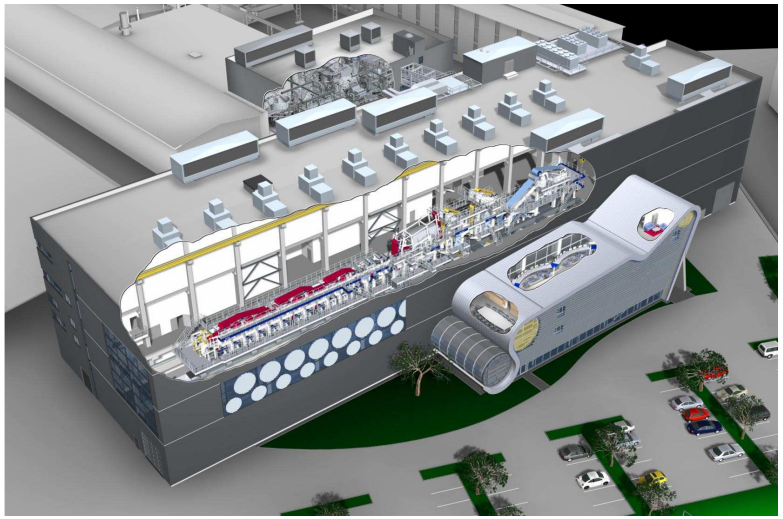
One step ahead with innovations from Voith Paper

Bled, 2011-11-24

Voith Paper R&D

- Voith strongly invests in R&D
- Voith Paper’s goal is to be the technology leader and the preferred partner of paper industry
- Voith has more than 7,000 protective rights, and yearly more than 200 new rights are applied
- 13% innovation rate (i. e. products younger than 5 years)

Paper Technology Centers (PTC) at Voith Paper



Paper Technology Centers:

- Heidenheim (G/S, Coating)
- Krefeld (Finishing)
- Ravensburg (Board & Packaging, Fiber technology)
- Sao Paulo (Tissue)
- Motomiya (Coating)

R&D – Paper Technology Centers (PTC): Hold tomorrow’s paper in your hands today

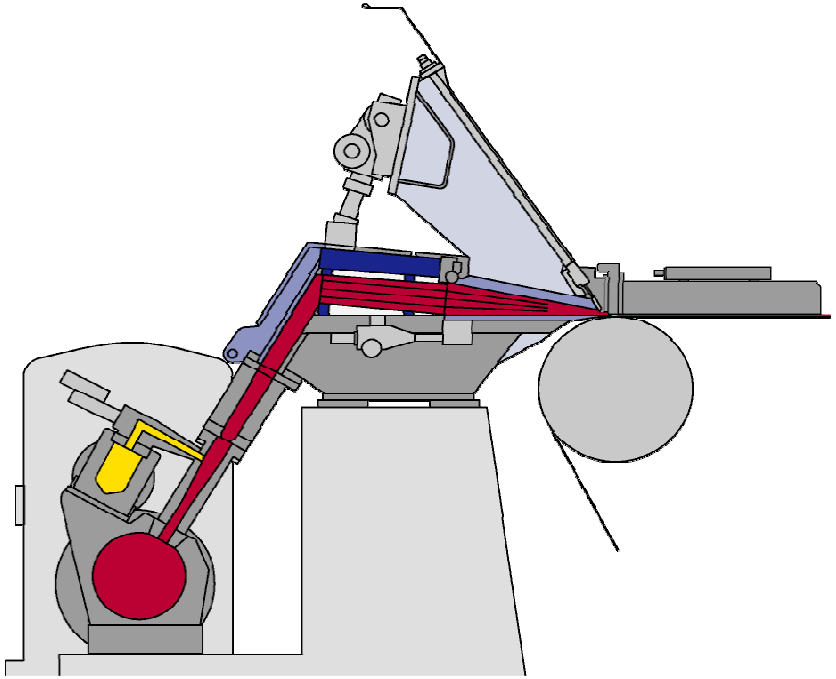
Innovation

- At our Paper Technology Centers every single process in paper manufacturing is analyzed.
- The entire process chain is adjusted under real production conditions on our test paper machines.
- In this way we develop practical new products and find solutions for our customers.

Voith Paper
The new headbox generation MasterJet Pro

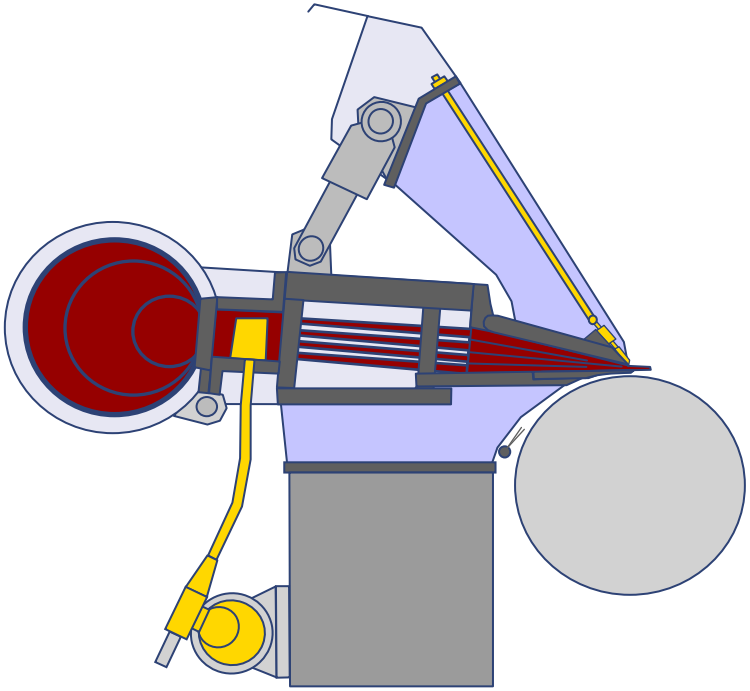
MasterJet Pro
New Generation

MasterJet with ModuleJet I



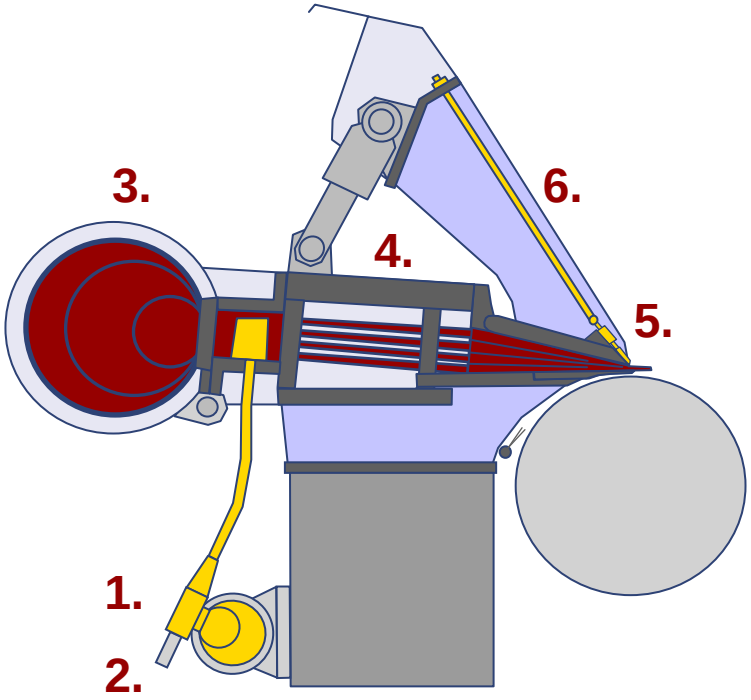
➔

MasterJet Pro with ModuleJet II



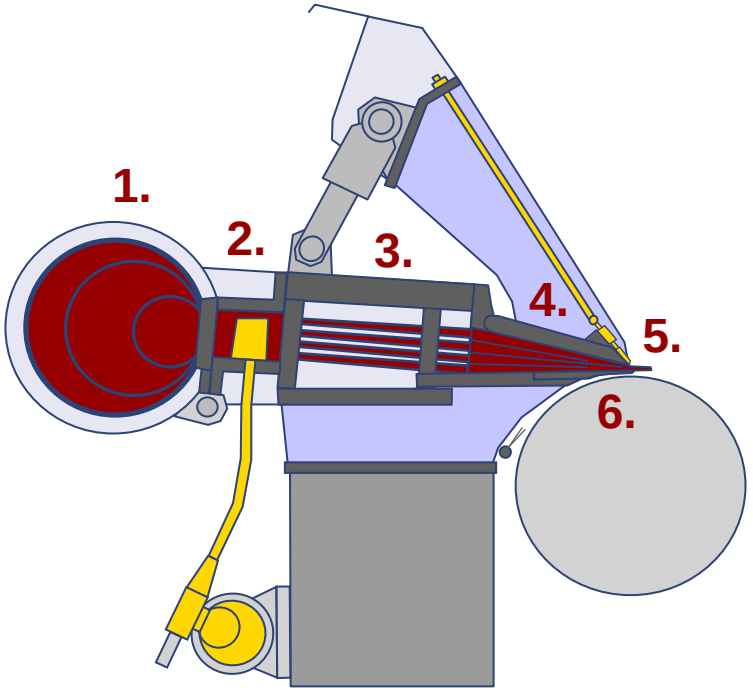
MasterJet Pro
Innovation package

1. **New ModuleJet dilution system**
   better profiles & reduced pressure loss
2. **New OnQ profile control**
   highest reliability in wet environment
3. **Cross distribution without recirculation**
   reduced energy consumption
4. **Optimized hydraulic layout**
   grade-specific, energy efficient
5. **ParaSlice nozzle geometry**
   improved paper quality
6. **New thermal expansion design**
   no heating system necessary

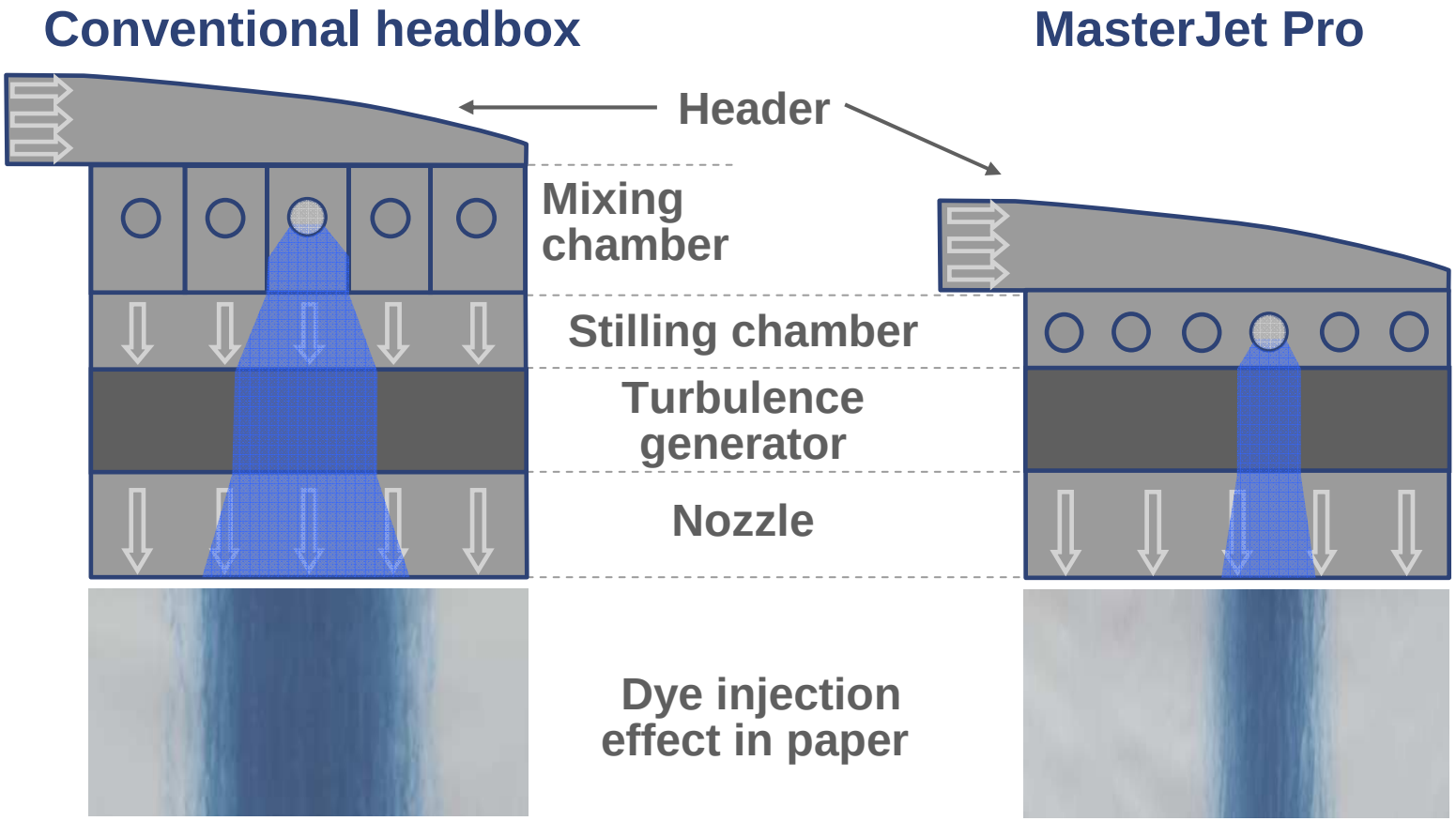


MasterJet Pro
Proven features

1. **Round shaped header**
   minimal contamination (no edges)
2. **Stilling Chamber**
   stable headbox flow
3. **Turbulence tubes**
   optimum deflocculation
4. **Lamella technology**
   superior jet quality
5. **Slice blade with long spindles**
   easy fiber orientation adjustment
6. **Exchangable bottom lip**
   simple and cost efficient replacement



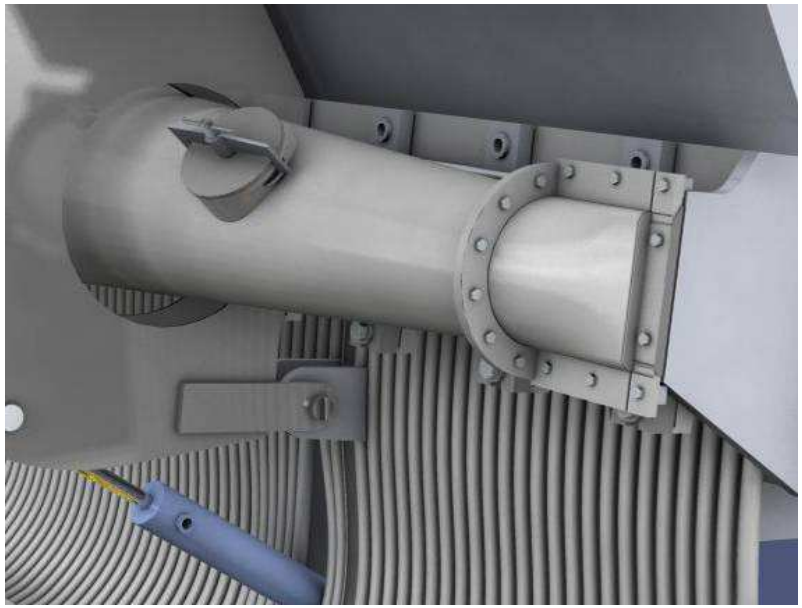
MasterJet Pro -
New ModuleJet dilution system



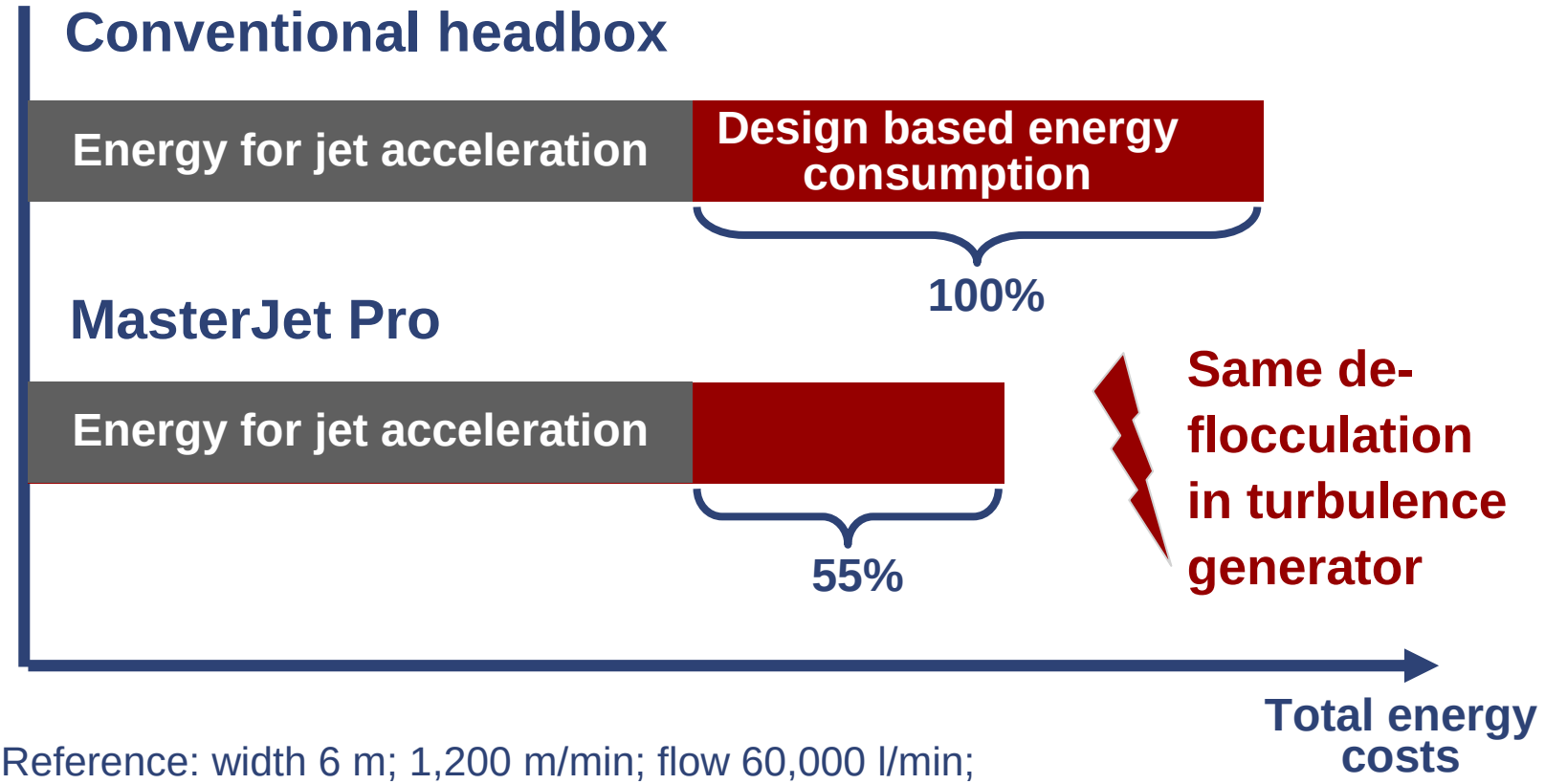
Response width reduced to 50%

MasterJet Pro - Innovative cross distribution concept

- New design of cross distribution unit (headers, inlet plate, stilling chamber) allows elimination of HC and LC header recirculation lines
- Production trials proofed clearly
  → No impact on total flow range
  → No impact on basis weight or fibre orientation CD-profiles
- Up to 10% less flow to headbox results in considerable energy savings



MasterJet Pro -
Reduction of operating costs



Reference: width 6 m; 1,200 m/min; flow 60,000 l/min;

Voith Paper Headbox References

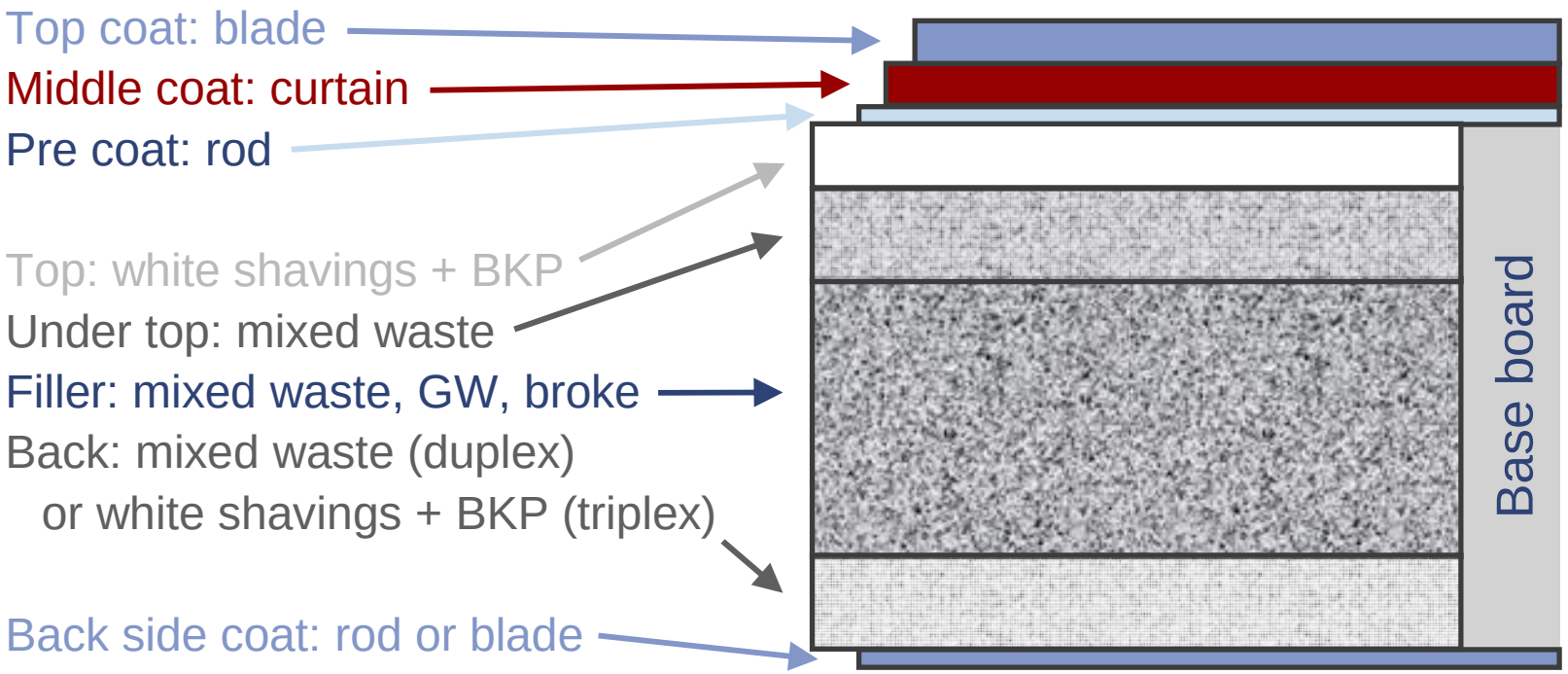
- **> 350 Headboxes in 10 years**
- **40 sold MasterJet Pro since 2008**

VOITH

Voith Paper
Curtain Coater replaces Air Knife Technology

Curtain Coater for a Board Machine

Composition of white lined chip board



Driving force for Curtain Coating Technology

- Speed limit with air knife at approx. 600 m/min
- High energy consumption due to low solid content of coating colour (approx. 40%)
- Limited range of coating weight

Voith Pilot Coater at Heidenheim

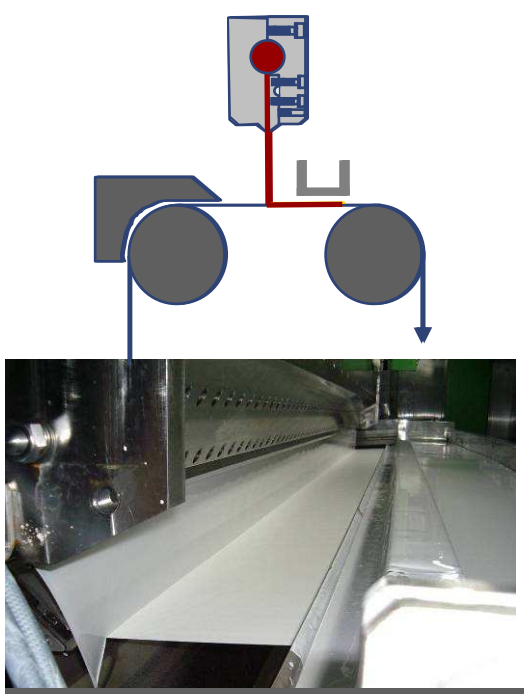
Maximum speed: 2500 m/min

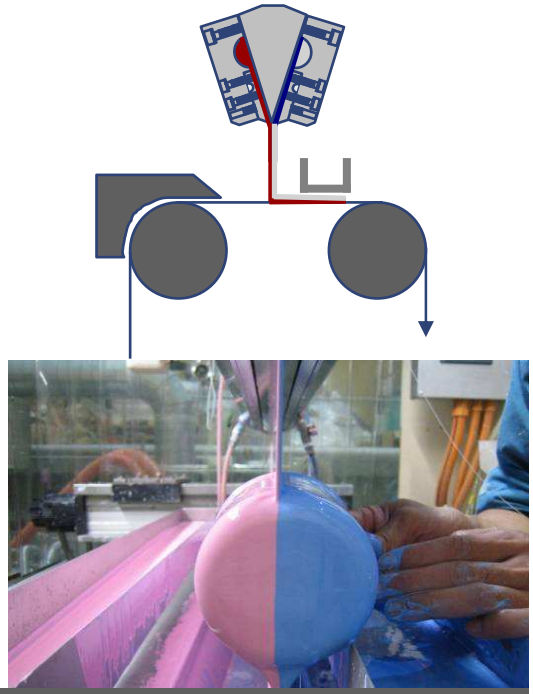
Web width: 800 mm

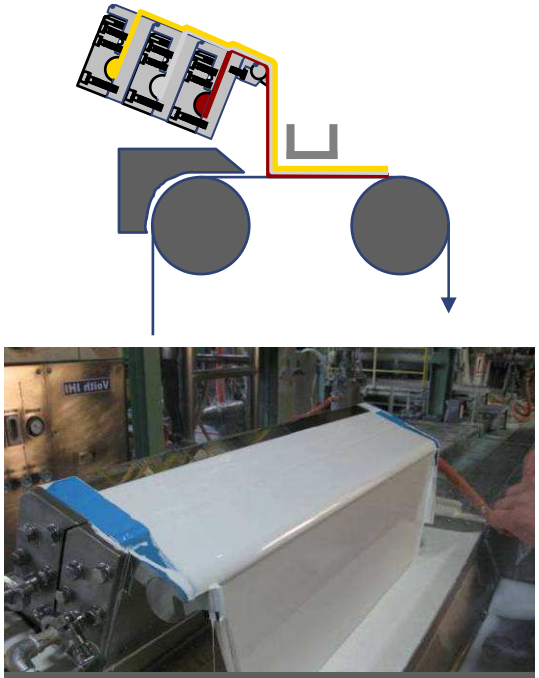
Coater stations:

- Film Coater: SpeedSizer®
- Blade Coater: JetFlow F®
- Curtain Coater: 1 DF Coater™

Curtain Coater Family







“Slot Die” concept

“Slide Die” concept

Single-coat
DF Coat-S
One layer

Double-coat
DF Coat-D
Two layers

Multiple-coat
DF Coat-M
more than two layers

Suitable for multi layer application!

Pilot trial results :
Curtain Technology versus Airknife Coater

- Superior coverage and clearly reduced cloudiness

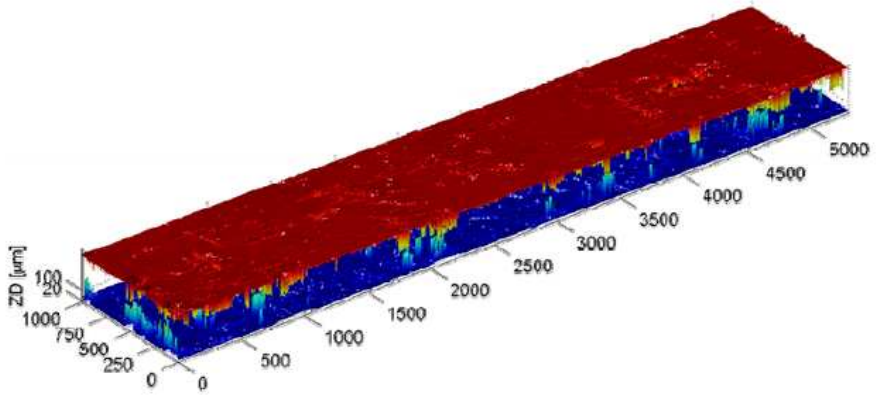
Reference: Airknife as middle coat (12 g/m²)

DF Coat as middle coat (12 g/m²)

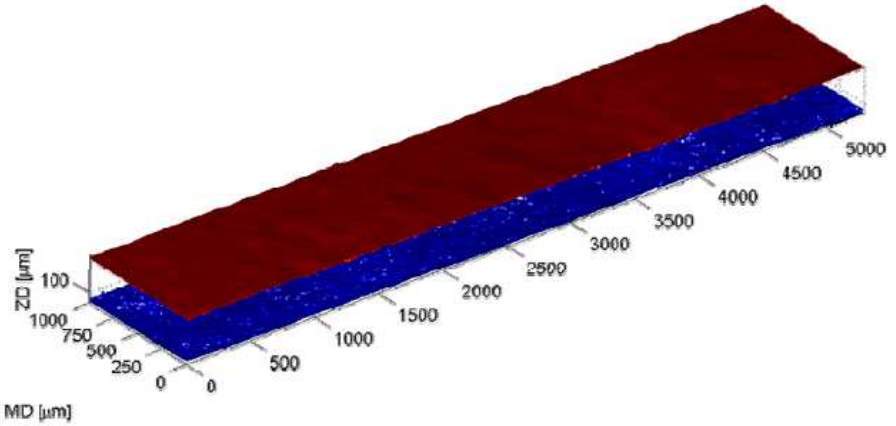
Note: Samples are treated with Levacel blue; 6+12+11 g/m²; Varibar, middle coat, Bentblade

Blade coating vs. Curtain coating

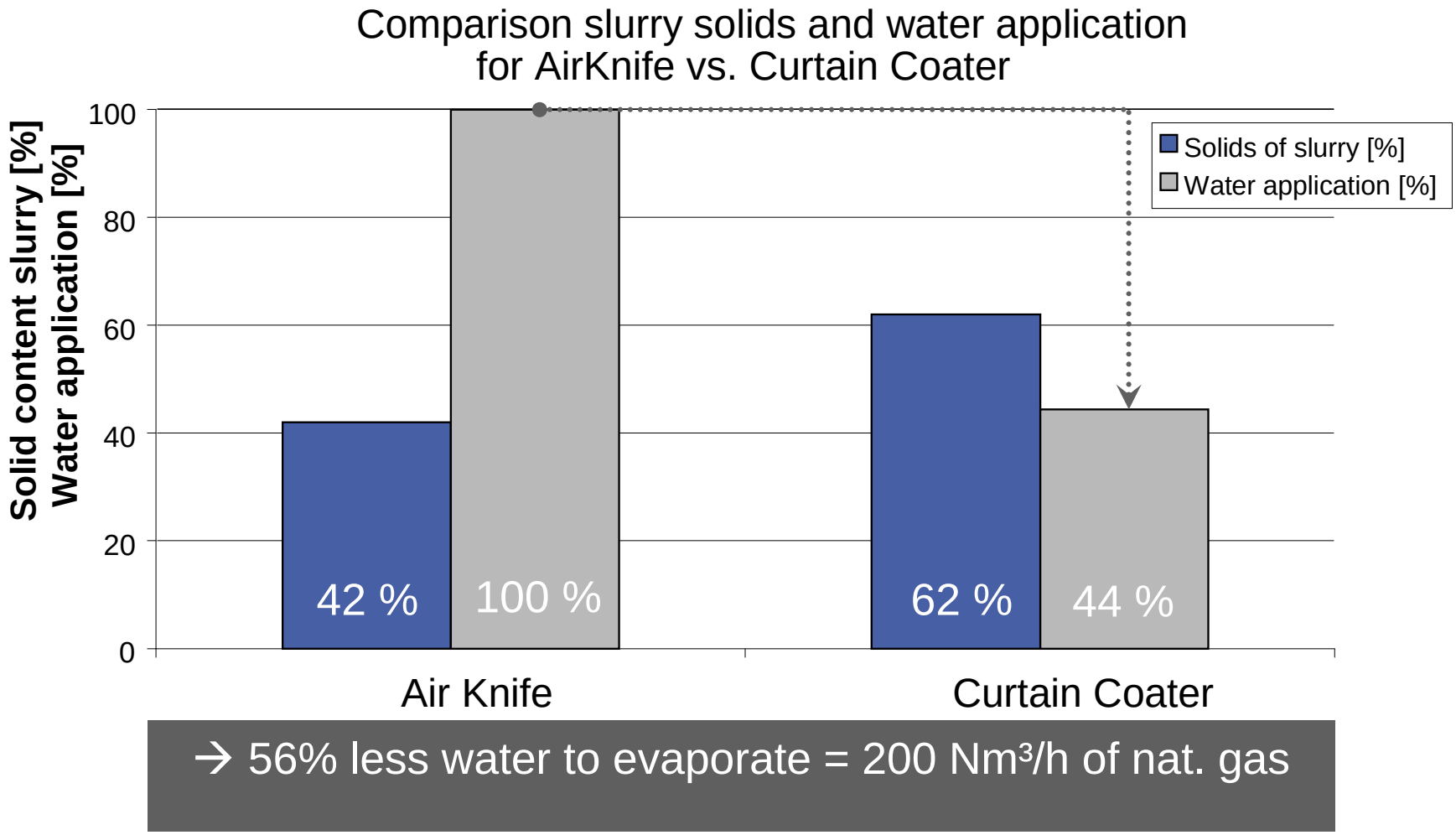
Blade coating



Curtain coating



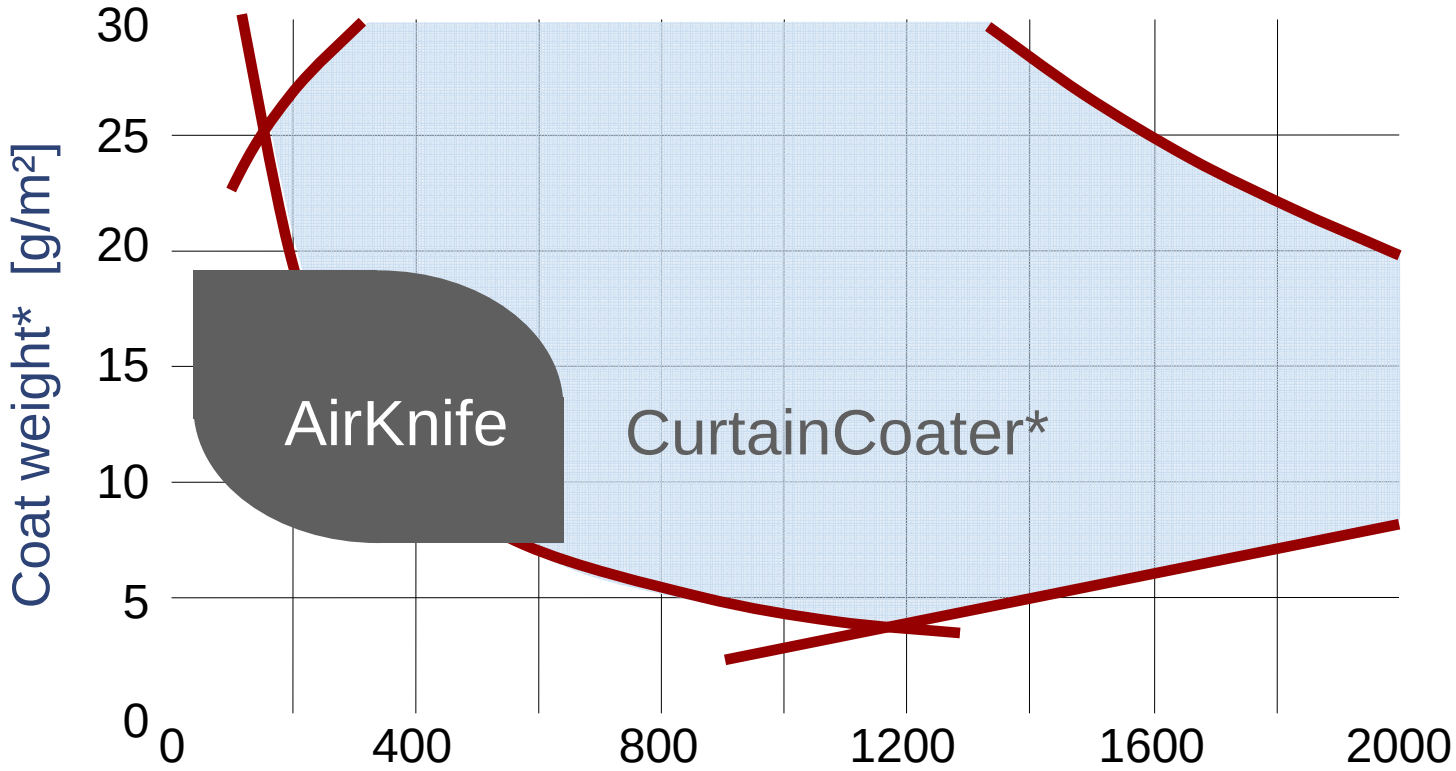
Air Knife versus Curtain Coater



→ 56% less water to evaporate = 200 Nm³/h of nat. gas

Operation windows

→ Air Knife vs. Curtain Coater



*) at high solids contents (≥ 60 %)

No more speed limitations for BM!

Customer Benefits from Pilot Trials : Curtain Technology versus Air knife Coater

- Superior coverage and clearly reduced cloudiness
- Best coating colour distribution (CD + MD)
- Significant higher solid content (62 – 64 %)
- No speed limit (v > 600 m/min)
- Wide coat weight range (11 to 20 g/m² without any difficulty)
- Very good runability

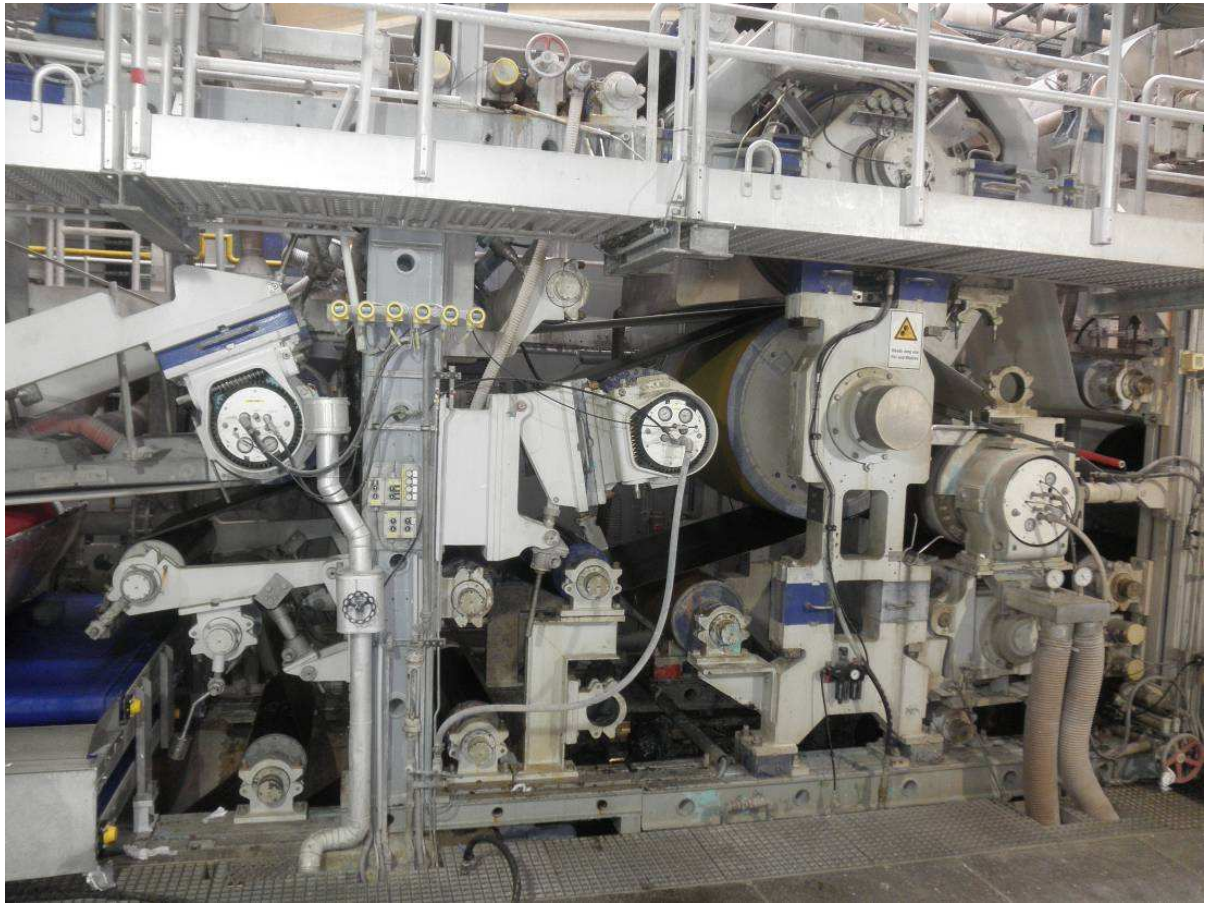
➔ **DF Coat is the perfect replacement for Air knifes**

Curtain Coater on industrial Machine

Benefits

- **Possible furnish cost reduction**
  Improved coverage could allow to replace DIP by mixed waste paper
- **Less investment in stock preparation and approach flow**
  No separate DIP line required
- **Production increase due to increased machine speed**
  No more speed limits
- **Energy savings**
  Increase in solids content from 42% to 62%
  → 50% less water to be evaporated
- **Coating cost reduction**
  Reduced pigment costs at maintained quality due to superior coverage of the coat (e.g. less TiO_2 or lower coat weight, less binder)

Voith Paper
Single-felted NipcoFlex press with transfer belt



MG Paper Machine
Project goals + challenges

Customer’s goals

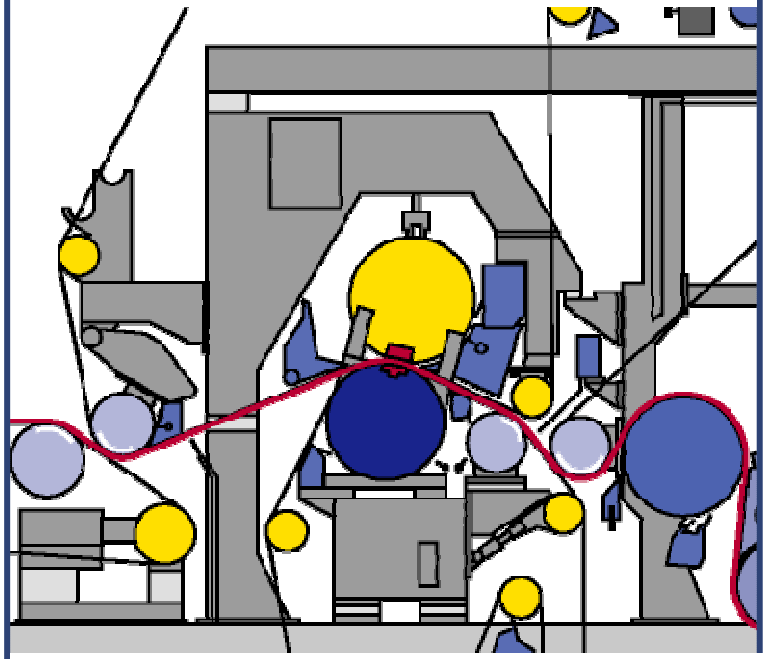
- Production increase from 13,600 t/a to 45,000 t/a net
- Efficiency (energy + sheet breaks)
- Quality (gloss and smoothness on MG side)
- Variety of products + new products (silicone base paper)

Challenges

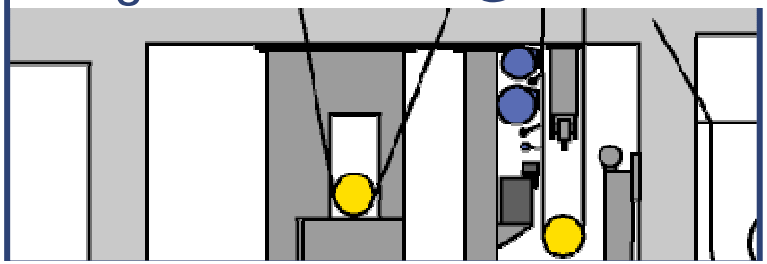
- Existing building
- Performance of MG cylinder and hood (max. evaporation rate)

The Single Nip Press concepts

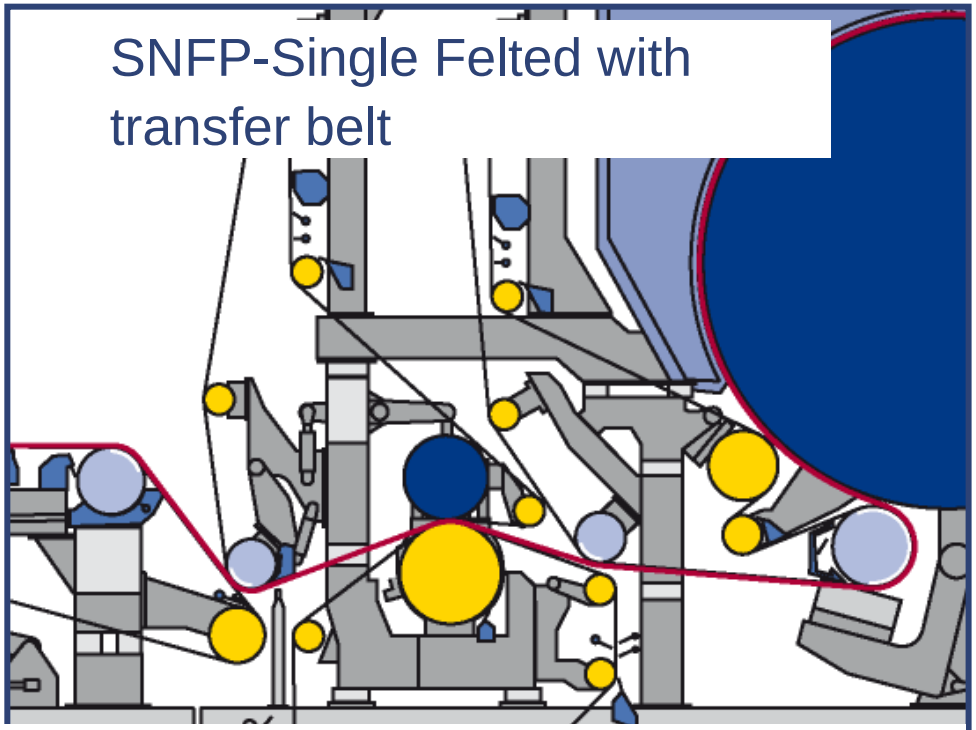
SNFP-Double Felted



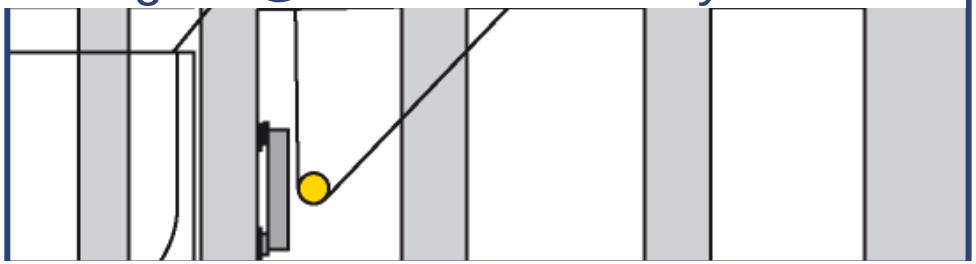
80 g/m² woodfree @ 1400 m/min



SNFP-Single Felted with transfer belt



40 g/m² @ 600 m/min? Why not?



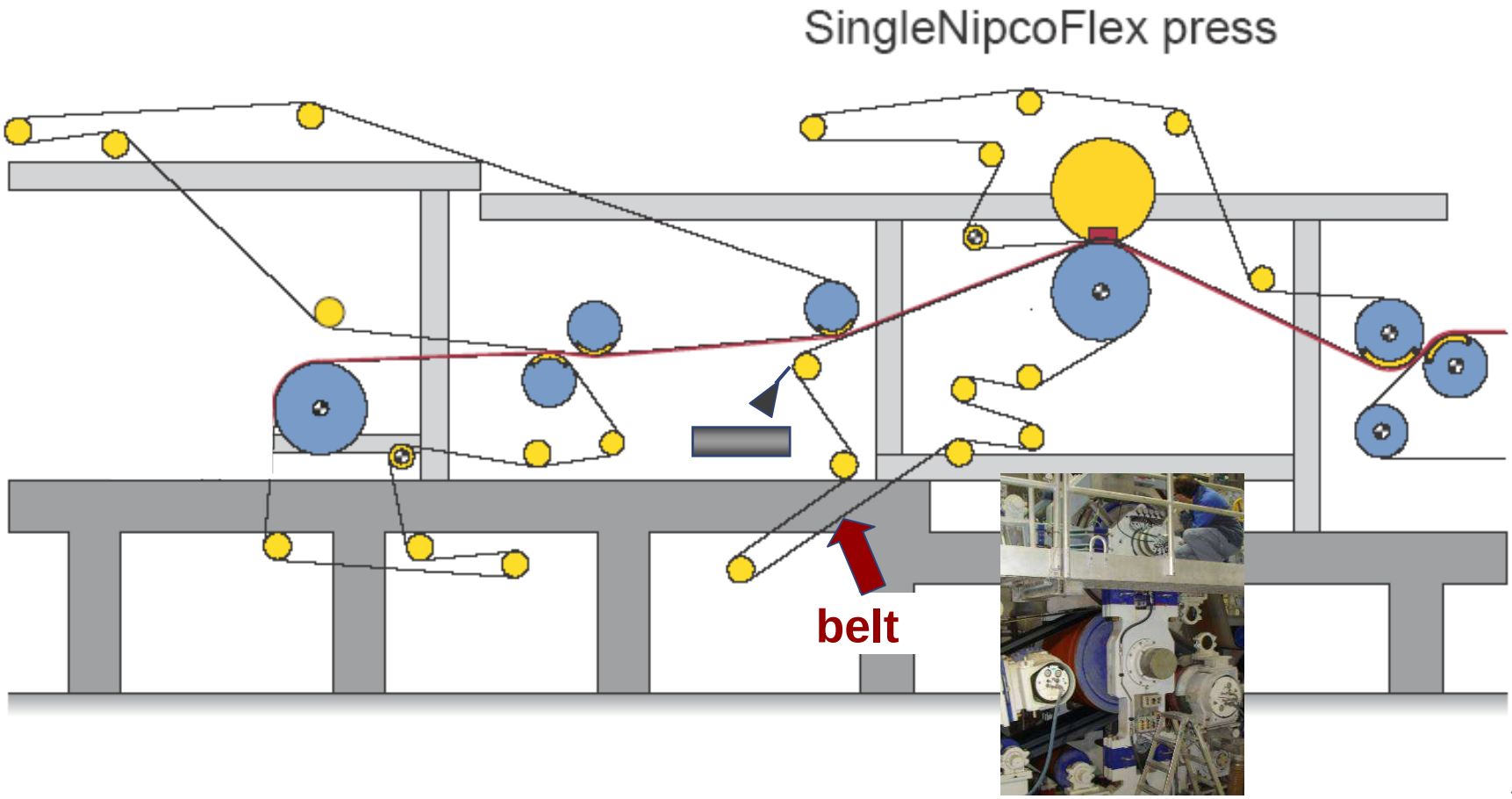
PTC Ravensburg

- Production capacity
  - Basis weight range: 20 –1000 g/m²
  - Speed range: 50 – 1800 m/min
- Concept studies
  - Sheet forming
  - Press section
- Comparison of raw materials and additives
- Combined trials with PTC Stock preparation

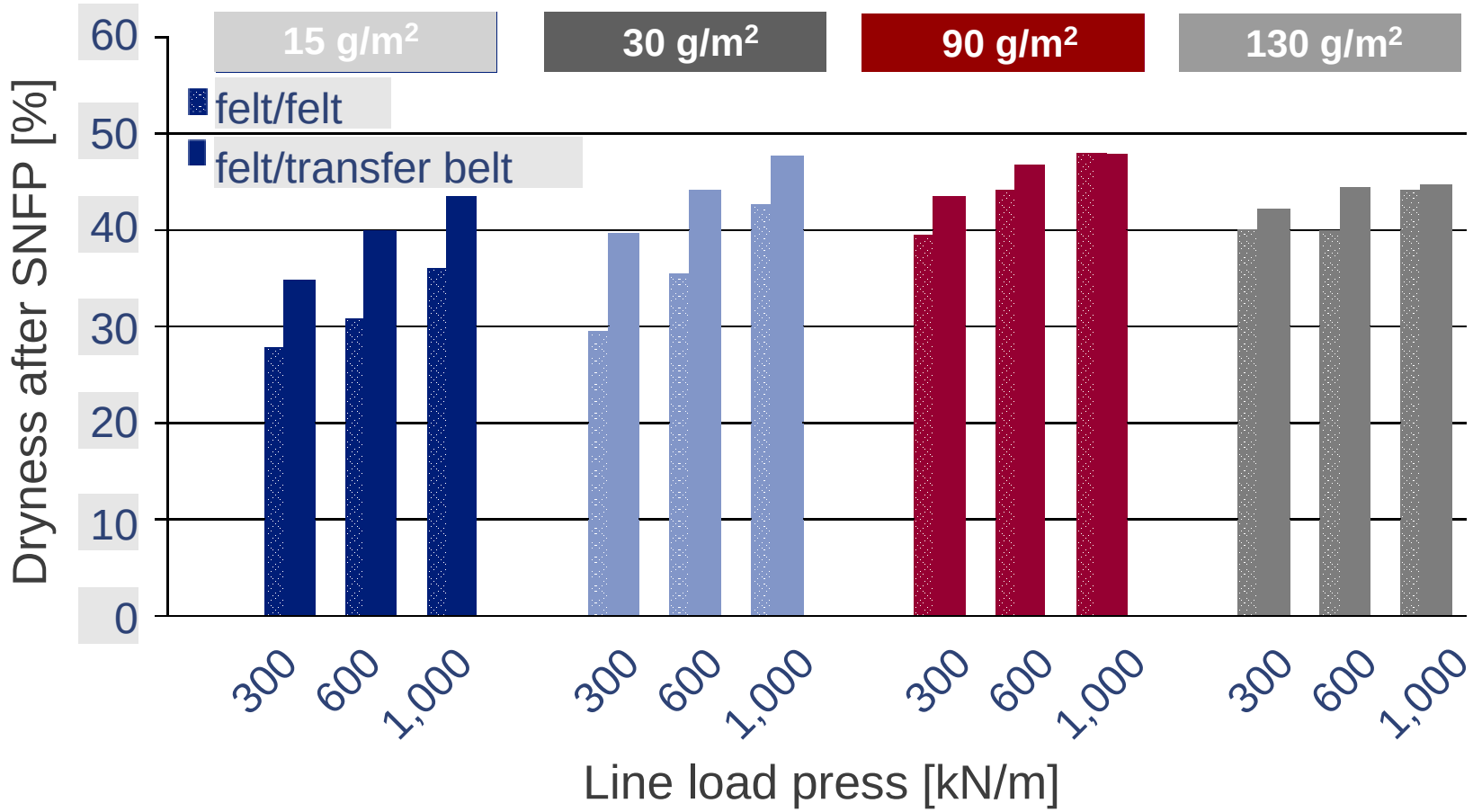
PTC Ravensburg
Trial Targets

- Verify the achievable dry content with a single felted shoe press at typical MG-machine furnish and basis weight range
- Check web run after shoe press (i.e. whether the web follows the TransferBelt or the pick-up felt after the press nip
- Check release behaviour of the web from the TransferBelt
- Check the initial roughness and roughness twosidedness of the paper before entering the MG cylinder

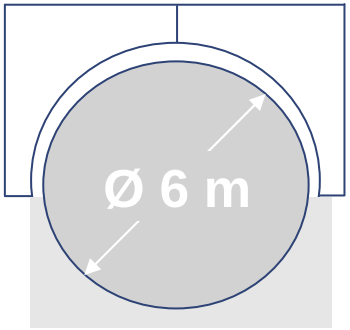
PTC Ravensburg
Press section with belt



PTC Ravensburg
Concept evaluation with pilot trials



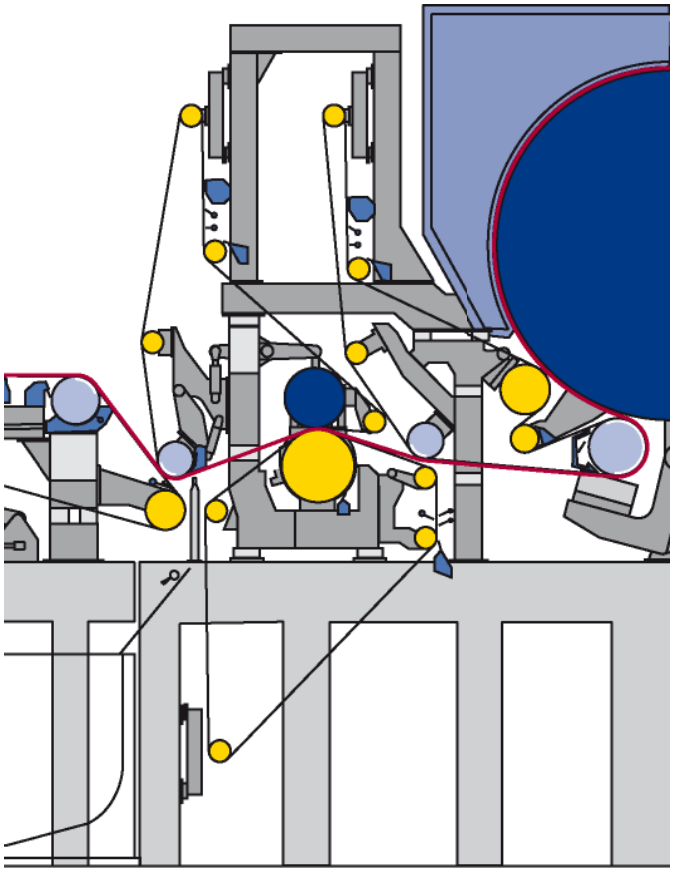
Benefits of new SNFP vs. double felted press @ 40 g/m²



	Double felted press	New SNFP
Dryness content after 3rd nip [%]	42	47
Machine speed [m/min]	480	600
Capacity [t/a]	36,000	45,000

+ 20 % more production @ less spec. operating cost

The new press concept



- Suction pick-up with tailing zone
- Single-felted NipcoFlex press, with transfer belt in bottom position
- Suction press roll on MG
- 2nd press roll on MG

Operational experience

- Increase in dryness between 4 and 6 % vs. double felted press
- excellent runnability also at low basis weights → amount of paper breaks is ~ 1 per month
- Production increase by 330 % compared to old PM
- Wide BW and quality range

Innovations from Voith Paper pay off!

Possibilities through innovation

Raw materials, fresh water and energy are limited

– but not ideas!

VOITH

Engineered Reliability