# „How can a forming fabric reduce the energy consumption in the wet end“


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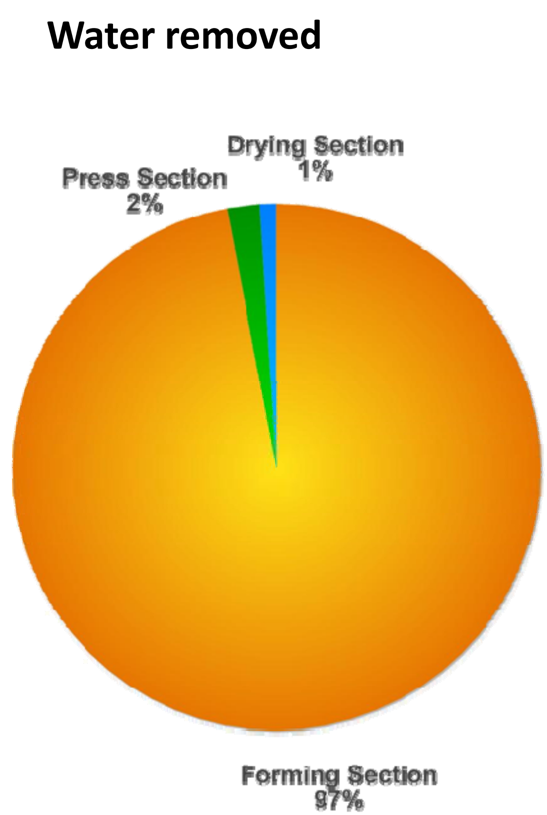
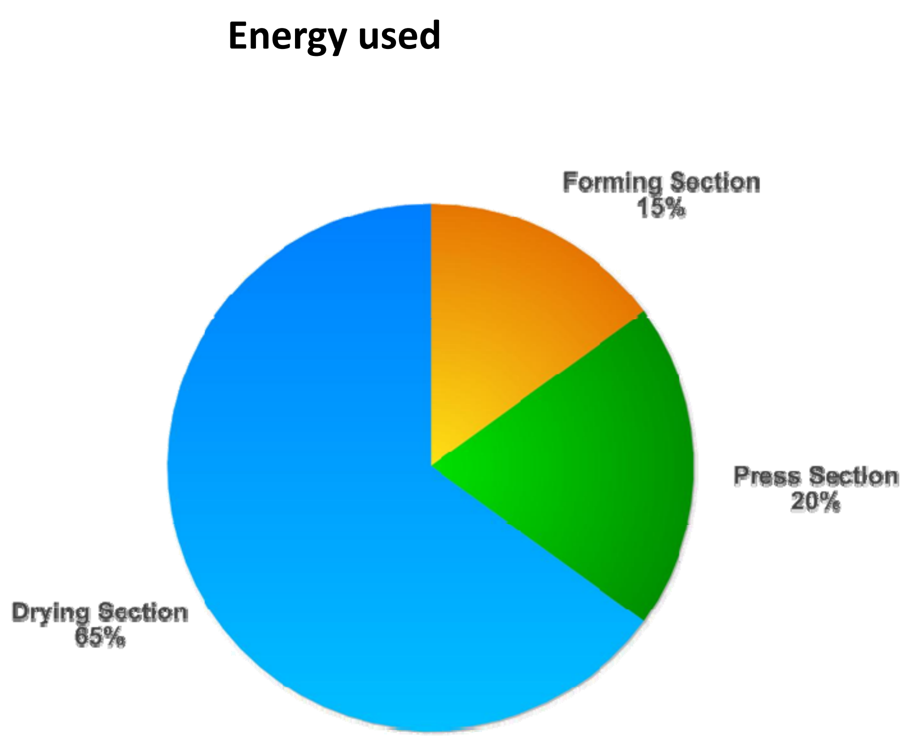
RETHINK PAPER: Lean and Green

# Content

- Description of the situation/target
- Laboratory trials
- New product development
- Field results
- Summary

# Energy consumption
## PM

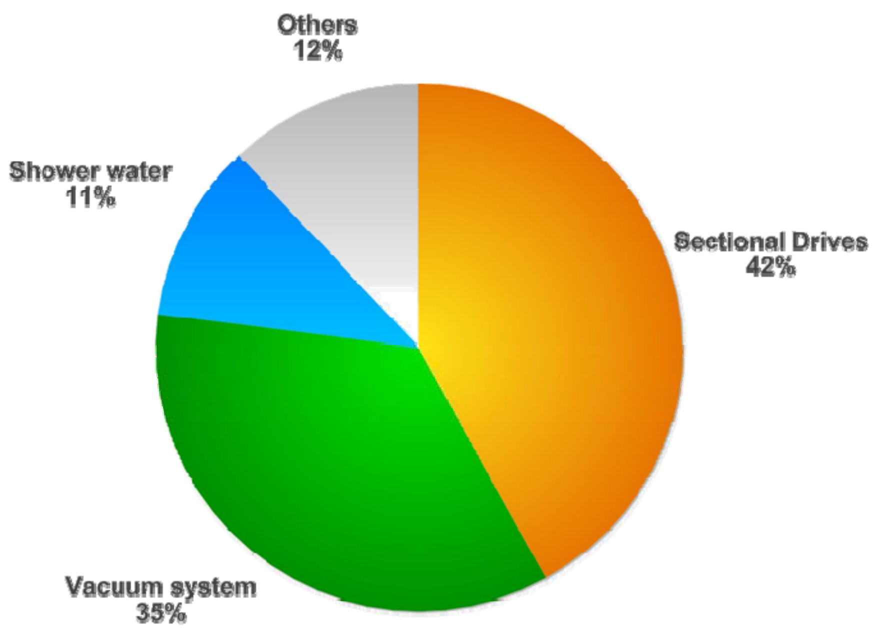



Source: Pöyry

# Energy consumption
## Wet End

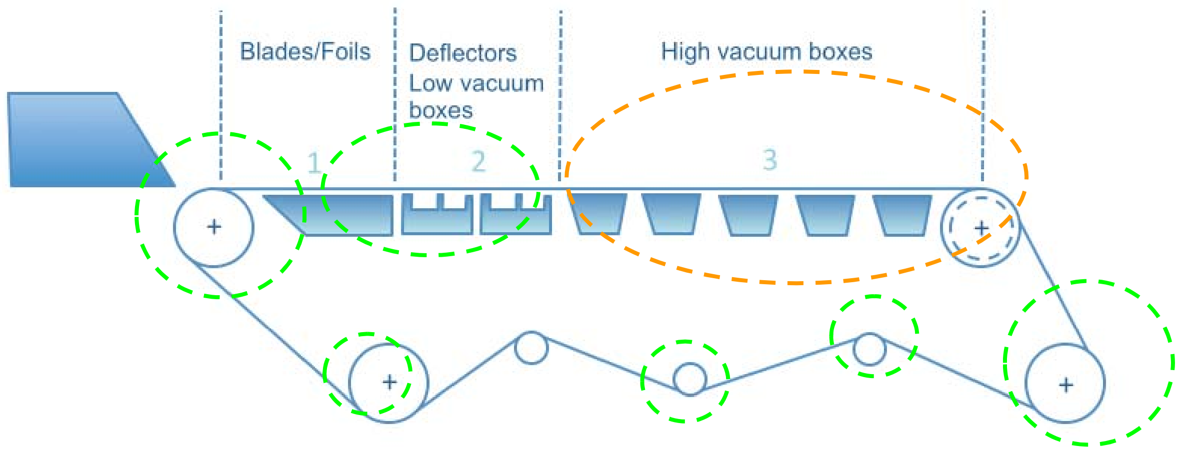
**Energy used in Forming Fabric Section**




- Main energy consumer are the vacuum pumps and energy used for the sectional drives (77% of the whole consumption)

Source: Pöyry

# Affecting the Drive Load (42%)



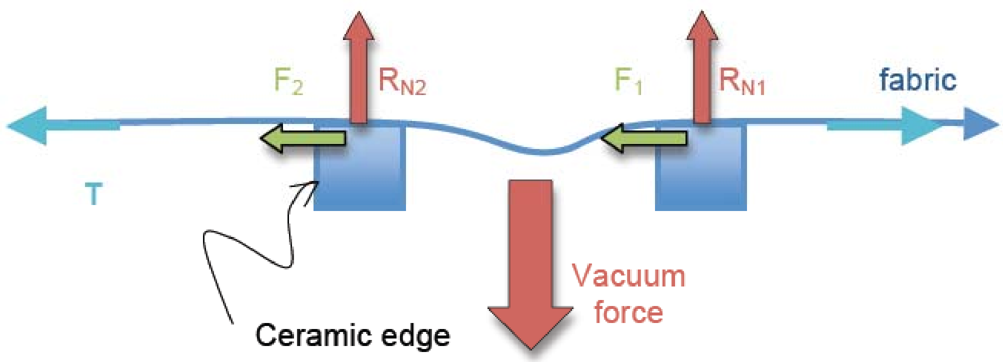

20% energy consumption due to rolls, blades…

80% energy consumption due to high vacuum boxes

# Concepts to reduce drive loads

## Fabric parameters influencing the drive load

**$F_1$ & $F_2$ is the force we need to reduce !**




**$R_{N1}$&$_{N2}$: reaction force of the applied vacuum**

- **Vacuum loads, dryness influences the thermical and electrical energy consumption**
  - → Concepts to improve sheet built up, formation
  - → Concepts to improve the drainage
- **Drive loads influence the electrical energy consumption**
  - → Concepts to reduce drive loads

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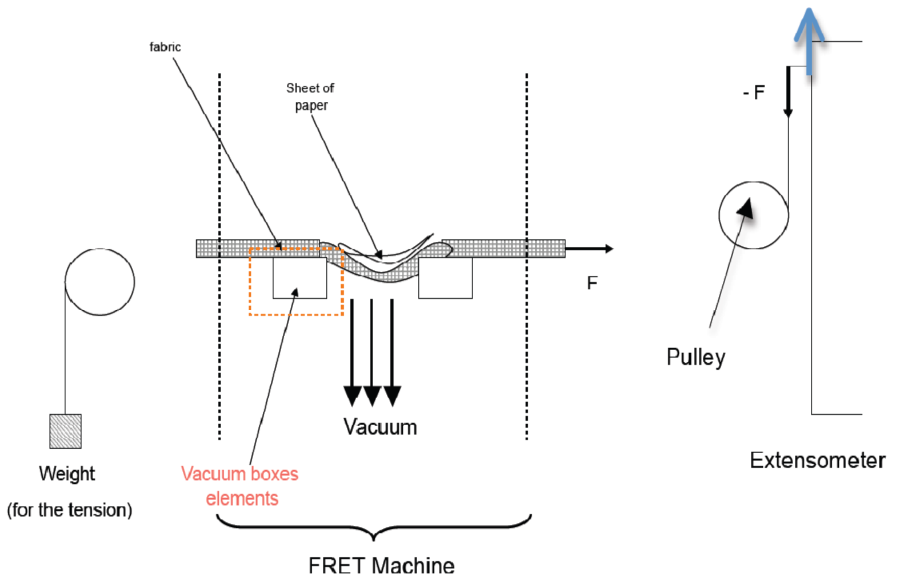
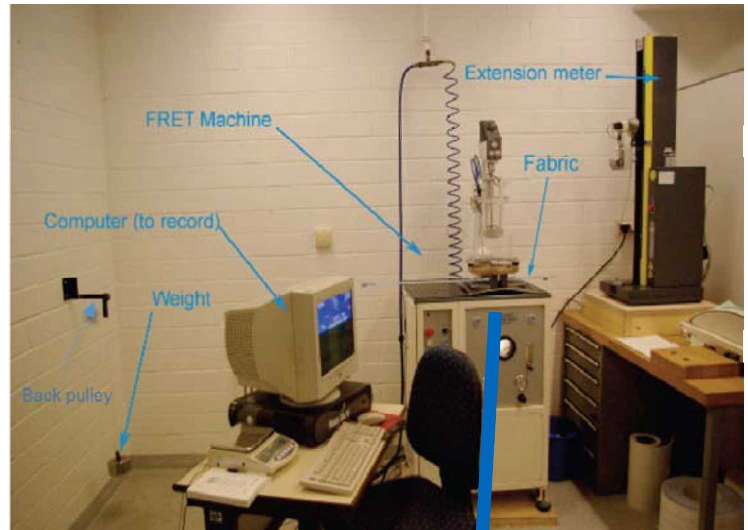
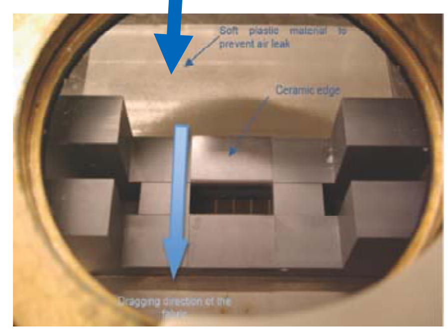
# Concepts to reduce drive loads
## Measuring method



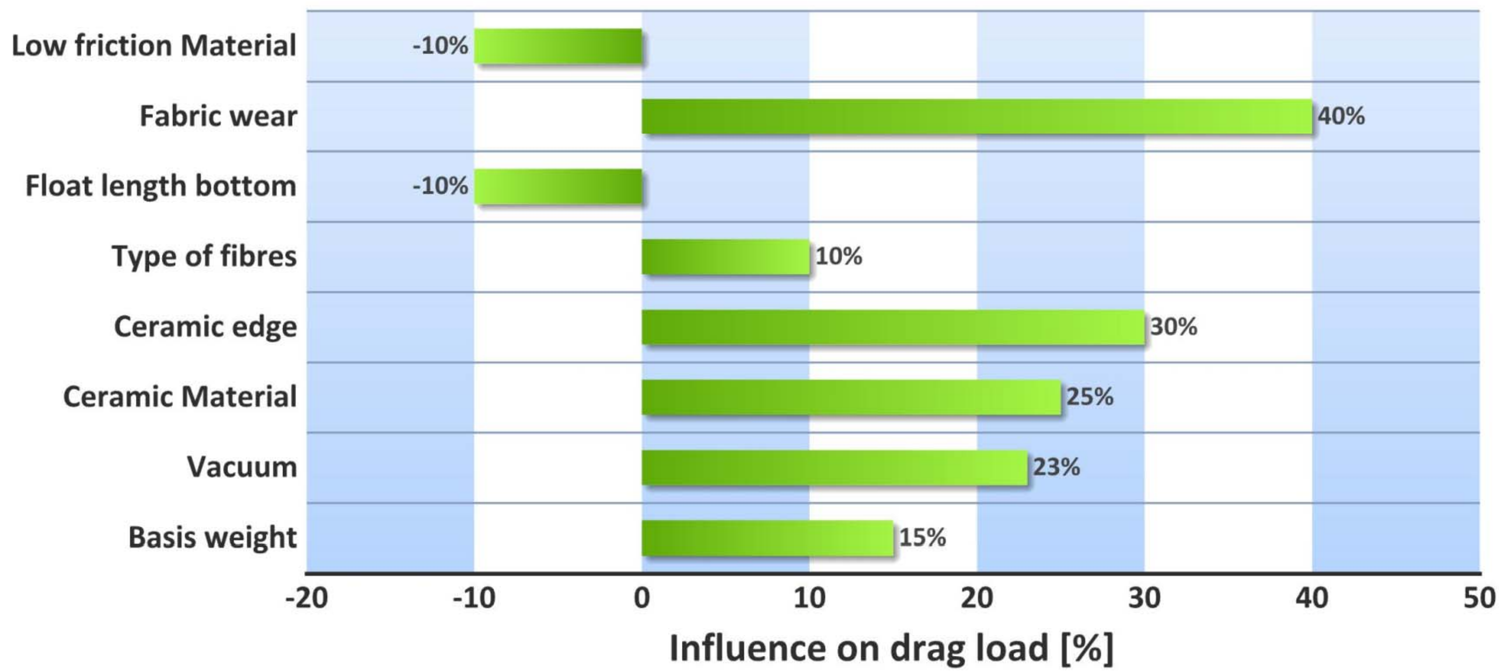

| Main specifications of the laboratory vacuum box | |
|---|---|
| Vacuum slot dimensions | 18x50 mm |
| Edges material | Ceramic Si - Nitrid |
| Edges radius | 2 mm |
| Tension | 0,65 kN/m (5kg on 7,5cm width) |
| Real vacuum level | 0,3 – 0,35 bar |
| Friction in the system | ~ 1 – 3 N |
| Basis weight range | 70 – 200 g/m$^2$ |



**Consistency = 5 g/L; 0,5%**

# Energy consumption in the forming section

## Measurement results / Lab device




- **Drag load difference in [%] of the specific drag load (KW/m @ 100m/min) for each parameter versus the reference forming fabric, ceramic material and paper grade, e.g. low friction material gave 10% lower specific drag load in this experiment.**

# Energy consumption in the forming section

## What is influencing the energy level?

**Parameter in order of importance**

Drive loads

- Vacuum loads, dryness
- Fabric wear – bottom side float
- Ceramic edges
- Basis weight
- Yarn materials on the machine side
- Type of fibers
- Roughness of the fabric paper side and running side
- Fabric Tension
- Speed
- Fiber orientation

**FF parameters with impact**

**FF drainage properties:**

→ Surface Open Area/FSI/Perm

→ Caliper

→ Structure

**FF mechanical properties:**

→ Structure/Stability

→ Materials

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# Product develpoment

**Lab testing**

- **Focus on the initial drainage**

  The sheet structure has a significant impact on the drainage behavior of the web and hereby on the necessary dewatering forces, which directly impacts the vacuum.

- **Material combination**

  The friction between the running side material and the dewatering elements has a direct impact on the friction force and hereby on the drag load

→ **Both parameters together result in the friction force and determine the Energy consumption**

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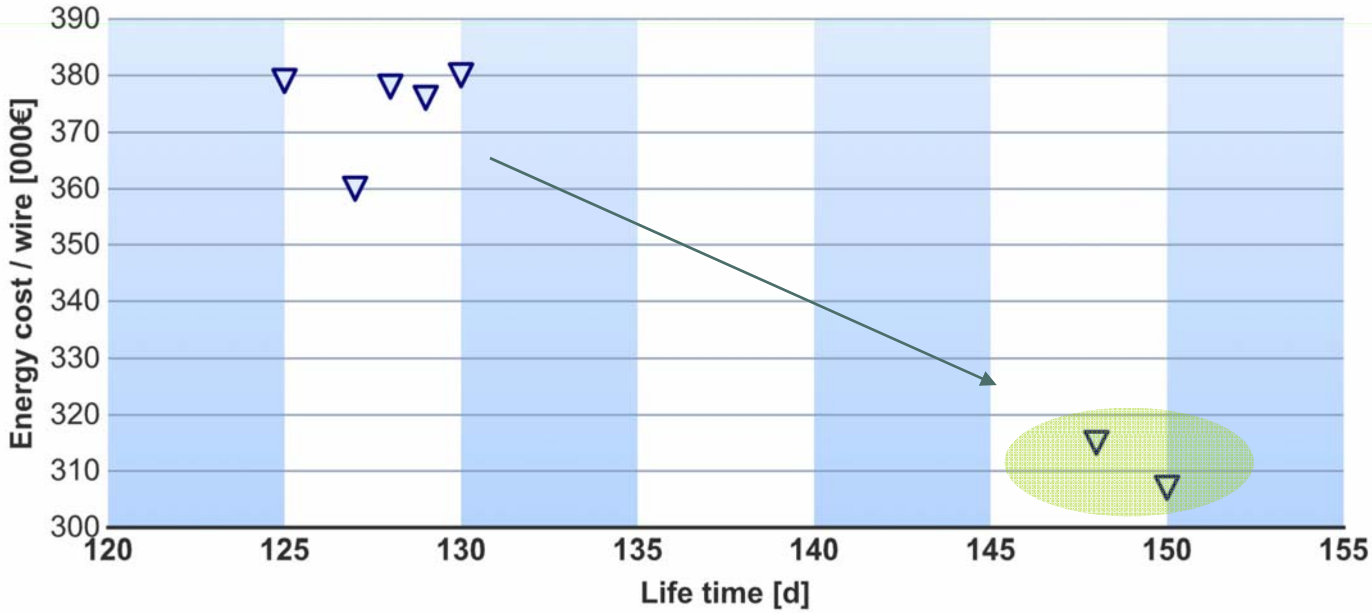
# Field trial No 1 – New RS material
## New running side Polymer

- **Product**: Fluting 125- 220g/m²
- **Design**: SSB-coarse (PA:PES) and special RS polymer (bottom)

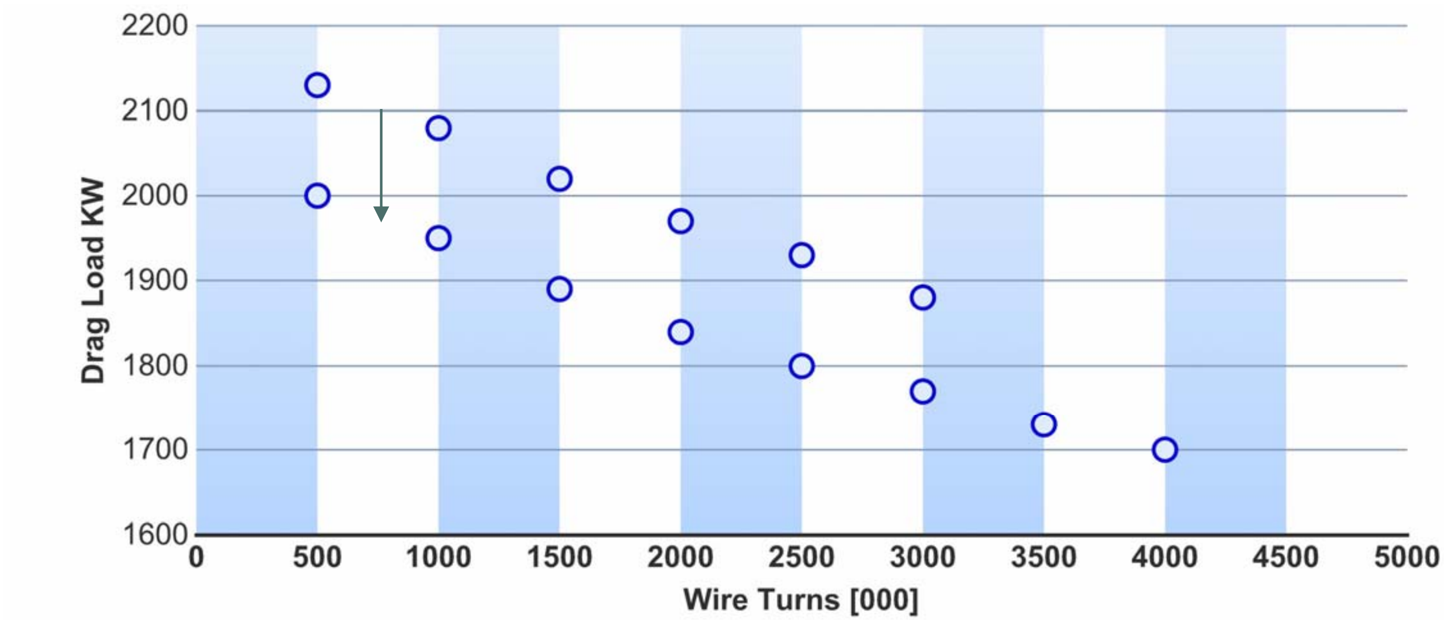



- **~25% Energy savings in that particular case**
- **Fabric life was increased about 27% at the same time**

→ **$ savings due to the Drive energy reduction and less fabric consumtion**

# Field trial No 2 – Fabric structure
## Engineered drainage channels

- **Product**: News, Telephone dirctory 38-60 g/m²
- **Design**: EDC-fine




- **5% Drive energy savings due to an improved sheet built up**

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# Summary

- There are many forming fabric parameters which are related to the energy consumption of the wet end. These parameters divide into 2 major groups:
  - Energy saving two to less vacuum load, influenced by the sheet formation in the initial drainage zone
  - Friction of the wire over the dewatering elements, many impacted by the forming running side structure and the used materials

- Field evaluations show a huge saving potential up to 30% of the drive load in the wet end.