Sustainability in commercial laundering processes

Module 2
Machine technology

Chapter 4

Dewatering methods

Content

Education and Culture
Leonardo da Vinci

- History of extraction technology
- The 3 columns of extraction technology
- Column 1: Speed
- Column 2: Power
- Column 3: Drainage
- Example of an extraction press: Kannegiesser PowerPress
- Example of a centrifugal extractor: Kannegiesser PowerSpin
- Selection: Field of application for extraction presses and centrifugal extractors
- Saving potentials with modern extraction technology

Learning targets

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After finishing the module you will

- be able to describe the "3 columns of extraction technology".
- know the different fields of application for extraction presses and centrifugal extractors.
- have a feeling for the influence of extraction on the energy consumption in the following drying processes.

History

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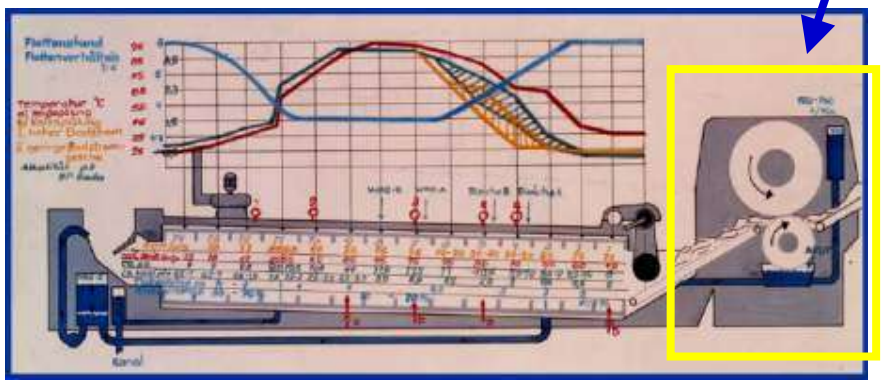
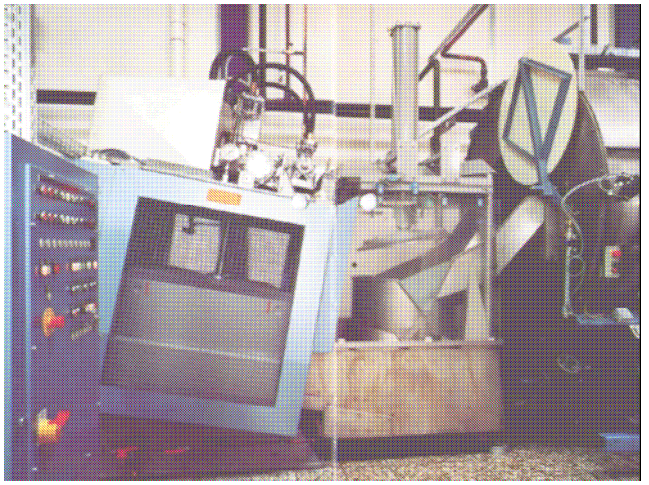
Extraction presses in history

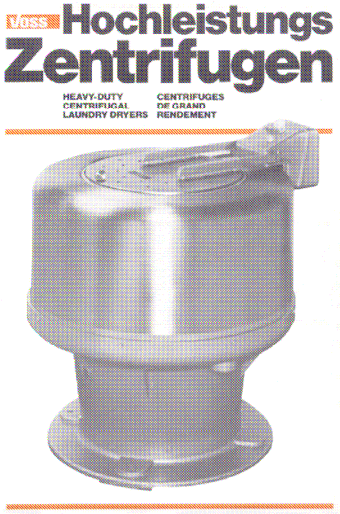
1-stage press

2-stage press

Roller press



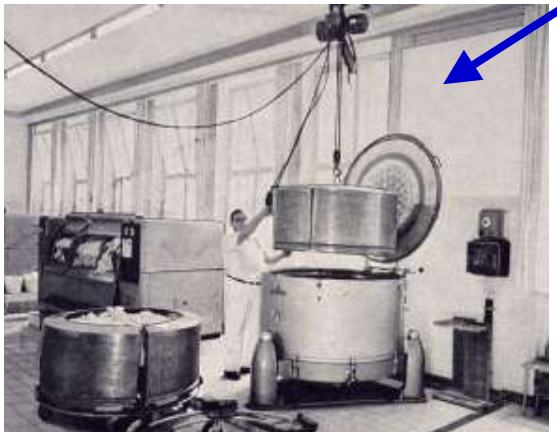




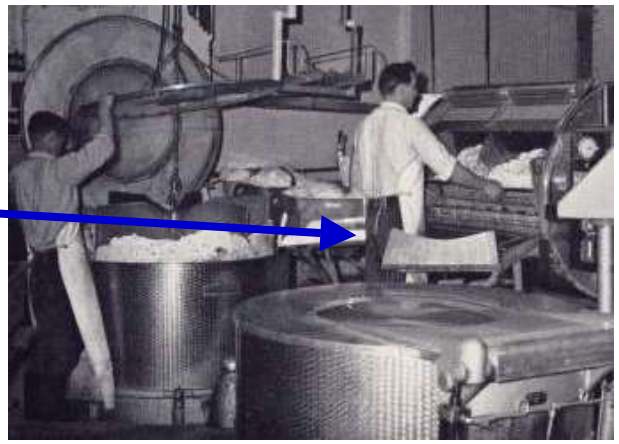
Centrifuges in history

With pneumatic unloading

With crane loading and unloading



With chute loading



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State of the art in extraction technology:

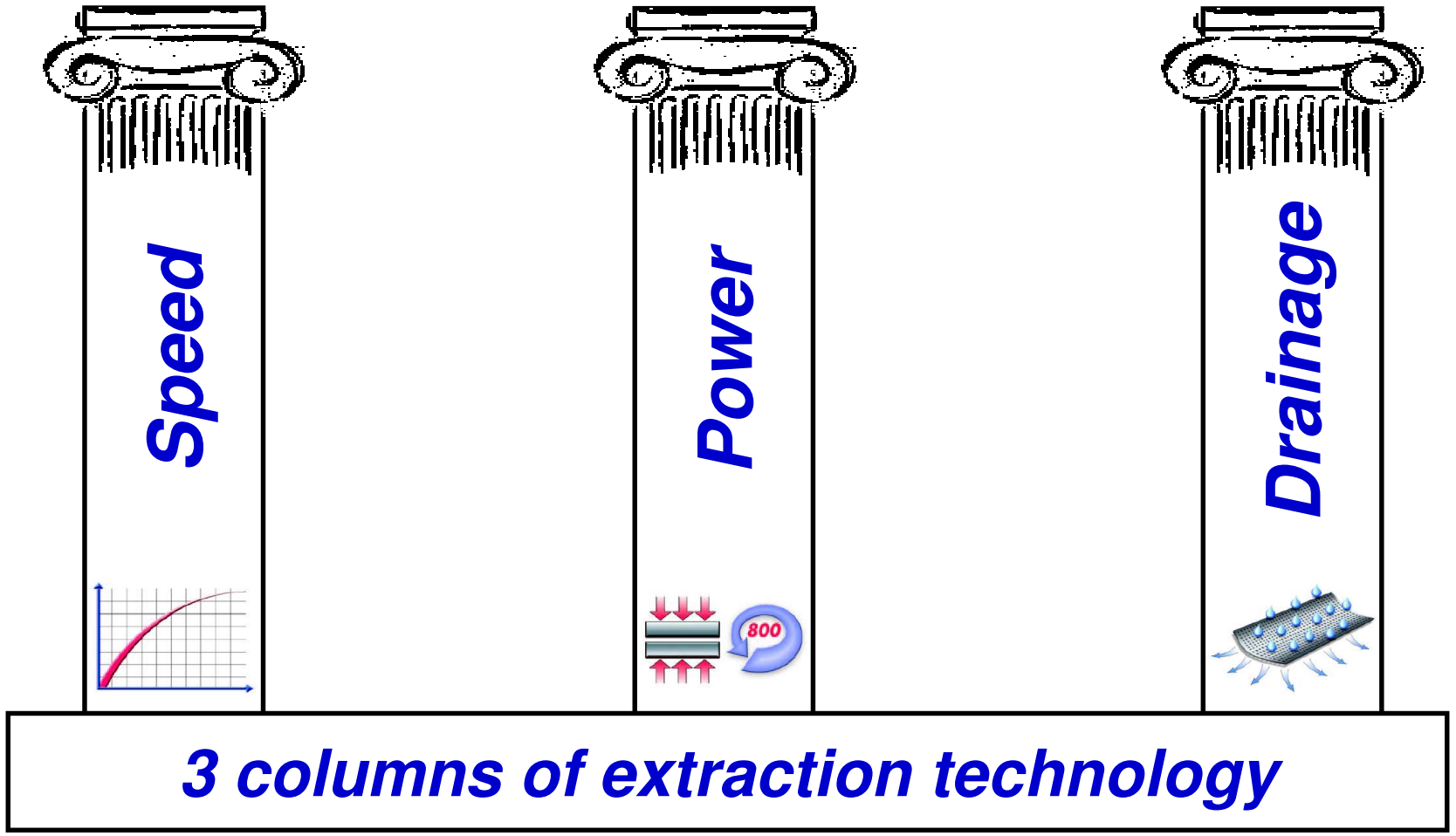
Kannegiesser extraction press type "**PowerPress**"

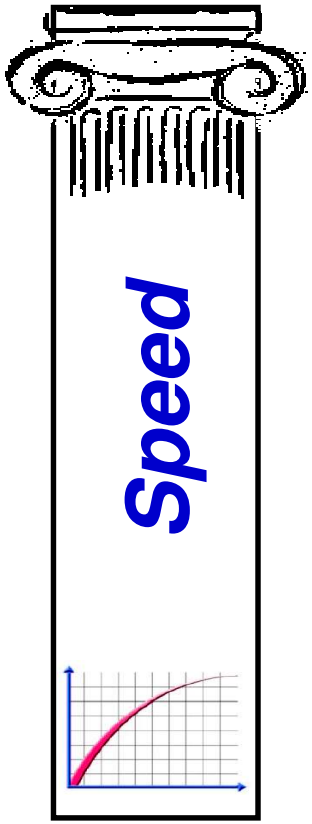
Kannegiesser centrifugal extractor type "**PowerSpin**"

Targets of modern extraction technology:

- **Lower moisture retention** at **higher output**
- Optimum processing of **modern textiles**
- **Energy savings** in the entire working process

3 columns of extraction technology





Concerning "SPEED":

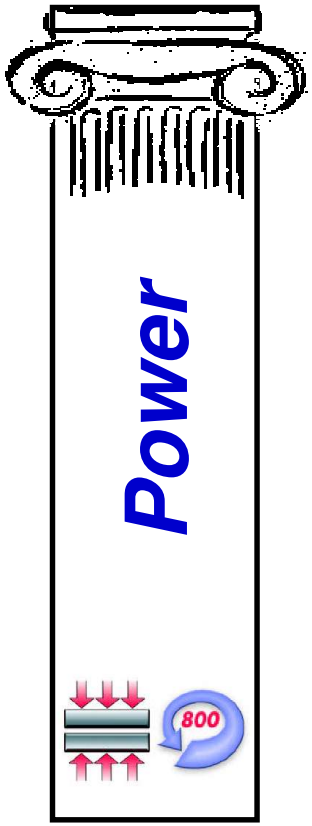
As the available time is limited by the cycle time of the tunnel washer, it is of high importance to **minimize the ancillary times** and to **maximize the extraction times**. Example:

PowerPress turbo-version:

- Only 50 sec. ancillary time
- 40 sec. high pressure with 90 sec. cycle time

PowerSpin turbo-version:

- Only 90 sec. ancillary time for 800 g high speed extraction programme
- 30 sec. high speed with 120 sec. cycle time



Concerning "POWER":

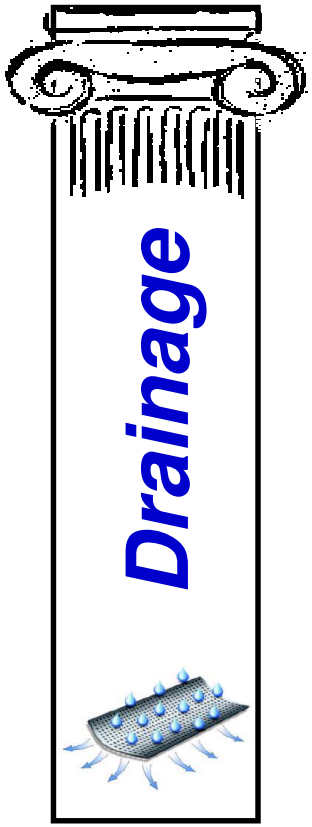
Due to the **cohesion** between textile fibres and water, external forces are needed to extract the water.
Example:

PowerPress:

- High pressure version up to 56 bar
- Medium pressure version up to 40 bar
- Constant monitoring of the real membrane internal pressure

PowerSpin:

- Max. speed up to 800 g
- Still gentle to the textiles, as 800 g correspond to an equivalent extraction pressure of 3 bar only!



Concerning "DRAINAGE":

Fast and powerfull extraction does only work in conjunction with a fast removal of the extracted water. Example for a single stage extraction press:

PowerPress:

- Web-like full plastic conveyer belt running over a simple, large drainage plate
- Free water flows through holes of the press container into the collection tank
- Only the remaining bounded water has to be pressed through the linen

3 columns of extraction technology

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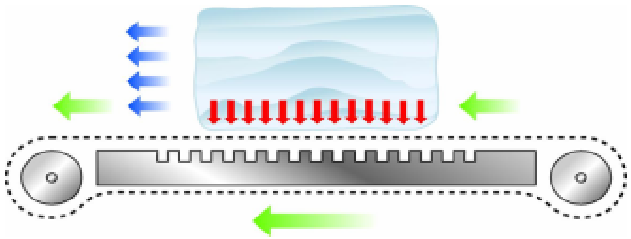
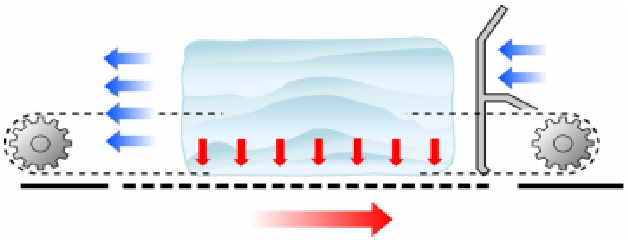
Comparison: Belt running over drainage plate vs. perforated plate with pusher



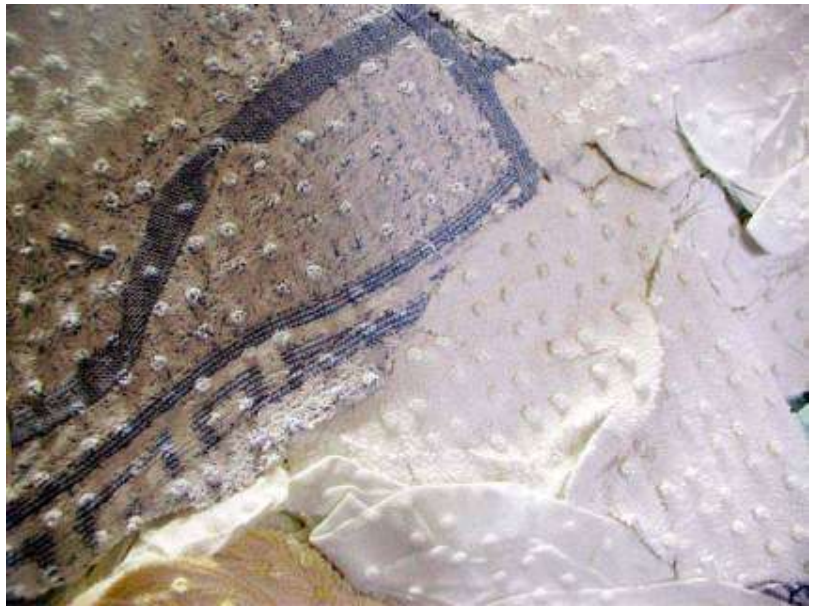
Belt running over drainage plate

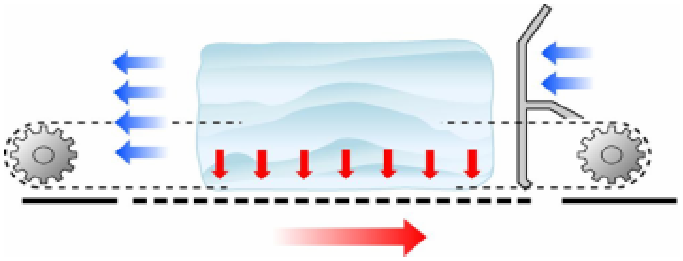


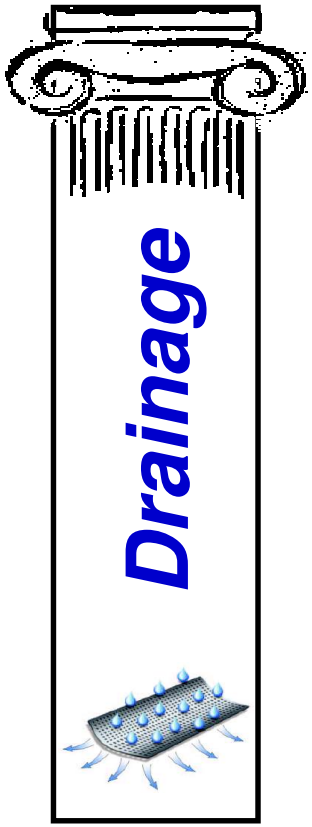
Perforated plate with pusher

Risk of perforated plate system:

- Textiles are pressed into the perforation
- Poor drainage due to "plugging effect"
- When unloading, the pusher shears off the plugs







Concerning "DRAINAGE":

Fast and powerfull extraction does only work in conjunction with a fast removal of the extracted water. Example for a centrifugal extractor:

PowerSpin:

- High proportion of wholes (approx. 60'000 drillings for PS100)
- Drillings of 3 mm only
  ⇨ avoiding the "plugging effect"
- Large drum diameter for flat distribution of the textiles

Inner drum perforation of the centrifugal extractor "Kannegiesser PowerSpin":

3 columns of extraction technology

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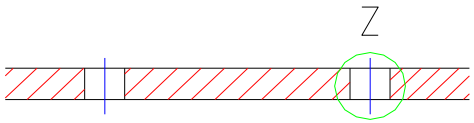
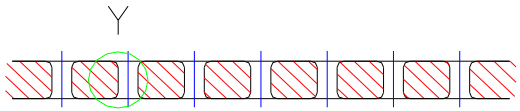
Comparison: Conventional inner drum vs. PowerSpin inner drum

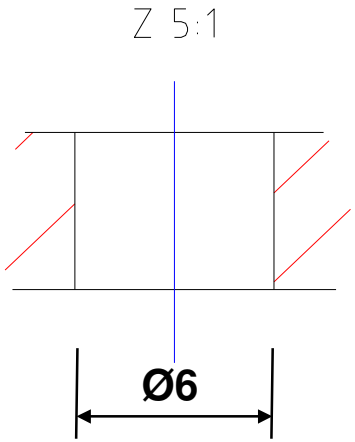
A) Conventional inner drum

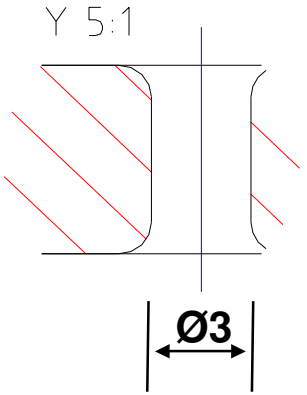


B) PowerSpin inner drum



- Double sized whole area ⇨ fast drainage

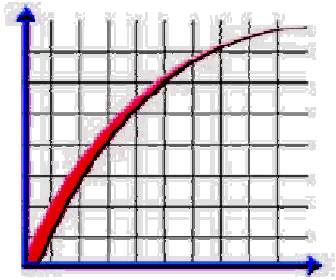


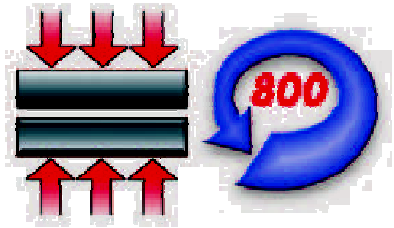


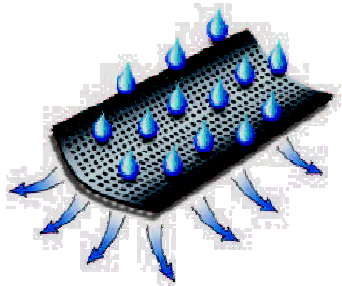
- Half sized whole diameter ⇨ reduced strain to the fibres and improved loosening for unloading

The extraction performance of the system is always a result of the interaction of the 3 columns of extraction technology

– SPEED, POWER and DRAINAGE –







Extraction press

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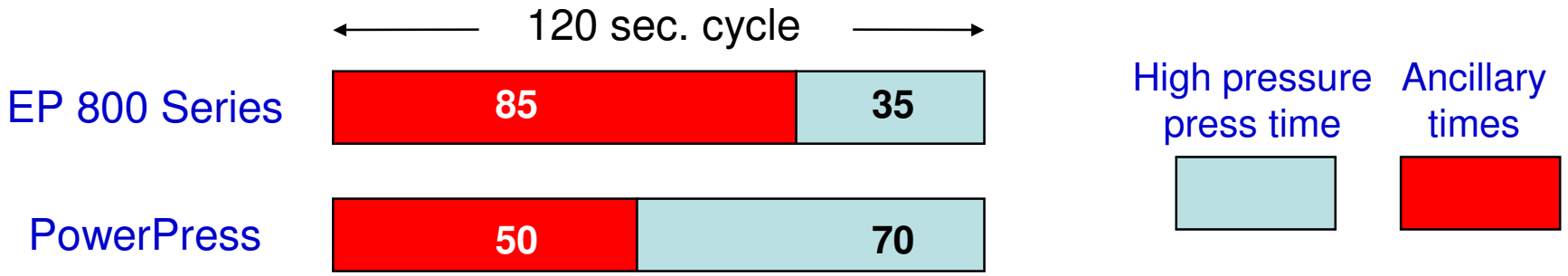
Example: Kannegiesser PowerPress Turbo Version

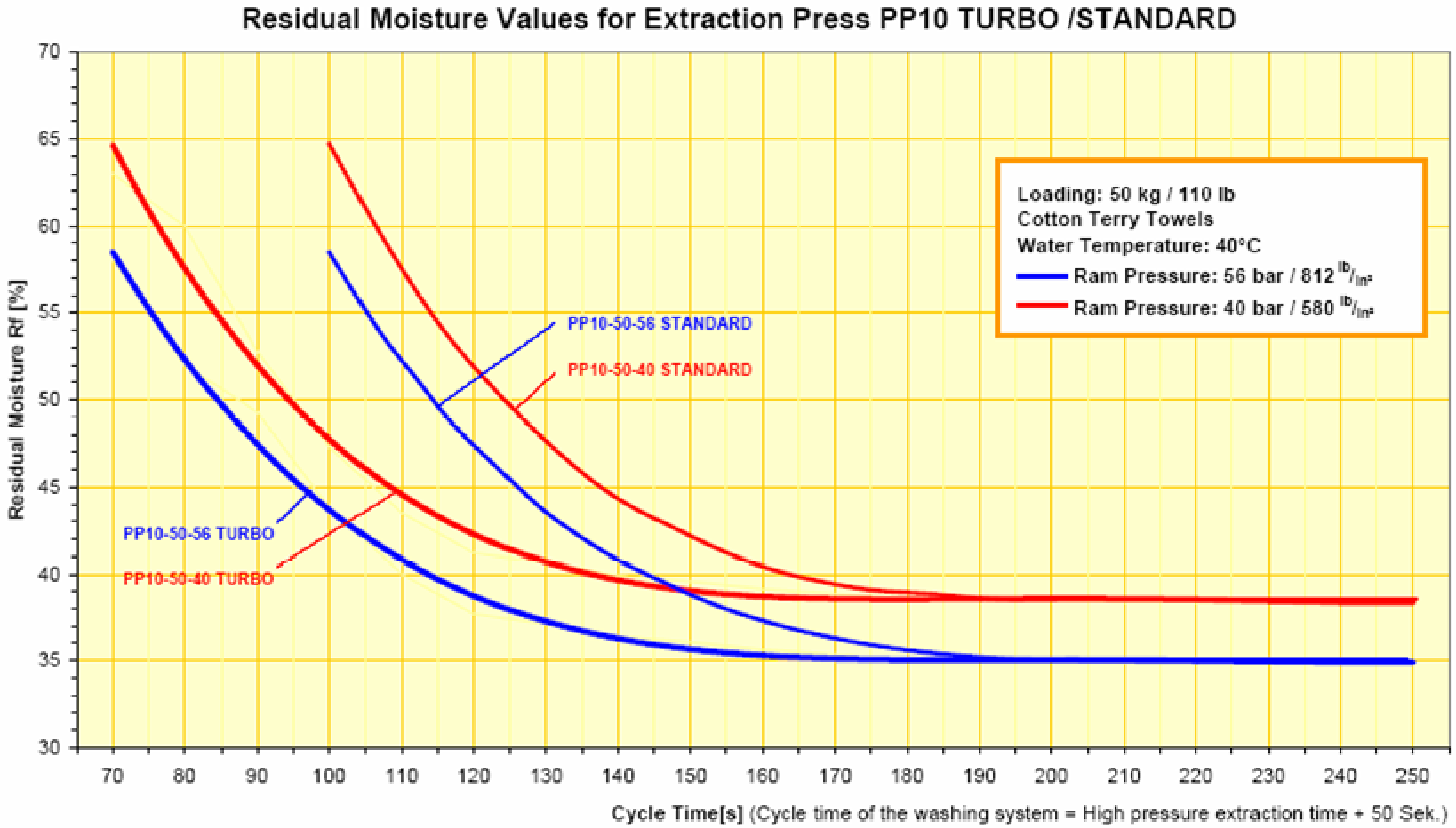


Active press time increased by 100 % leading to:

Up to 20-25 % less residual moisture at same cycle time ⇒ substancial energy savings

Up to 60 % shorter cycle times at same high pressure time ⇒ higher productivity

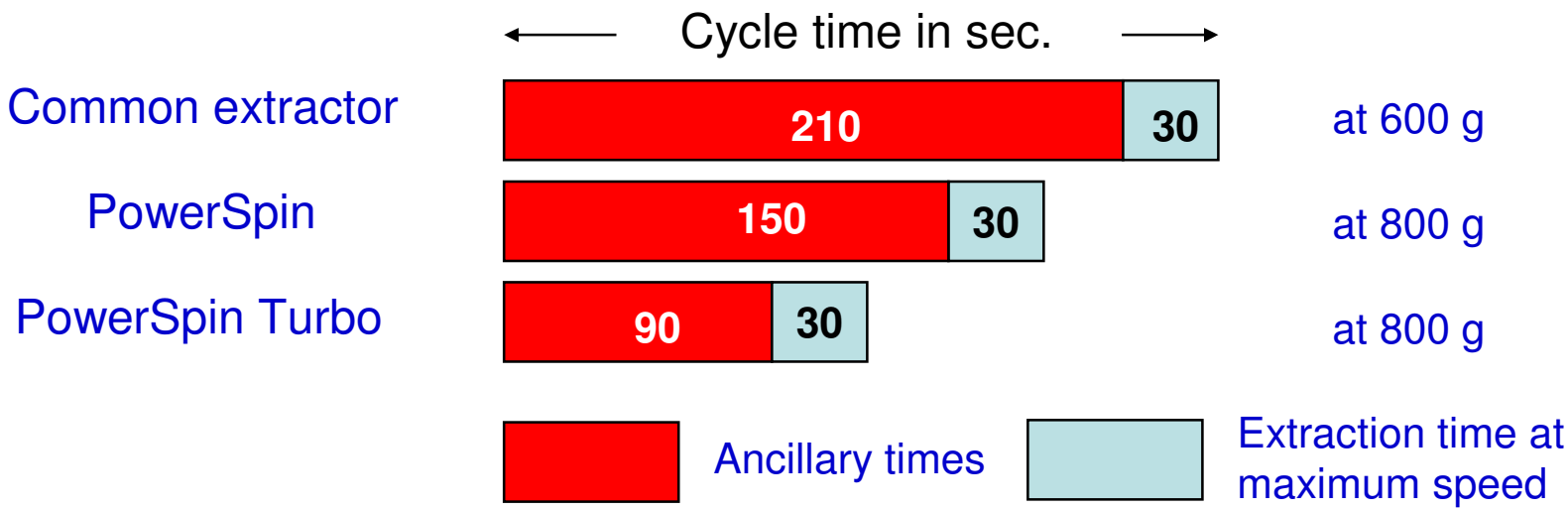
Extraction press



Note: Terry is the material which is most difficult to extract.
For these tests the most difficult common type of washing has been chosen on purpose.

Centrifugal extractor

Example: Kannegiesser PowerSpin



Very low unproductive times (90 sec.). leading to:

- Extended extraction time at maximum rotation speed.
- High extraction rate even with 2 min. cycles (30 sec. at 800g).
- Interval centrigutes to optimise quality.

Centrifugal extractor

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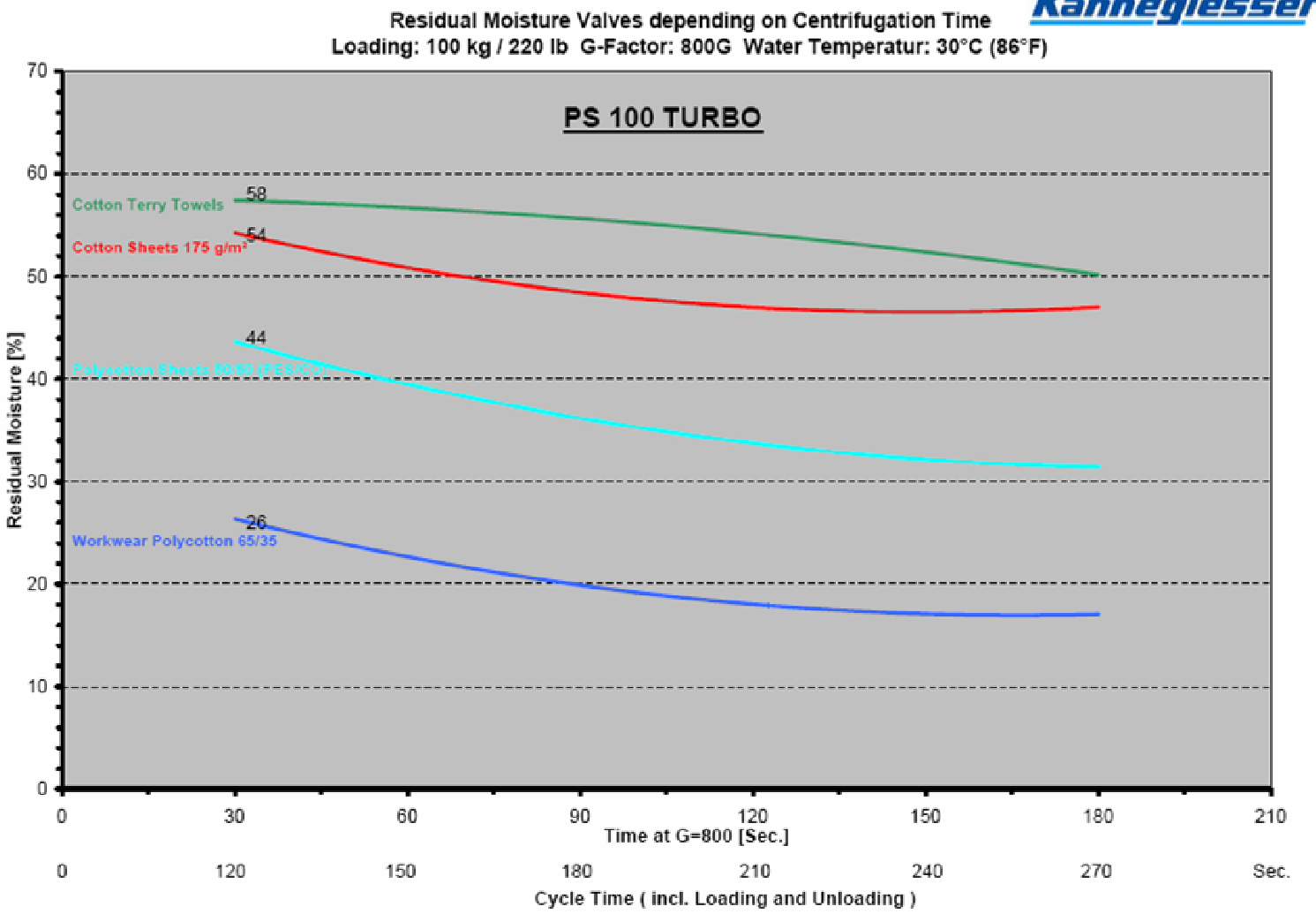
Kannegiesser



Press vs. spin

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Which system is the best for what classification at what cycle time?

A)

	cycle time under 110 seconds			
	Press		Centrifuge	
	until now	PowerPress	until now	PowerSpin
classification				
flatwork cotton	+	++	-	-
flatwork P/C	+	++	-	-
terry towels C	+	++	-	-
terry towels P/C	+	++	-	-
garments C				
-without buckles etc.	+	+	-	-
-with buckles etc.	-	-	-	-
garments P/C				
-without buckles etc.	+	+	-	-
-with buckles etc.	-	-	-	-
garments pers. safety	-	-	-	-
walk-off-mats	+-	+-	-	-
Theatre textiles				
-barrier cloth	-	-	-	-
-microfibres	+	+	-	-
-P/C	+	+	-	-

- = not possible
+- = with limitations
+ = sligth limitations, eventual higher cost
++ = optimum process conditions, cost savings

Press vs. spin

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Which system is the best for what classification at what cycle time?

B)

	cycle time 120 to 150 seconds			
	Press		Centrifuge	
	until now	PowerPress	until now	PowerSpin
classification				
flatwork cotton	+	++	-	+
flatwork P/C	++	++	-	+
terry towels C	+	++	-	+
terry towels P/C	++	++	-	+
garments C				
-without buckles etc.	+	+	-	+
-with buckles etc.	-	-	-	+
garments P/C				
-without buckles etc.	+	+	+-	++
-with buckles etc.	-	-	+-	++
garments pers. Safety	-	-	+-	++
walk-off-mats	+-	+-	-	++
Theatre textiles				
-barrier cloth	-	-	+	++
-microfibres	+	+	+	++
-P/C	+	+	+-	++

- = not possible
+- = with limitations
+ = sligth limitations, eventual higher cost
++ = optimum process conditions, cost savings

Press vs. spin

Which system is the best for what classification at what cycle time?

C)

	cycle time 150 to 180 seconds			
	Press		Centrifuge	
	until now	PowerPress	until now	PowerSpin
classification				
flatwork cotton	++	++	-	+
flatwork P/C	++	++	-	++
terry towels C	++	++	-	+
terry towels P/C	++	++	-	++
garments C				
-without buckles etc.	+	+	+-	++
-with buckles etc.	-	-	+-	++
garments P/C				
-without buckles etc.	+	+	+	++
-with buckles etc.	-	-	+	++
garments pers. Safety	-	-	+	++
walk-off-mats	+-	+-	+	++
Theatre textiles				
-barrier cloth	+	+	+	++
-microfibres	+	+	+	++
-P/C	+	+	+	++

- = not possible
+- = with limitations
+ = slight limitations, eventual higher cost
++ = optimum process conditions, cost savings

Possible savings with new extraction technology

1) Extraction performance

In most cases the extraction performance is the key factor for the investment into new extraction technology.

Example:

With a capacity of 1.5 t/h, each percentage point of **residual moisture reduction** leads to the following savings of energy.

Savings per percentage point of residual moisture reduction:

- Kannegiesser High Power Ironer HPM
  ⇨ 0,72 €/h *(per percentage point of residual moisture)*
- Older ironers (poor insulation, no covers)
  ⇨ 1,12 €/h *(per percentage point of residual moisture)*

Example:

- HPM, reduction of residual moisture by 10 %
  ⇨ 14.400 €/year *(savings per 8 h shift)*
- Older ironer, reduction of res. moisture by 10 %
  ⇨ 22.400 €/year *(savings per 8 h shift)*

Possible savings with new extraction technology

2) Increasing of output

- Due to better extraction performances, the output of full dryer systems and of ironer lines is increased especially for terry and for cotton bed linen.
- Investment into new extraction technology is therefore often the solution for eliminating a "bottleneck" in the entire process.

Possible savings with new extraction technology

3) Reducing water consumption

- Due to better extraction performances, the ***amount of water which can be reused for the wash process*** increases. This goes in conjunction with intelligent tank technology controlling the water amount and temperature required for the pre wash.

- In the extraction press, additional water savings are archieved by having a ***thermostatically controlled cooling water circuit*** instead of a ball valve.