Building Leadership Excellence

Curtain Coater as Air Knife Replacement

Martin Schmid
Voith Paper Inc.
Appleton, WI

May 1-4
PaperCon 2011
Northern Kentucky Convention Center

RETHINK PAPER:
Lean and Green

Content

1. Introduction
2. Curtain Coating
3. Rebuild
4. Results
5. Summary

Sustainability –
The Vision for the Future of Paper Production

Raw material

Maximizing the recycling rate

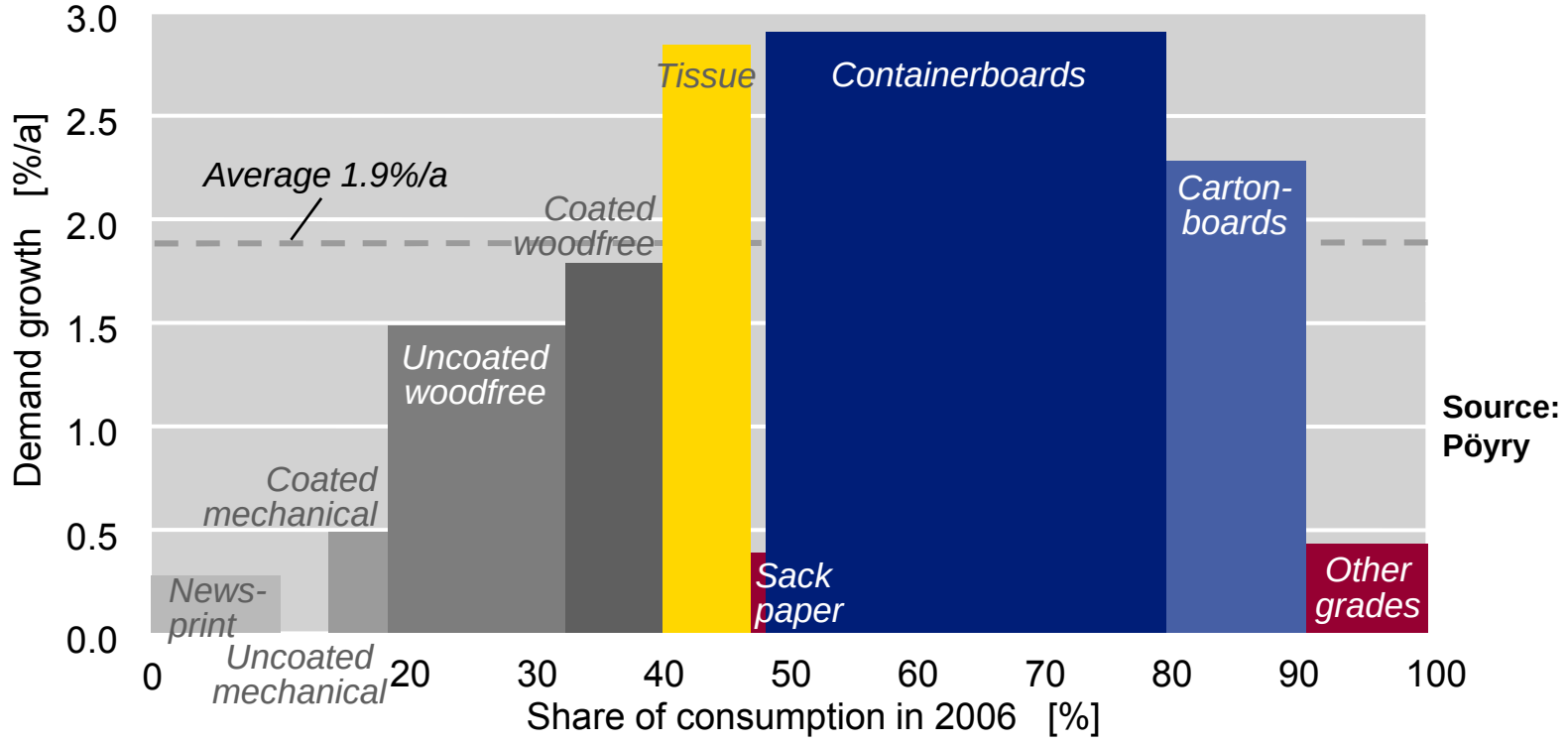
Energy

Reducing worldwide primary energy consumption by half

Water

Lowering consumption of fresh water to less than 1 liter per kg

Long-term Demand Growth by Product Area through 2025



- Above average growth rates for containerboards and cartonboards

Curtain Coating
Single - Multilayer

Single layer

- Well proven slot die technology
- More than 30 references
- For all paper and board grades

Double layer

- Based on the proven single layer concept
- Application of two different coating formulations
- No "teapot" effect

Multi layer

- Slide die technology
- Multiple layers possible

Curtain Coating

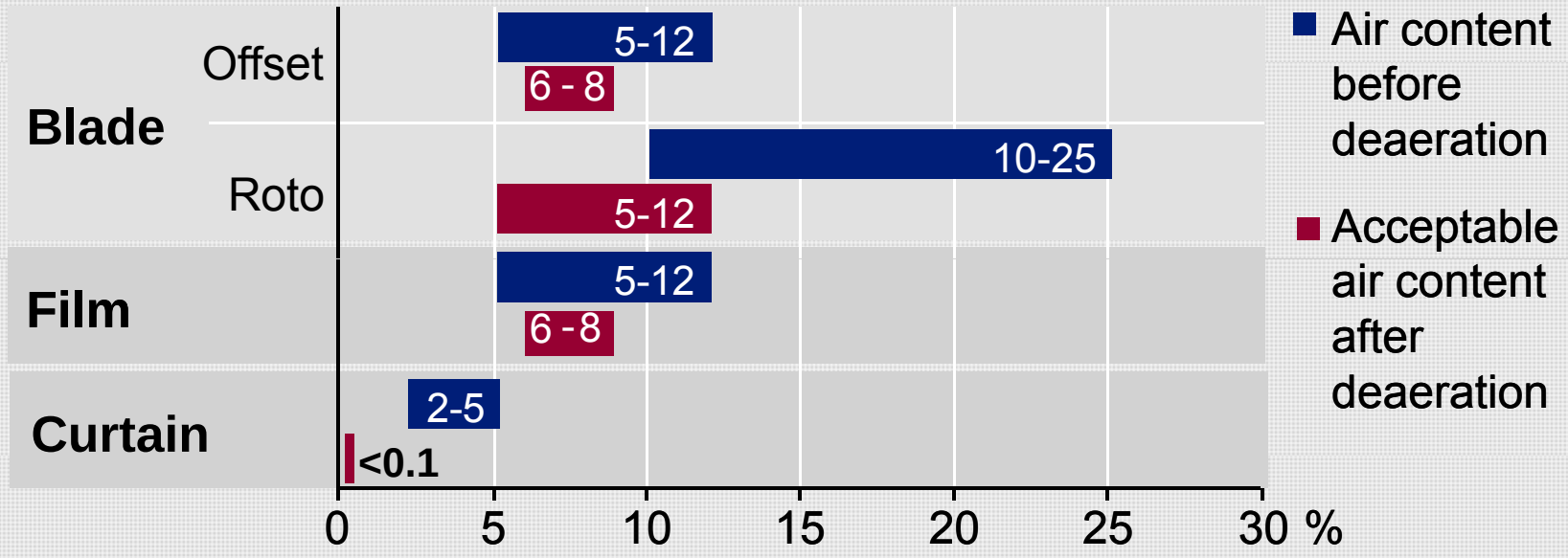
Characteristics

- Perfect coverage
- Excellent runnability
- High solids contents
- Ease of operation
- High efficiency
- No wear parts
- Excellent handling
- Optimum CD and MD coat weight profiles

Benefits

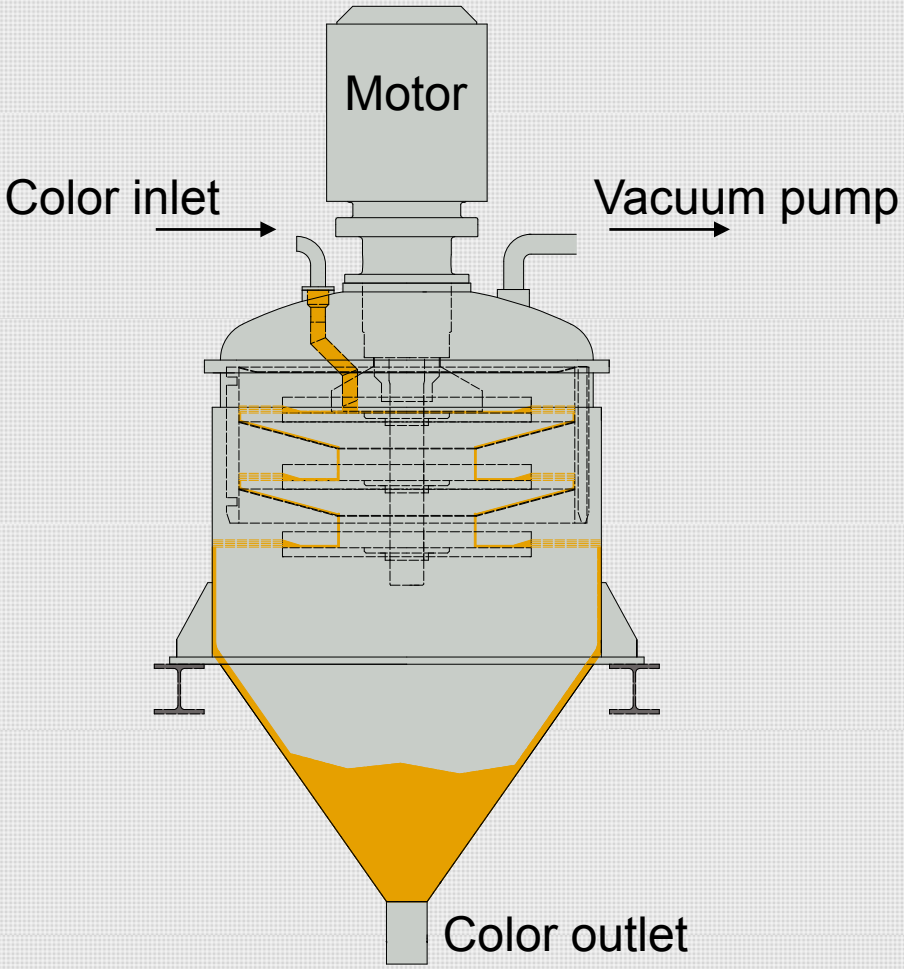
- Improved printability
- Less break time
- Reduced drying energy
- Wide coat weight range
- Higher content of recycled fibers

Deaeration
Typical Air Content Blade, Film and Curtain



Only very low air contents are acceptable in curtain coating

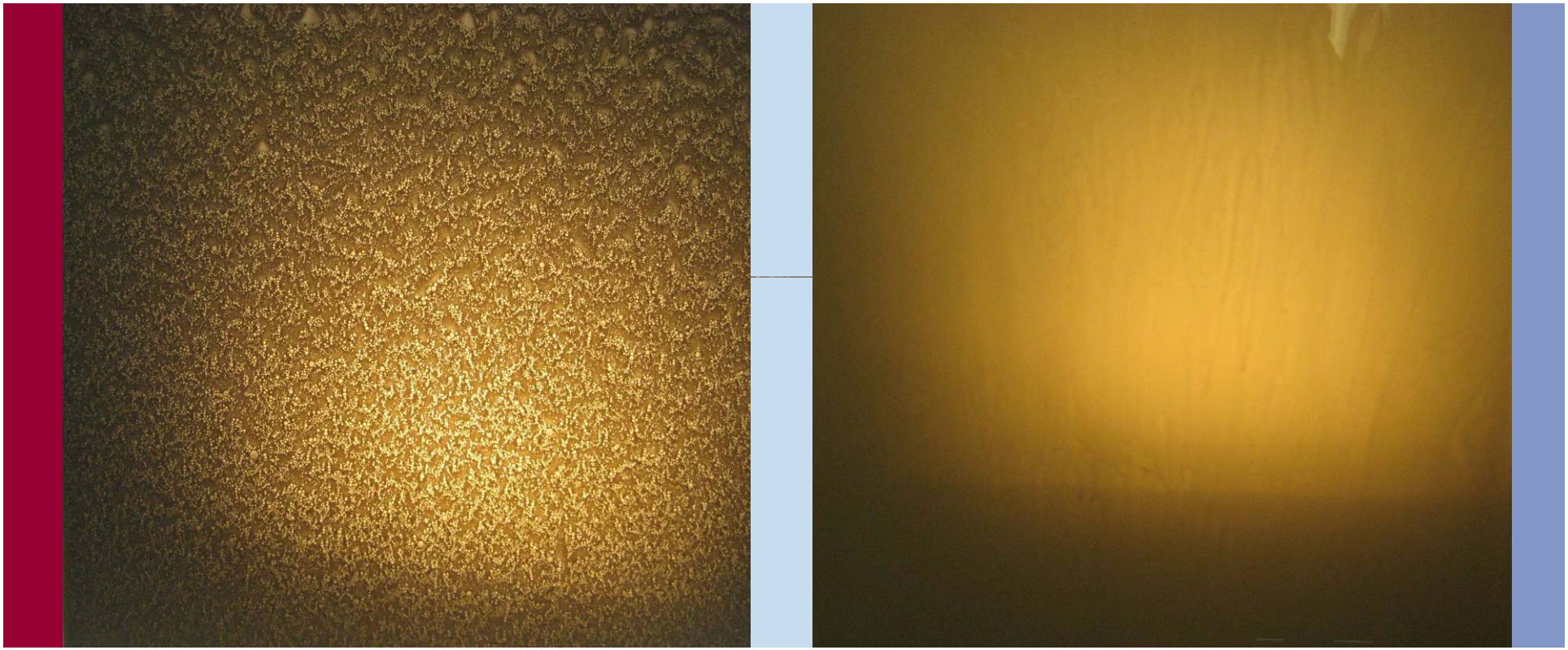
Deaeration
Vacuum deaerator for Curtain Coaters



Cascade principle:

3 X more surface at similar outer dimensions compared to competition

Deaeration
Visualisation of Air - Coating Color on a Glass Plate



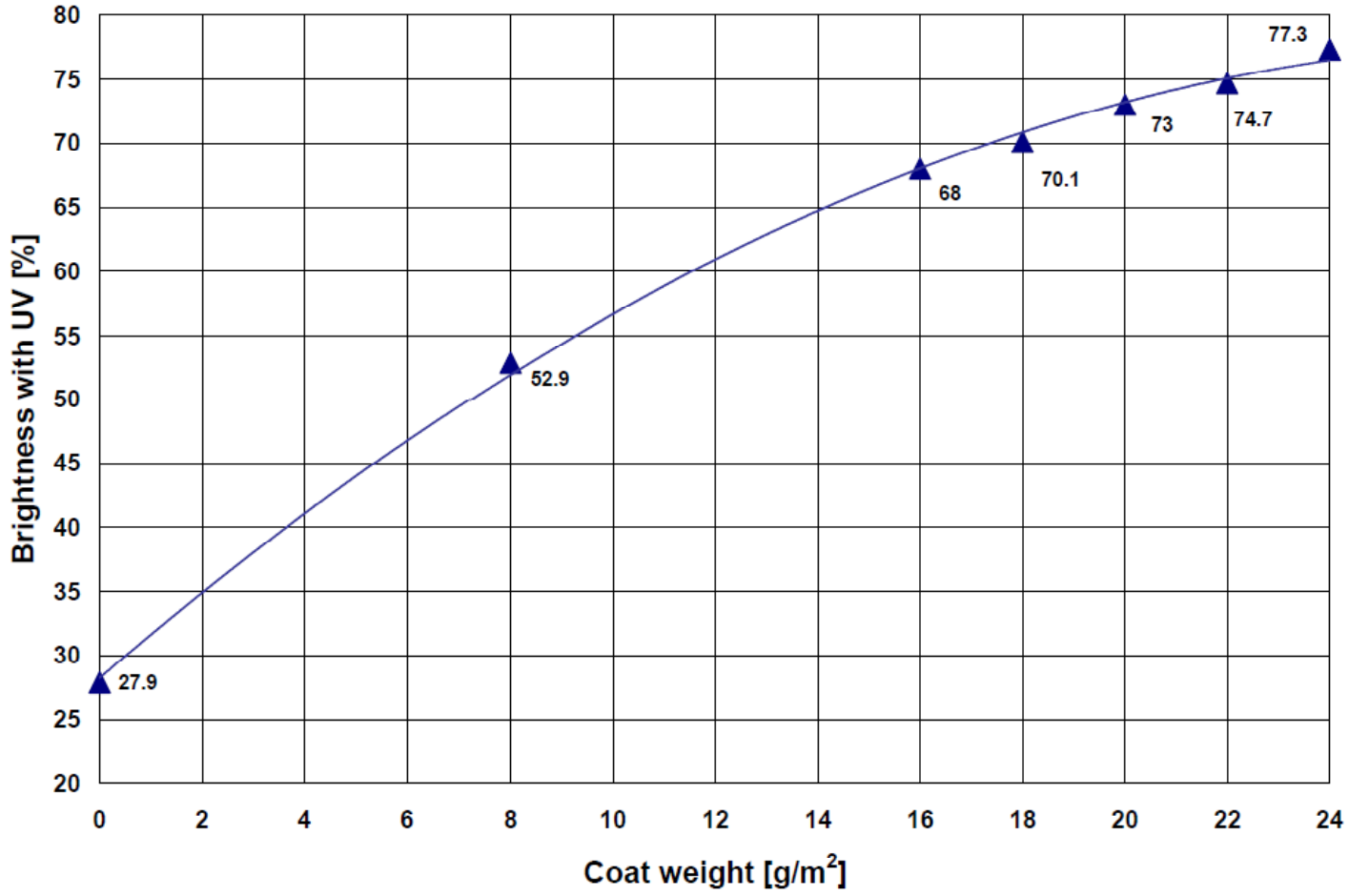
Before deaeration

After deaeration

Curtain Coating
Coverage effect with Curtain Technology

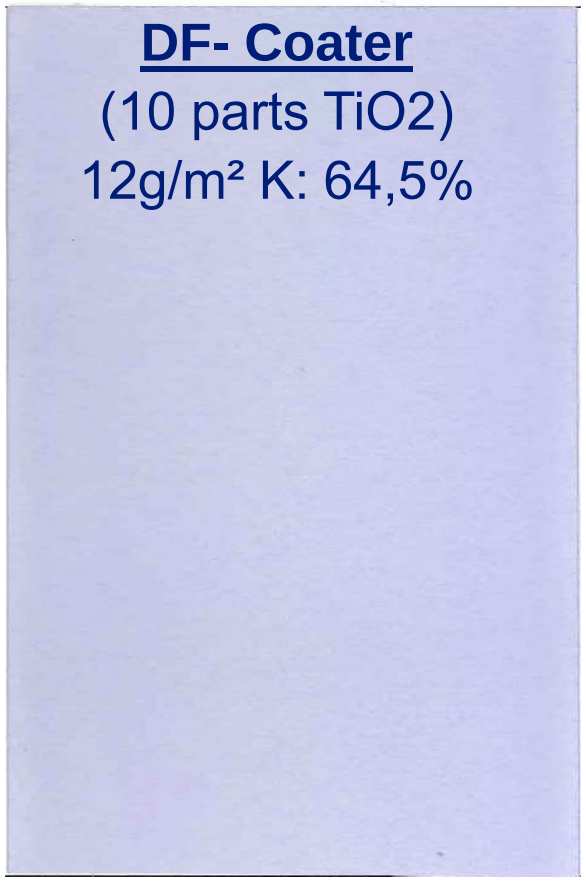
Curtain Coater is capable to cover raw paper or board with low brightness!

Curtain Coating
Brightness vs. Coat Weight

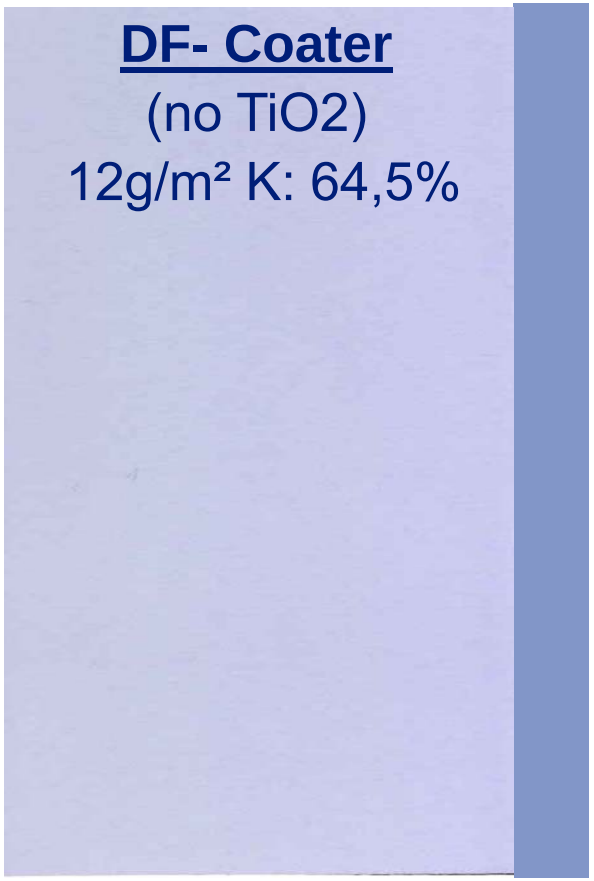


Pilot Trial Samples

Air Knife
(10 parts TiO2)
12g/m² K: 42%

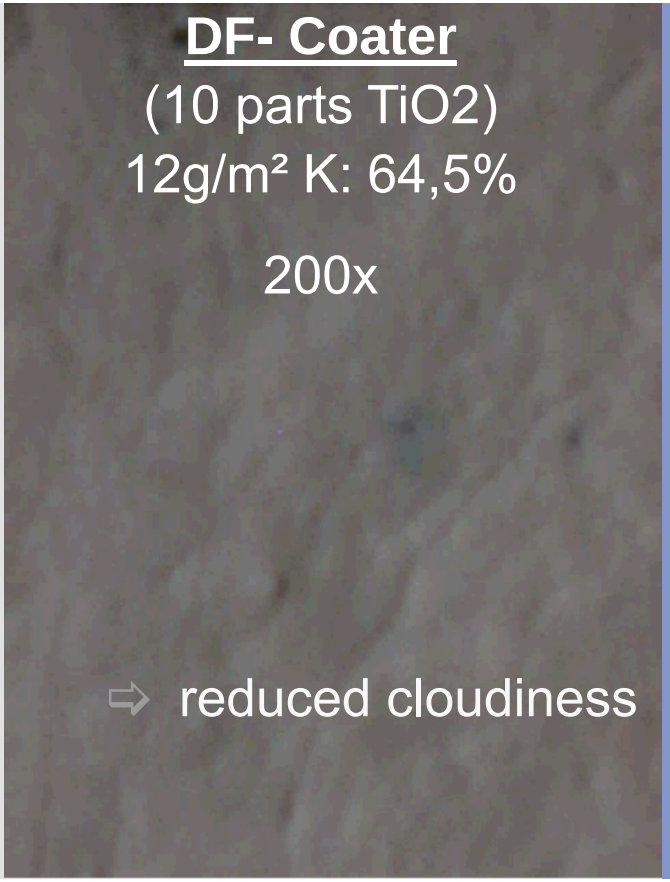


DF- Coater
(10 parts TiO2)
12g/m² K: 64,5%



DF- Coater
(no TiO2)
12g/m² K: 64,5%

Pilot Trial Samples

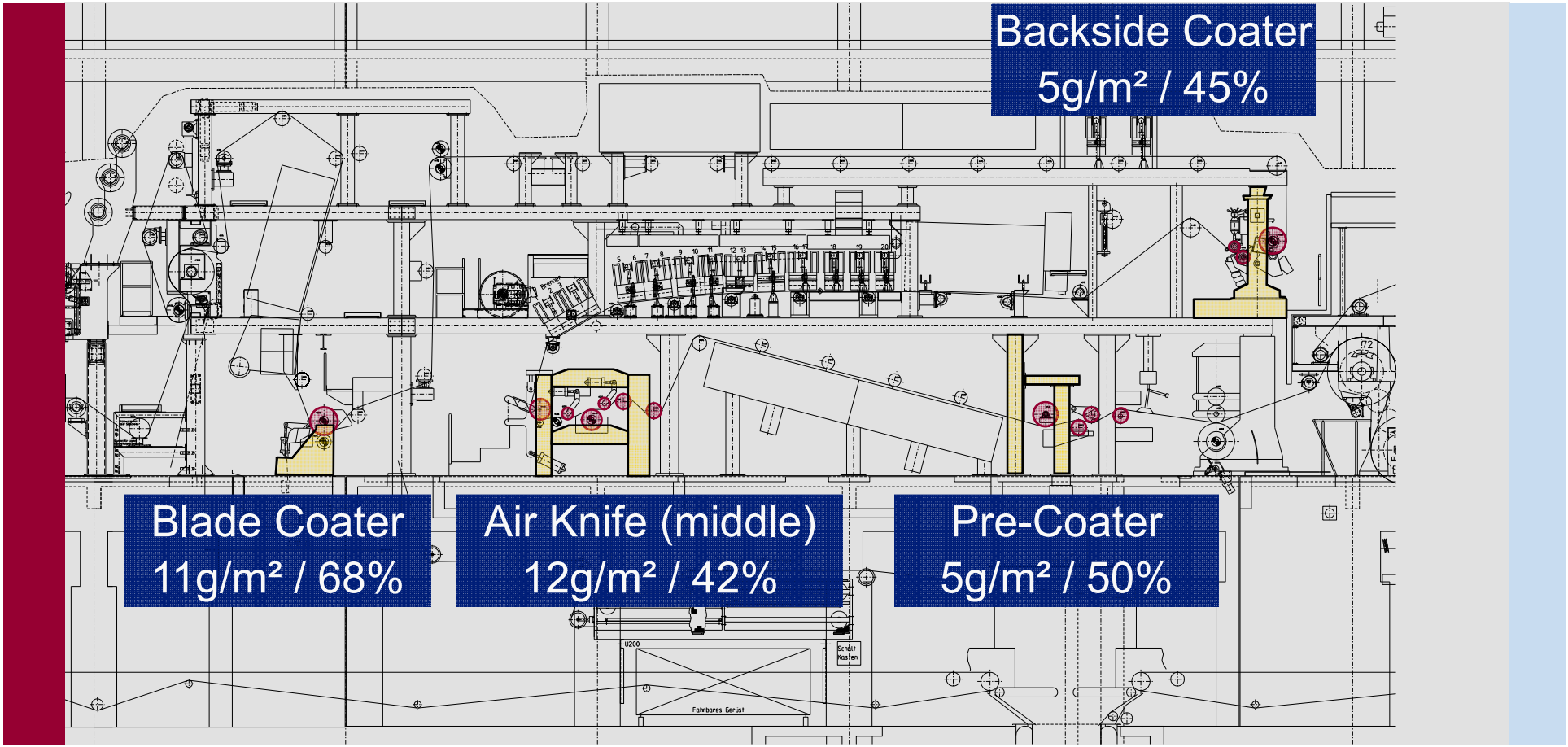


Machine Rebuild
Curtain Coater for a Board Machine

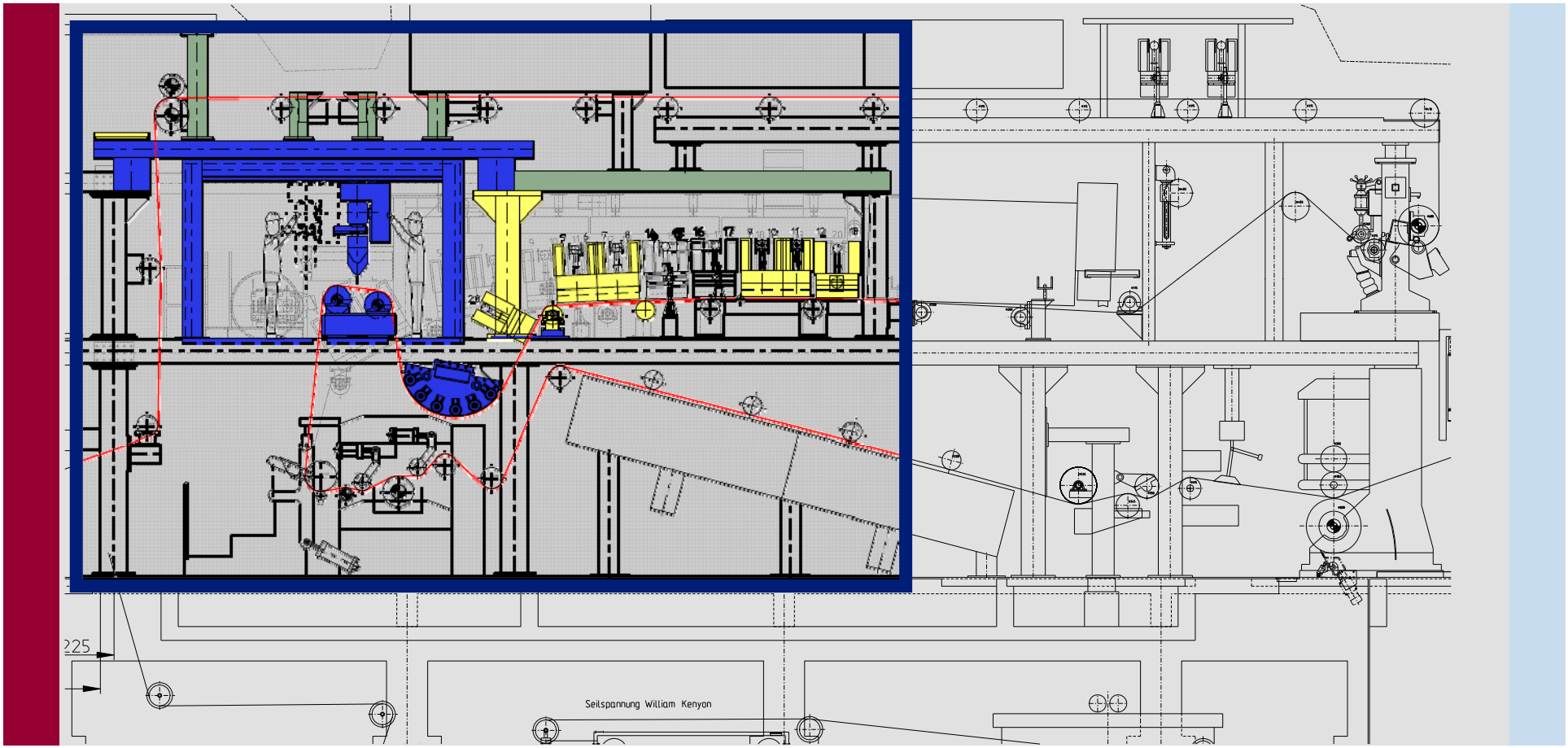
Substitution of an air knife by a curtain coater

Products:	several board grades	
Basis weight:	230…390 g/m²	
Machine speed:	370…550 m/min	
Coat application:	12 g/m² pigment coat in the middle coat	
Solids content:	62 %	(previously with air knife: 42 %)
Width:	4850 mm	
Start up:	May 2010	

Machine Rebuild
Layout with Air Knife Coater (Before Rebuild)



Machine Rebuild with Curtain Coater
Main Scope of Supply



Machine Rebuild
Start-up

- First color on web on June 17, 2010
- Since June 18, 2010 in continuous operation
- June 19 and 20: 24hrs operation without a break
- Savings in drying energy immediately achieved
  (6 rows of IR instead of 14)
- Color curtain is very stable
- Curtain formation after start is
  extremely fast

Machine Rebuild
Quality

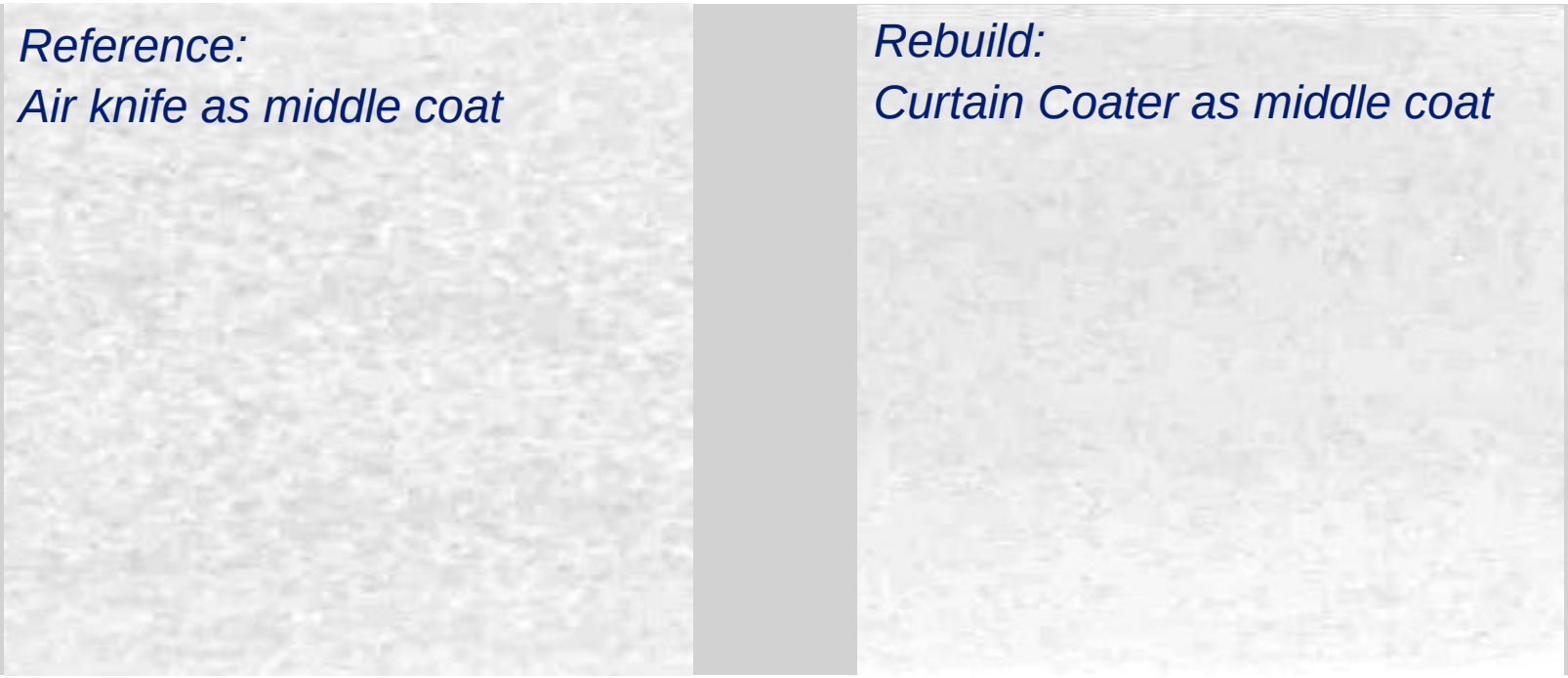
- Produced board was saleable from the 1st jumbo roll
- Coverage (opacity) and gloss are better than before
- Coat weight could be reduced
- Flatness was much better
  → Sheeters could run faster
- Improved pick-resistance
- Better printability (no mottling)

Results
Curtain Coater for a Board Machine

Latest results: Superior coverage and reduced cloudiness

Reference:
Air knife as middle coat

Rebuild:
Curtain Coater as middle coat



Precoat: 6 g/m² rod coater
Middle coat: 12 g/m² air knife or curtain coater, resp.
Top coat: 11 g/m² bent blade

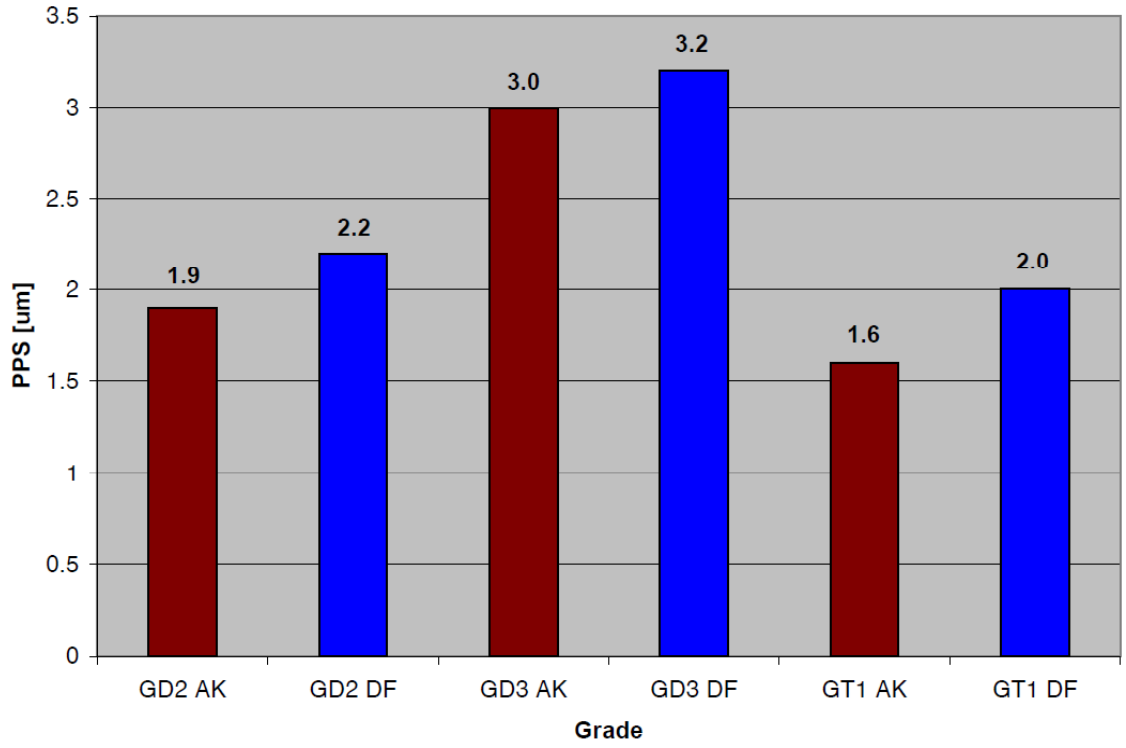
contrast enhanced

Results
Coating Layer

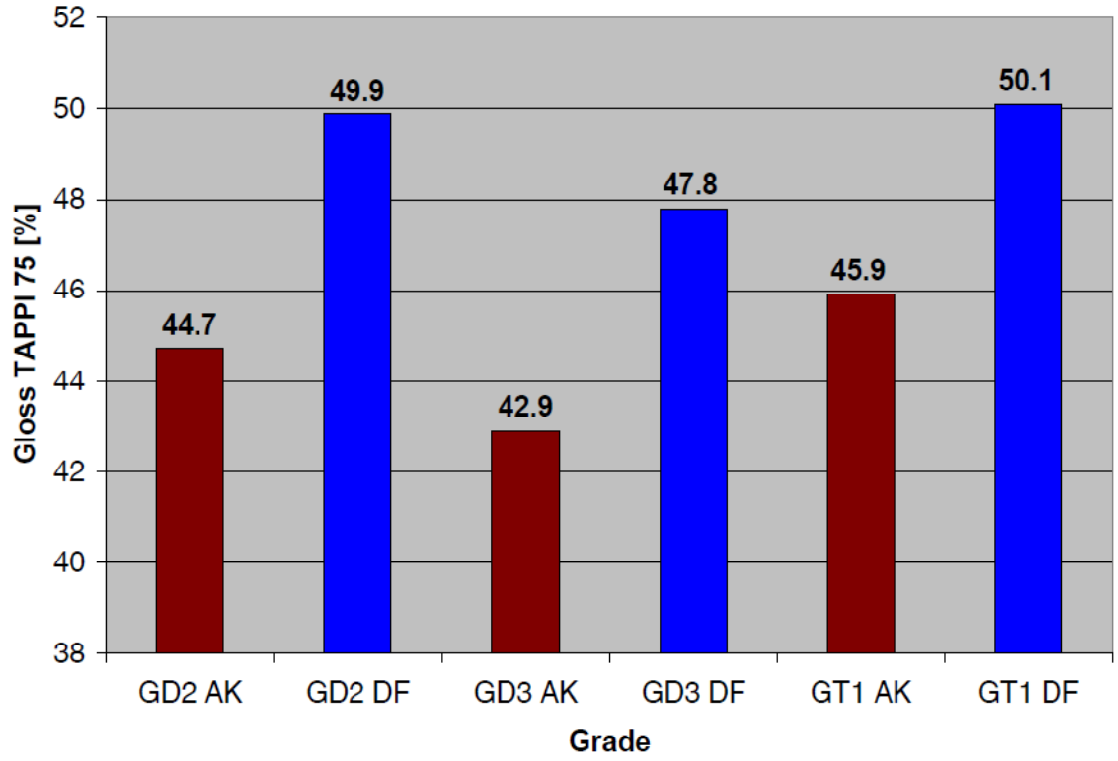
Air Knife

Curtain Coater

Results
Curtain Coater for a Board Machine



Results
Curtain Coater for a Board Machine



Results
Curtain Technology versus Air Knife Coater

- Superior coverage and clearly reduced cloudiness
- Best coating color distribution (CD + MD)
- Improved visual appearance by coating layer
- Significant higher solid content (62 – 64 %)
- No speed limit (v > 500 m/min)
- Wide coat weight range (11 to 20 g/m² without any difficulty)
- Very good runnability (no web break in the curtain coater since start – up).

Summary
Curtain Coater for a Board Machine

- Furnish cost reduction
  Improved coverage allows to replace DIP by mixed waste paper
- Production increase due to increased machine speed
  Air knife has been the bottleneck
- Energy savings
  Increase in solids content from 42% to 62%
  means 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)

MM Frohnleiten KM3 - Pictures

Summary

Curtain Coating is a
Green Technology

- Energy savings due to:
  - Higher machine efficiency
  - Less drying requirements

- Increased use of recycled fibers due to:
  - Improved machine runnability
  - Improved coating coverage

Thank You!