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PRESS FELTS CONDITIONING

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Summary

Felt conditioning can get written into a strategy of paper sheet quality quite naturally, due to the direct effect it can have on dewatering characteristics; and, secondly, on the maintenace of these characteristics.

Today, conditioning by suction boxes is to be found everywhere. The size of the unit must be chosen with great care, since the final elimination of water from the paper sheet is related to the water transporting capacity of the felt, which itself is a function of the felt's structure.

Felt cleaning is another important role. This goes along with the necessity for rinsing, the actual tendency of which is to improve the uniformity of the result with less cost in water and energy.

A felt conditioning which is either insufficient, or excessive, can have negative results. To get it right, it must form part of the permanent watch over the machine since it is such an important factor in machine exploitation.

1. Felt conditioning can get written into a strategy of paper sheet quality quite naturally, due to the direct effect it can have on dewatering characteristics and, secondly, on the maintenace of these characteristics.

Different Methods Of Conditioning:

* Plain wringer press
* Suction wringer press
* Blowing roll
* Suction box

Of these, only the suction box can regulate the quantity of water transported in the felt as well as the cleaning of the felt whatever the felt structure.

Objectives Of Conditioning:

1. to participate in the work of the paper-sheet drainage
2. to maintain the felt in good condition.

Conditioning is not an end in itself.

2. Today, conditioning by suction boxes is to be found everywhere. The size of the unit must be chosen with great care, since the final elimination of water from the paper sheet is related to the water transporting capacity of the felt, which itself is a function of the felts' structure.

Under the effect of wear and plugging a felt can lose its thickness becoming a compact mass. This matter finds its way into the more or less compressible void volumes.

1 To obtain large void volumes in the compressed state, the felts which are being developed today possess base cloths which are becoming more and more complex. All felts will eventually lose their void volume and become compact, but modern felt structures are being noted for their slower rate of compaction.

The water which is being permanently transported in the felt occupies a part of the available void volume. Without conditioning, water would rapidly fill up the whole felt.

On the other hand, the quantity of water present in the felt coming ut of the nip is always higher than when it went in, when considering only the void volume occupied in relation to the total volume available as the felt passes mid-nip position.

The difference, which is of the order of 5% for felts which are entirely made of staple fibres, can go upto 25% for felts made with complex monofilament base cloths. This is explained by the drainage which takes place in felt plane.

In the nip, water runs more quickly than the press speed. This is particularly true for nips where the drainage is regulated by nip pressure. When its a question of heavily loaded presses with hard rolls and susceptible to vibrations, there is a definite advantage in reducing this drainage in avoiding saturated nip conditions.

In the case of "shoe" presses there is practically no water flow in the felt plane, and in this case the water taken up throughout the nip must have been totally lodged in the compressed felt structure.

These presses won't run without an efficient conditioning.

Some Qulitative Observations About on Boxes

*** Suction And Slot Area Constant**
With increasing dwell time over the box air flow through the felt increases and the felt humidity decreases

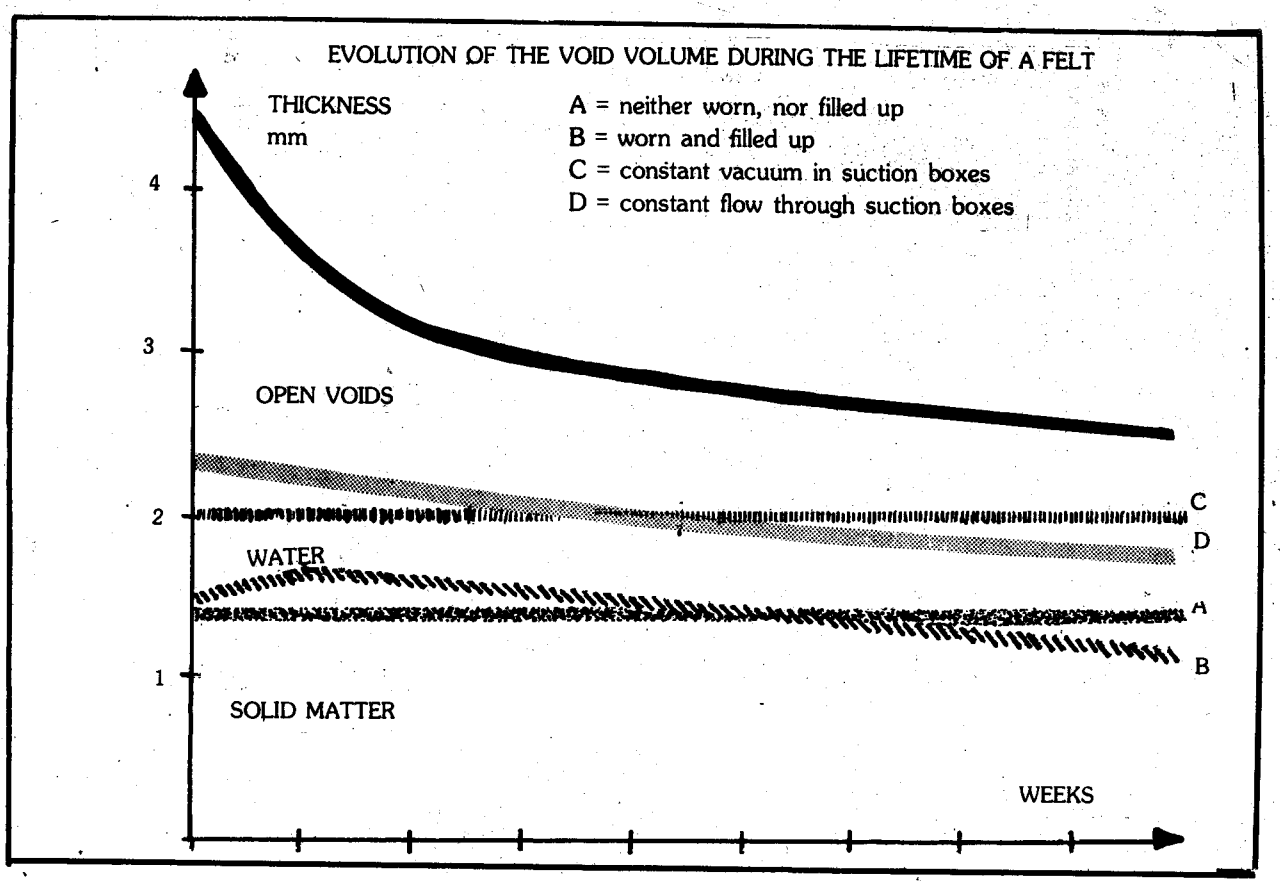
*** Machine Speed Constant**
The vacuum level is more important than the time it is applied.

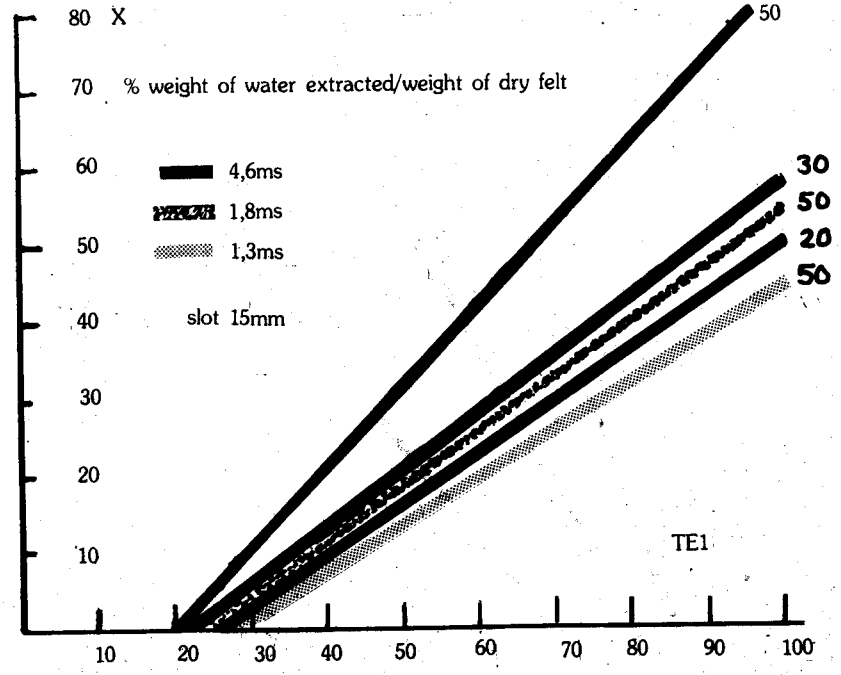
*** Speed And Slot Area Constant**
With increasing vacuum, air flow through the felt increases and felt humidity decreases.

*** Machine Speed, Vacuum And Slot Area Constant**
An increase in felt humidity before the suction box increases felt humidity after the box.

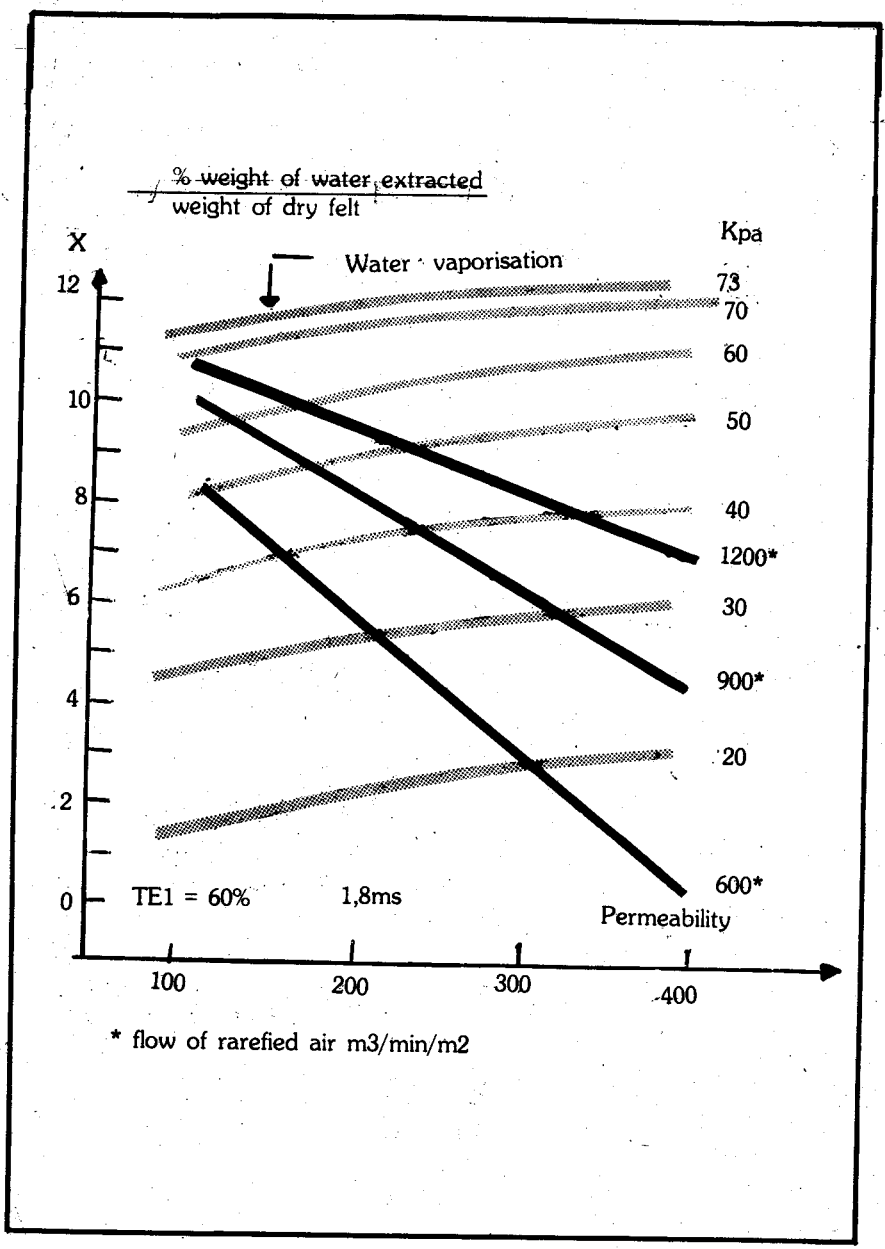
Factors Regulating Water Extraction Over Suction Boxes

O	**TE1**	= water content of felt before the box
O	**PF**	= Felt permeability
O	**VA**	= vacuum applied
O	**TA**	= time of application
	TEI	= depends on felt compressibility and nip loading
	TA	= depends on machine speed and total slot areas


EVOLUTION OF THE VOID VOLUME DURING THE LIFETIME OF A FELT
THICKNESS
mm
A = neither worn, nor filled up
B = worn and filled up
C = constant vacuum in suction boxes
D = constant flow through suction boxes
4
3
2
1
OPEN VOIDS
WATER
SOLID MATTER
C
D
A
B
WEEKS



1000 g/m2 felt having a monofilament base cloth


% weight of water extracted
weight of dry felt
X
Kpa
Water vaporisation
12
10
8
6
4
2
0
73
70
60
50
40
1200*
30
900*
20
600*
TE1 = 60%
1,8ms
Permeability
100
200
300
400
* flow of rarefied air m3/min/m2

The choice of the vacuum source is based on the common behaviour of the felts and illustrates the necessity of maintaining high permeability-porosity during their aging.

Volumetric pumps show up better for they assure the maximum sweeping effect at the end of the felt's life. Total energy consumption shows up less also, for comparable felt performance.

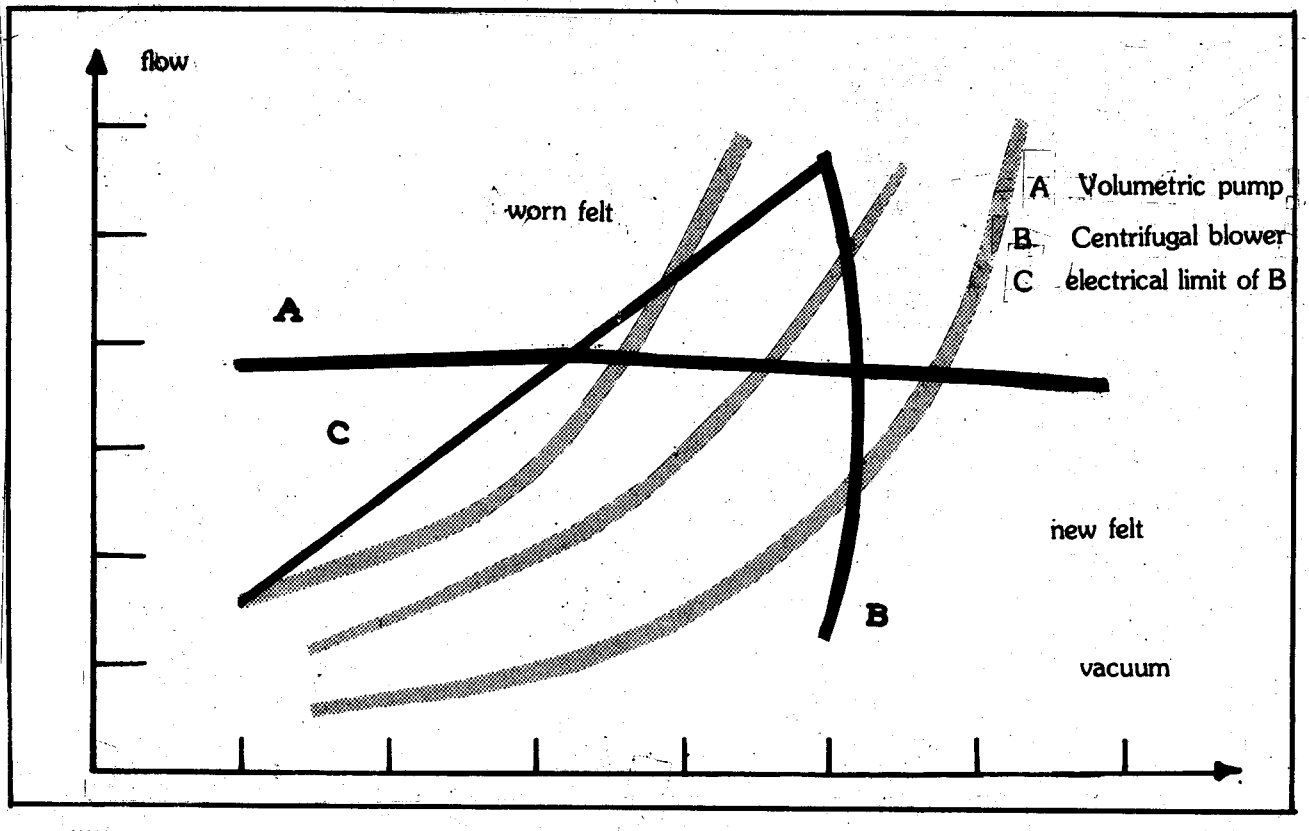
Liquid ring pumps are interesting from the point of view of higher felt and sheet temperature. Water vaporised with less vacuum is more easily condensed. From this fact the air flow is increased.

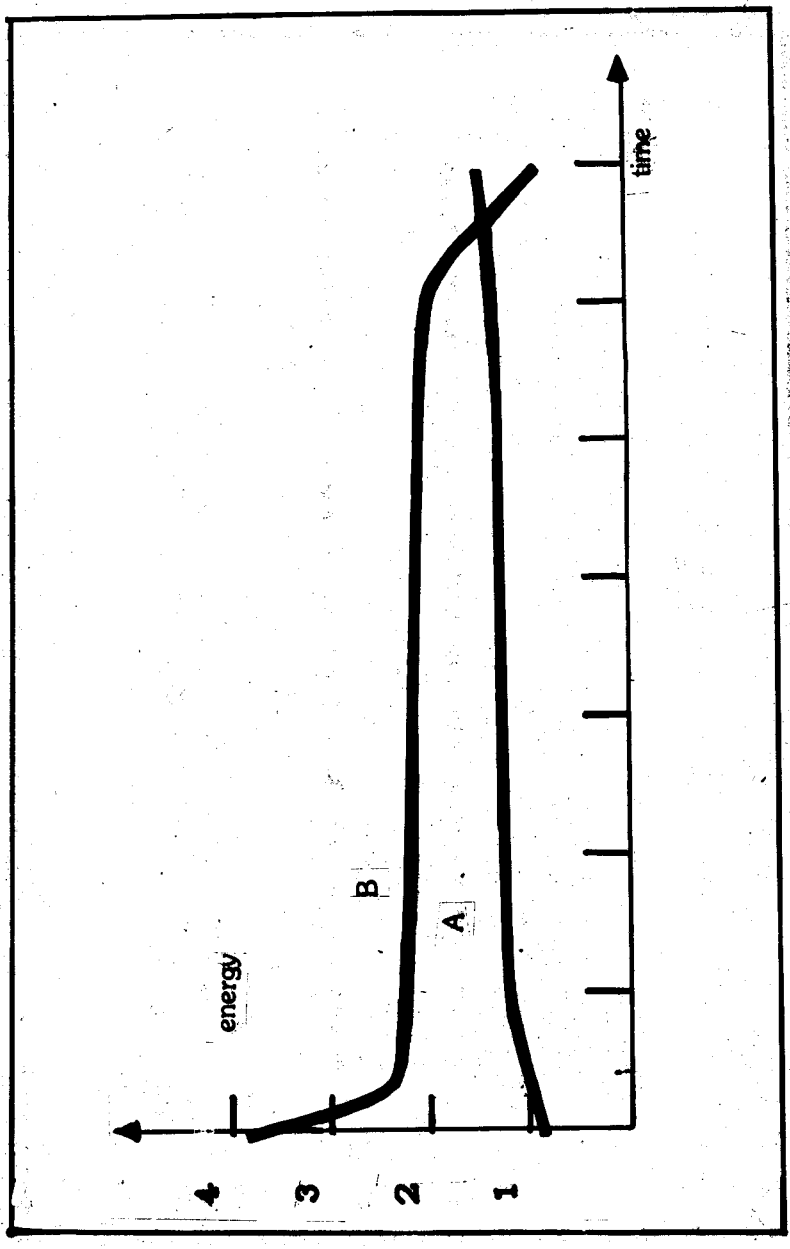
The good sense in investing in one pump per felt cannot be over estimated and leads to the optimum performance of each. Centralised vacuum sources, whilst less costly, lead inescapably to the modification of the felt's quality in a sense opposite to that sought, notable regarding dryness.

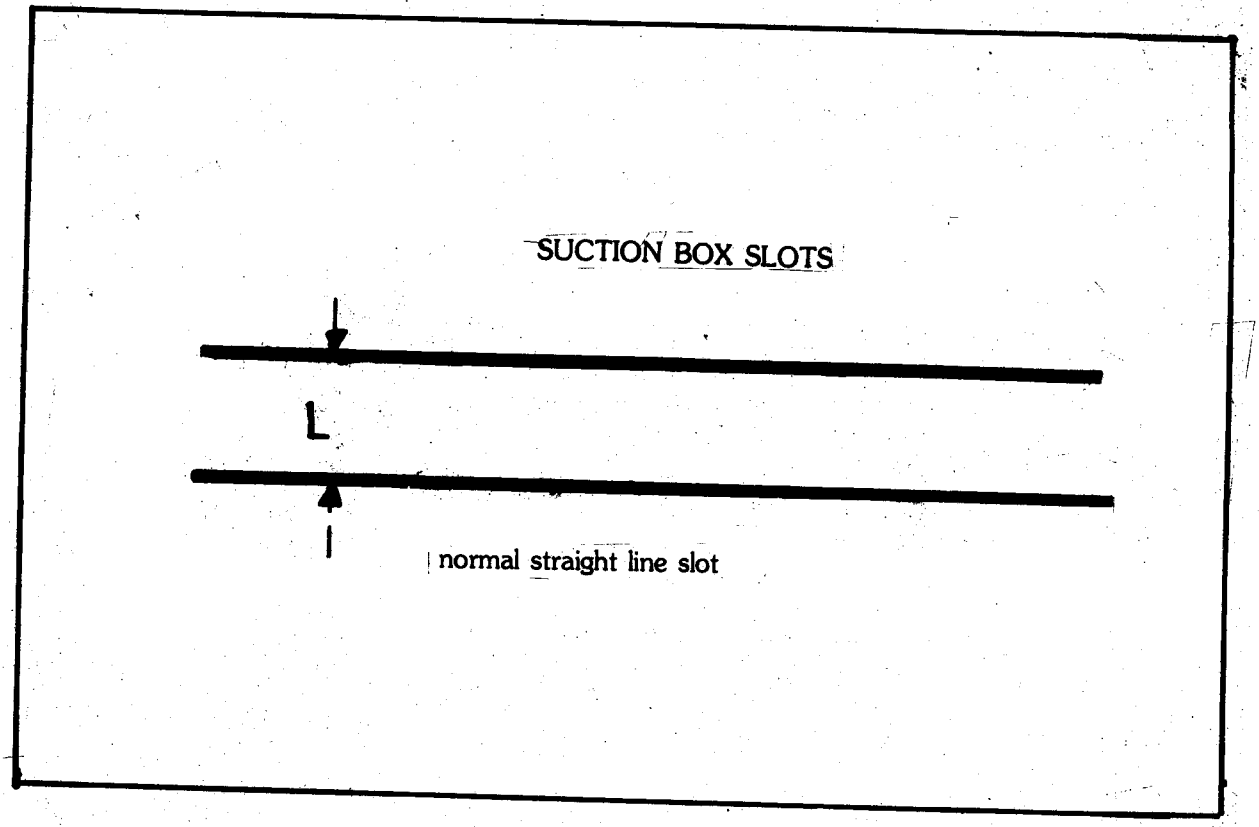
The characteristics which lead to the choice of a suction system can vary as a function of the felt itself.

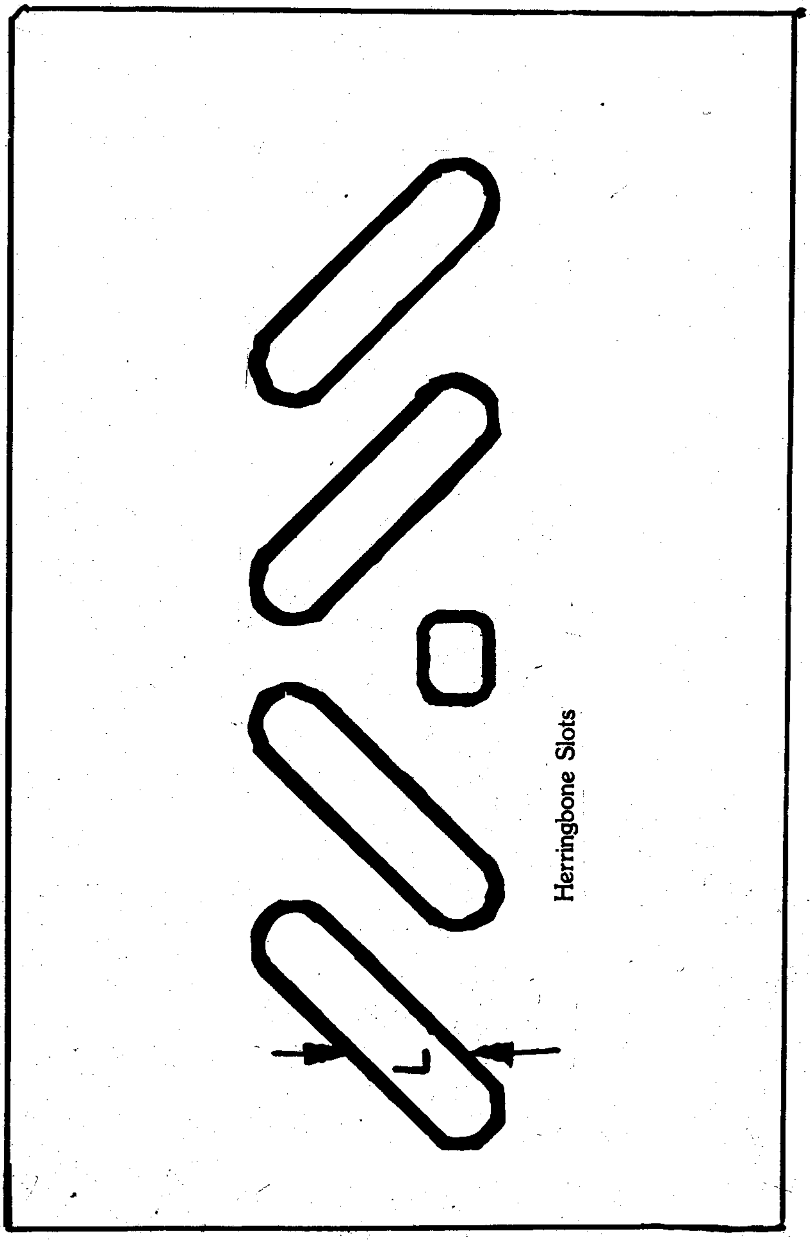
However, modifications only affect the suction box tops in the case where less permeable felts are being used. In total, the installed vacuum will stay appropriate.

The use of seamed press felts seems the to highlight today the use of herringbone suction box slots or slots in a broken line. The method of calculation stays the same when considering the slots in the direction of felt travel.

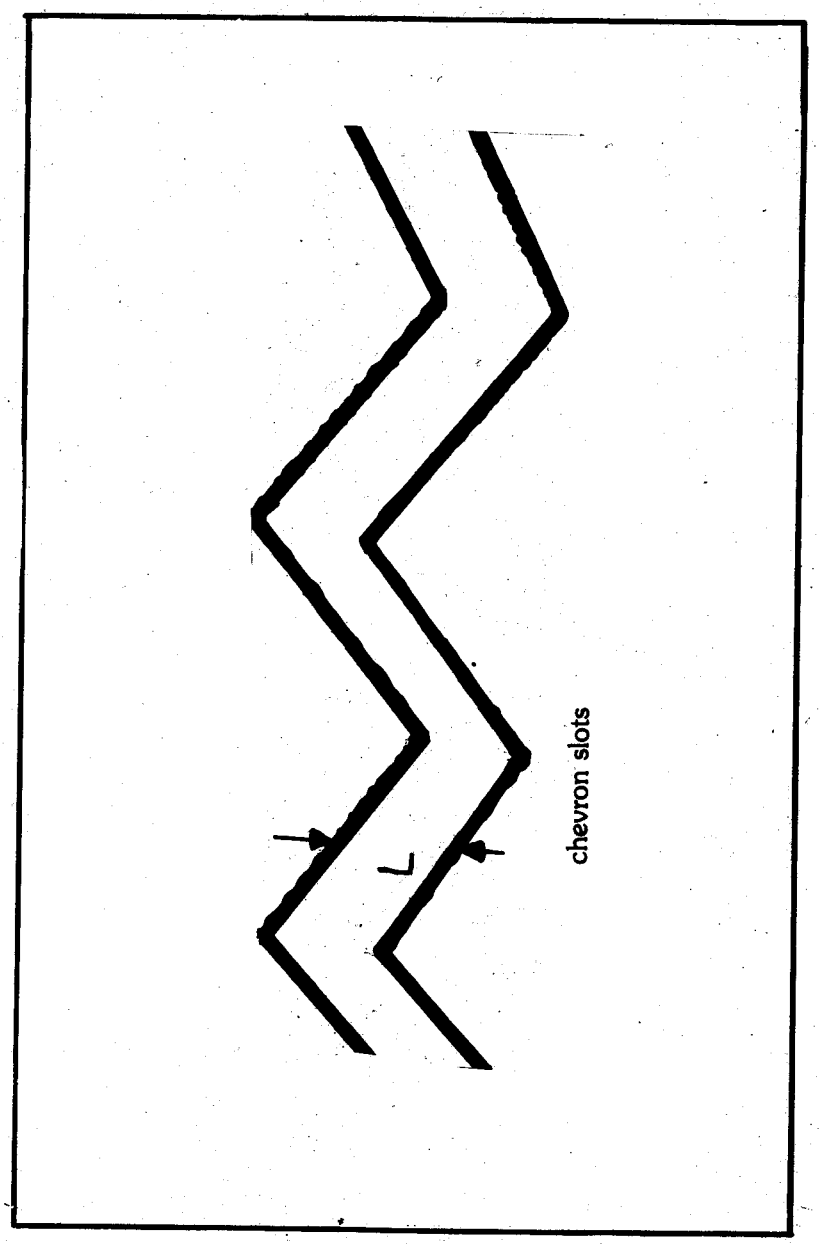

flow
worn felt
A
C
B
new felt
vacuum
A Volumetric pump
B Centrifugal blower
C electrical limit of B


time
energy
B
A
4
3
2
1


SUCTION BOX SLOTS
L
normal straight line slot



Herringbone Slots


chevron slots

Essential Characteristics For Suction Boxes

Felts with monotilament base cloth (p= 500*)
Volumetric suction pump

TIME OF APPLICATION 3ms

(Accumulated width of slots- 5mm/100 M/Min)

VACUUM (KPa)	Minimum	Normal level	Maximum
First positions	25	33	50
End positions	30	40	60

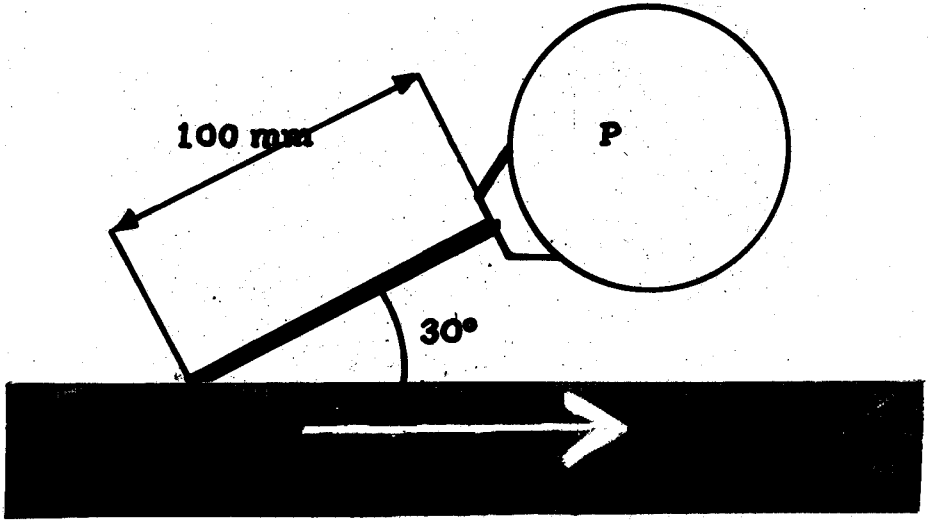
AIR FLOW (RAREFIED) 850 $m^3/min/m^2$

Nº OF SLOTS PER BOX	Minimum	Maximum
	1X8 mm	2X15 mm

Air Speed Through Slot 10 m/s

(* P = Air permeability, new felt
expressed in dm3/min/dm2 under a 200 Pa pressure drop)
(100 $dm^3/min/dm^2$ = 22,3 CFM)

HIGH PRESSURE JETS



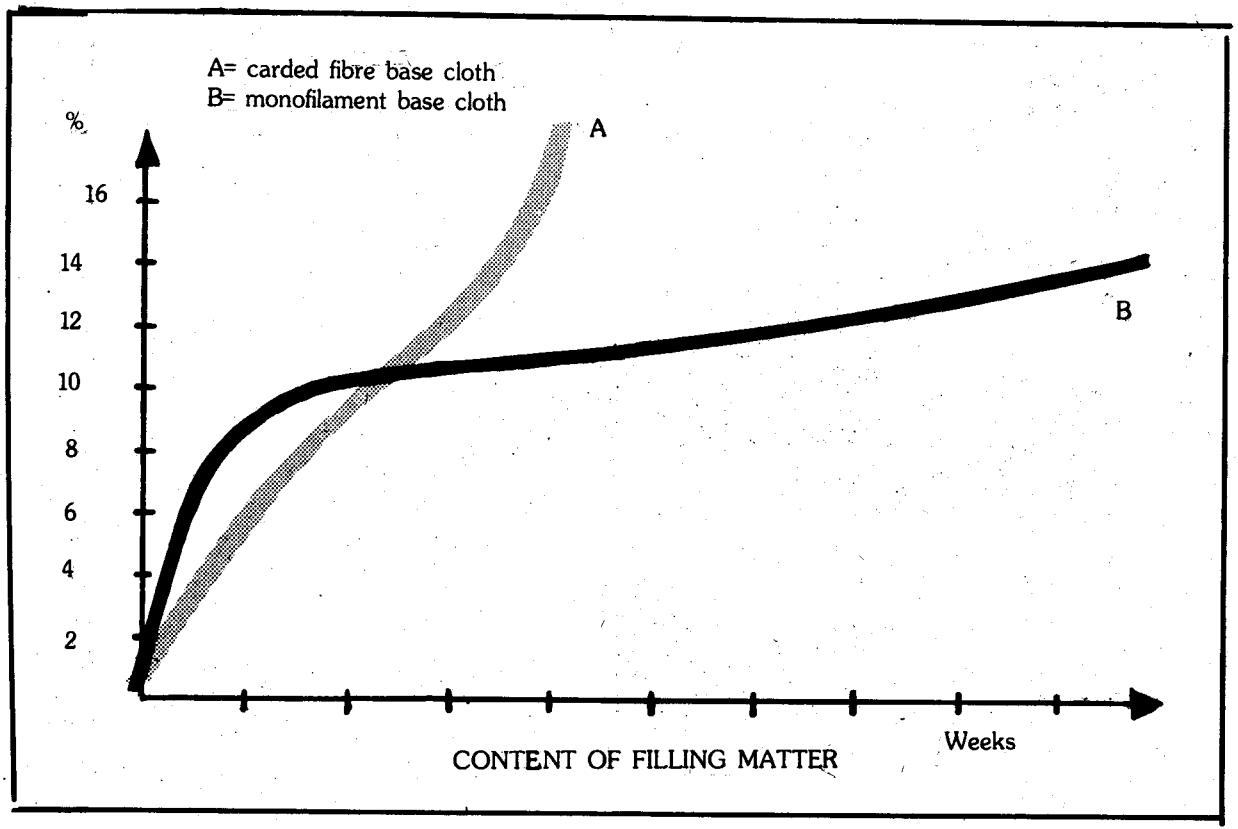
P= 500 a 1500 kPa
Jet nozzle o,8 to 1 mm dia.

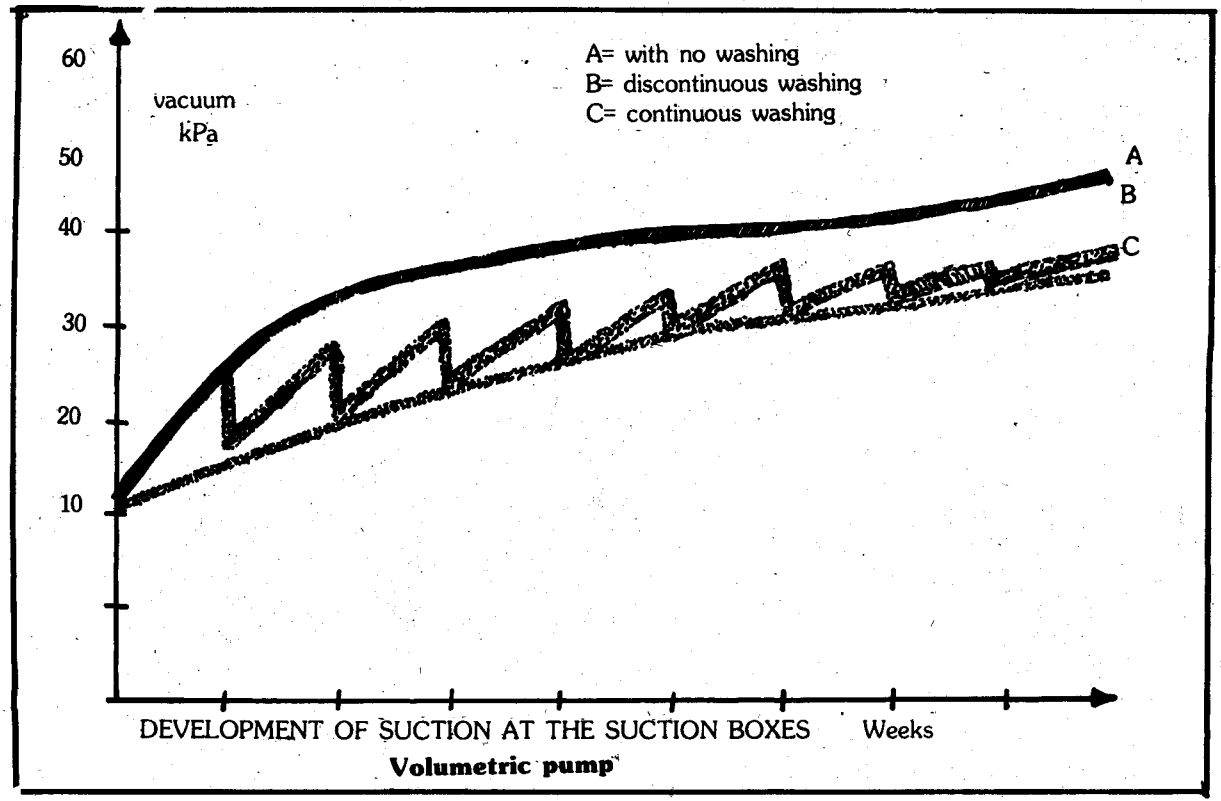
Felt cleaning is another important role. This goes along with the necessity for rinsing, the actual tendency of which is to improve the uniformity of the result with less cost in water and energy.

For this, high pressure sprays were developed. Exaggerated water pressure is useless and it is better to optimise the mechanical installation. Traversing mechanisms eliminate the bad effects of misaligned or overlapping spray patterns.

In the case of plugging by resin, pitch, binders, size and alum it is preferable to do a wash with a solution of 5% caustic soda mixed with 0,25% non-ionic detergent, rather than finding mechanical means to un-plug the felt.

Action to counteract plugging should be promoted right from the beginning of the felt's life. The tendency for filling matters to get lodged in the dead zones of the felt explains the increased rate of plugging.


A= carded fibre base cloth
B= monofilament base cloth
%
16
14
12
10
8
6
4
2
A
B
Weeks
CONTENT OF FILLING MATTER


60
50
40
30
20
10
vacuum
kPa
A= with no washing
B= discontinuous washing
C= continuous washing
A
B
C
DEVELOPMENT OF SUCTION AT THE SUCTION BOXES
Weeks
Volumetric pump

3) A felt conditioning wich is either insufficient, or excessive, can have negative results. To get it right, it must form part of the permanent watch over the machine since it is such an important factor in machine exploitation.

To find the best strategy, and the interpretation of results with the feltmakers, it is best to change the conditioning method during the whole felt's life.

CONDITIONING CHECKS FELT BY FELT :

* Vacuum at the boxes
* Air flow (indispensable in the case of blowers)
* Air flow at source
* Quantity of water extracted
* Quantity of water used to seal the pump
* Shaver operating frequency
* Shaver traversing frequency
* Position of the vacuum seals at the ends of the slot
* Felt humidity profile (easy access?)
* Felt analysis