open voids of the felt and can only be removed by the Uhle-box. In addition the risk of rewetting is increased. This might apply not only for the start-up phase but for the whole felt life.

If the speed is to be increased and the dewatering improved, the felt must enter the nip with a higher level of saturation. For this a modification to the dewatering system is necessary.

Uhle-box dewatering or Nip dewatering?

At current high speeds there is not sufficient time available for adequate Uhle-box dewatering. Example calculation: At a speed of 1800 m/min with two Uhle-boxes each with 15 mm slot width the total time for dewatering amounts to only 2 milliseconds. In this short time the water has to be removed at a 90 degree angle from the horizontally running felt into the Uhle-box slots, and this at an air velocity (in the slots) of only 10-15 m/min.



Ill. 1 Elimination of "Cost Triangle"

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In order to achieve this type of felt dewatering satisfactorily more than two Uhle-boxes and extremely high vacuum levels would be necessary. The result would be even higher energy consumption and that without any increased dewatering. Based on a normal vacuum figure of 50 kPa in the two Uhle-boxes a "dewatering pressure" of only 3 kN/m would be obtained.

Comparison: with 75 to 1200 kN/m the dewatering pressure in the nip is 25 to 400 times greater. This effectively answers the question of dewatering on high speed machines in favour of nip-dewatering. The Uhle-boxes are then – at a significantly reduced vacuum level – used for residual dewatering and felt conditioning.

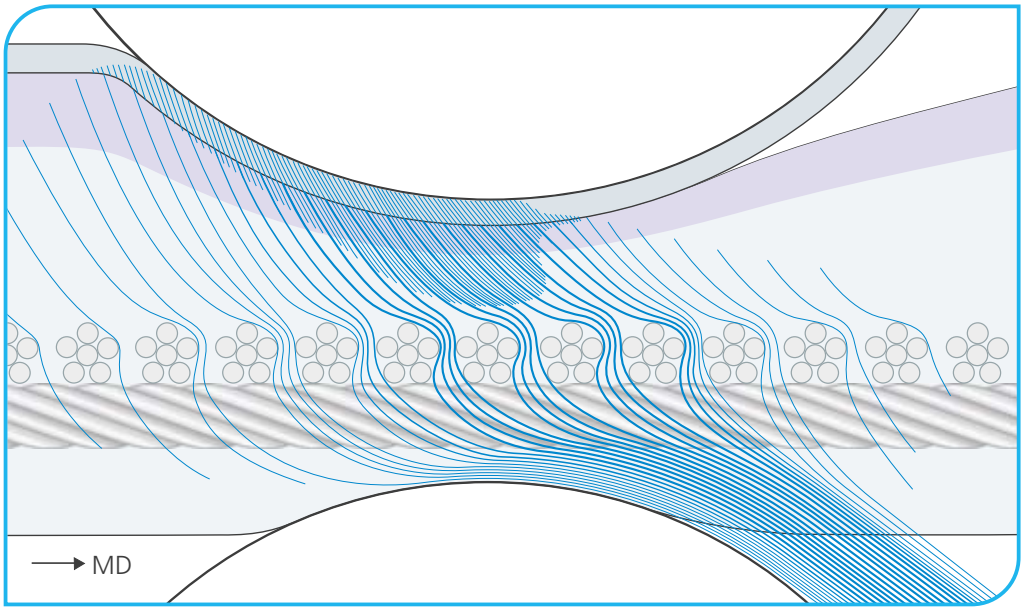
Nip dewatering –
a range of Energy saving possibilities

The achievement of optimum nip-dewatering requires appropriately constructed press felts: high permeability combined with low open void volume, highly active water removal from the sheet and fast unhindered water flow through the felt. To achieve an immediate high start-up speed the felt must already prior to installation have its (later) working permeability programmed into it.

Such press felts combining all these characteristics are the non-woven ATROCROSS substrate felts from Heimbach. The prerequisite for their basic advantages is that there is no yarn system in the Z-direction and therefore no weave knuckles. Furthermore the base is composed of non-woven yarn substrates, which combined with the batt surface lie flat over one another in cross- and machine-directions (Ill. 2). The special feature of the base is that the paper side layer is aligned in the cross-direction. In this way the CD yarns function as "microfoils", which scrape up the water fast and intensively from the sheet into the interior of the felt (Ill. 2). This provides a high level of felt saturation and reduces rewetting. For all these reasons the Heimbach non-woven felt has proved to be both an extremely fast starter and an unambiguous nip-dewaterer – and at the same time an active "Energy Saver".

Energy advantage from fast start

The dewatering measurement (Ill. 1B) of such a non-woven felt in the same position as shown in Ill. 1A shows in comparison a significantly higher nip-dewatering from the start and therefore a much higher total dewatering. This means that the felt can be started with almost immediate maximum operating speed.



Ill. 2 Non-woven felt: Nip-dewatering

"Energy saving" – the contribution of the press felt

The disappearance of the "Cost Triangle" shown in Ill. 1A indicates both production gains and energy savings. If, for example, an 11 m wide newsprint machine (42 g/m^2) can run 100 m/min faster as a result of optimal start-up dewatering, it would achieve an additional production during the start-up phase of about 66.5 tonnes per day. The consequential energy advantage: despite higher production virtually unchanged steam consumption in the dryers.

Energy saving through higher total dewatering

Although the dryer section removes the smallest amount of water from the sheet, it consumes by far the greatest amount of energy in the paper machine. The proof that this most costly component can be reduced is seen in the case of a non-woven felt from Heimbach on an SC Machine (Ill. 3). The apparently small dry content increase of 1% resulting from a clothing change in just one position resulted in an enormous energy saving over the course of a year.

Outcome: With maximum steam efficiency the 1% higher dry content brings 4% more production. Possible increased turnover per year: 8 million Euro.

Energy advantage through reduced break frequency

The faster the paper machine runs, the more important is the role of nip-dewatering. The long term trend for the above mentioned SC Machine shows over several installations of the previous felts relatively constant curves for tension, total dewatering, Uhle-box and nip-dewatering. After installing the non-woven felt, which dewatered predominantly in the nip, the increased total dewatering led to a reduction in break frequency (Ill. 4) and better energy utilisation, for example steam usage in the dryers (Ill. 3).

In total the change over to nip-dewatering and the resulting increase of "dewatering efficiency" produced a whole range of process advantages, which are documented both in steam saving (Ill. 3) and additional production (Ill. 4).

Energy advantages and savings through reduction in Uhle-box vacuum

A wide variety of installations proves that an optimally functioning nip-dewatering permits, or rather requires, the reduction of Uhle-box vacuum throughout the whole life to about 20-40 kPa and initiates far reaching energy advantages and savings.

Energy advantage through reduced felt wear

The higher the Uhle-box vacuum the more intensively the felt is pulled into the suction slots. Although this drag is minimal the braking effect on the felt causes increased wear through friction against the slot edges combined with increased wear on the driven rolls of the press section. The result is more frequent felt changes and more frequent shuts.

Production: 45 g/m^2 wood content, 10 m width, 1700m/min	
Daily production (effective)	936 t
Steam consumption per day	924 t
Steam costs per day (40 EURO/t)	36,960 EURO
Dry content plus (after press section)	**+1%**
Steam consumption minus (dryer section)	**-5%**
Steam consumption minus per day	46.2 t
Steam costs minus per day	1,848 EURO
Steam consumption saving per year	**16,632t**
Steam costs saving per year	**665,280 EURO**

Ill. 3 Energy saving: Higher dry content, lower steam consumption

Production: 45g/m^2 wood content, 10 m width, 1700m/min	
Production per hour (effective)	39.0 t
Steam consumption per hour	38.5 t
Steam costs per hour (40 EURO/t)	1,540 EURO
Dry content plus (after press section)	**+1%** (=increase of 2.04%)
Wet tensile	**increase of 6%**
Breaks minus	**97 per year**
Time gain (20 min per break)	32.33 hours per year
Increased production (39 t / hour)	**1,260t / year**
Increased turnover (590 EURO per t)	**743,400 EURO per year**

Ill. 4 Energy advantage: Reduced break frequency, increased production

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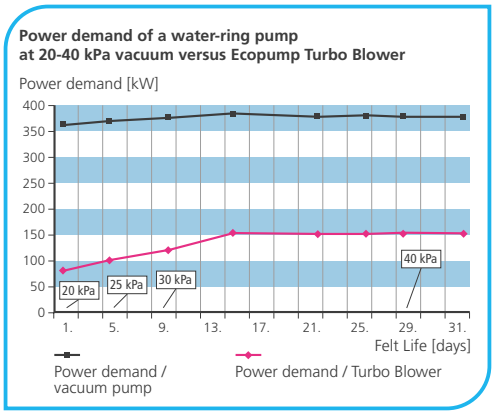
Positive in the opposite sense – the consequences of a well functioning nip dewatering as a result of lowering the Uhle-box vacuum – are exceptional energy advantages. By reducing felt changes and gaining production time energy is better utilised. The value of this is to be found in the value of the extra production which for one year for example can be calculated as follows: 2 additional production days at 1000 tonnes, paper price per tonne 600 Euro, increased turnover per year 1,200,000 Euro.

Energy saving through lower power consumption

Also relevant to energy is the fact that there is scarcely any braking effect on the felts following reduction of Uhle-box vacuum, which in turn reduces the power demand on the roll drives. In some cases of optimal nip-dewatering and the better felt cleaning which results the vacuum from one or more Uhle-boxes can be cut out completely. In such cases drive power demand is further cut.

Through a controlled reduction of Uhle-box vacuum down to 20-40 kPa all associated energy costs can be reduced. Example: A Uhle-box was connected to an old water-ring pump, the motor of which required 350 kW and which consumed annually about 200,000 m^3 of sealing water.

For comparison: In the measurement shown in Ill. 5 an Ecopump Turbo Blower (controlled revolutions)



Ill. 5 Power saving through reduced vacuum level

with a vacuum range of 0 – 70 kPa was attached to the felt. At a vacuum level below 40 kPa during the whole felt life enormous energy and other savings could be made. Vacuum energy savings 2,256 MWh (~ 0.06 Euro/kWh) = Euro 135,000.

Additional savings:
Water 200,000 m^3 (no sealing water required), lower felt costs (less felt wear), fewer felt changes, reduced power consumption for press drive owing to reduced vacuum.

Summary

The points raised in this paper highlight the extreme complexity of the subject of energy on the paper machine. No individual fact can be considered alone, no relationship without another relationship, no result that is not based on another result. This explains why a serious quantification of savings, freed from other influences and purely energy related, is so difficult to obtain.

One thing however is certain: The answers to energy questions in the press section are substantially determined by the clothing and the dewatering systems that it makes possible. Heimbach is pleased that with this contribution and its clothing it has been able to contribute a little to the very necessary reduction of energy consumption.

(Further information on the subject of energy can be downloaded from the Internet: under the following headings: under Download: Press Releases: Improved runnability for higher economic efficiency, Cost reductions on packaging grades by optimised utilisation of fabrics and felts, under TASK Info: Press Section: Influence of Vacuum Capacity on Press Concepts, The Exit Angle in the Tri-Nip Press Section, under TASK Info: Dryer Section: Influence of position of the zero point on drying, Trouble Shooting in the Dryer Section, How can the efficiency of the dryer section be increased? – All TASK Infos can also be obtained in hard copy from Heimbach in German, English and French.)

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