Material Compatibility in the Canmaking Process

G. Macfarlane

Member of the Board of Directors,
Böttcher Group

Euro CanTech 2016

Berlin

Systems ▶▶ Packaging

The Böttcher Group

- Founded in 1725
- Worldwide no.1 in roller coverings/printing chemicals
- 135 years experience in roller manufacturing
- 23 production plants in 17 countries
- 230 million € turnover
- 1900 employees

Böttcher Systems

Systems ▶▶ Packaging

Chemical and Physical Properties of Elastomer Covered Rollers

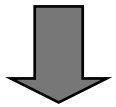
Böttcher Systems

Systems ▶▶ Packaging

Swell/Shrink Mechanism

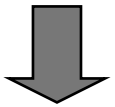
When an elastomer roller covering comes into contact with a chemical medium (e.g. ink, wash), 2 processes take place:

- Substances leach into the elastomer matrix



Swell

- Plasticisers are extracted from the matrix



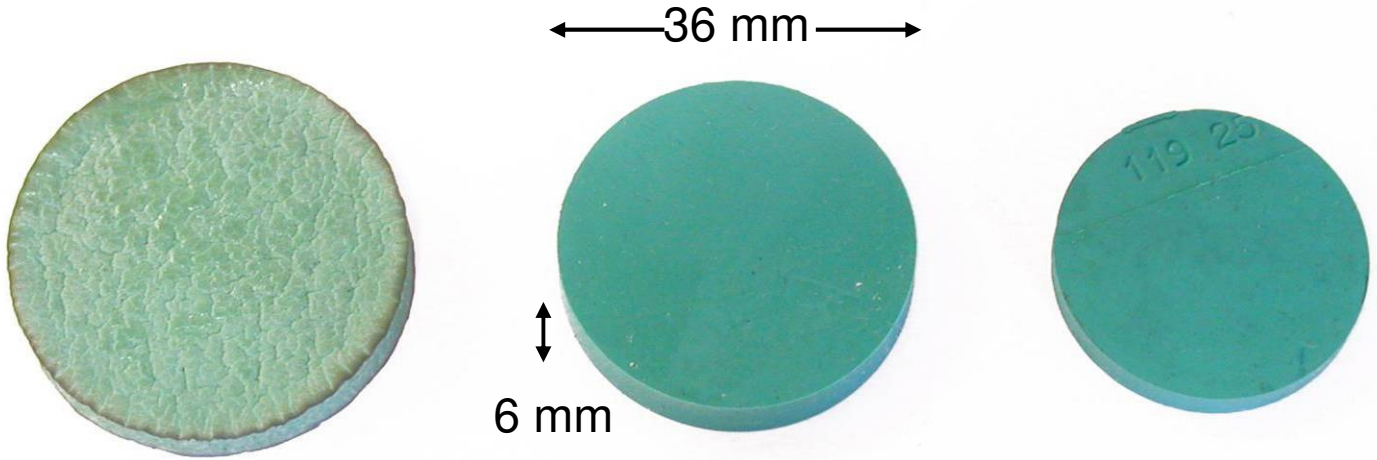
Shrinkage

Both processes are <u>always</u> present. Their effects depend on:

- Temperature
- Time (length of exposure)
- Nature of the medium
- Characteristics of the elastomer compound

Böttcher Systems

Roller Swell/Shrinkage: Lab samples after test



Swelling **Original** **Shrinkage**

Conclusions

- **Roller swelling**
  - is normally temporary and reversible
- **Roller shrinkage**
  - is cumulative and irreversible

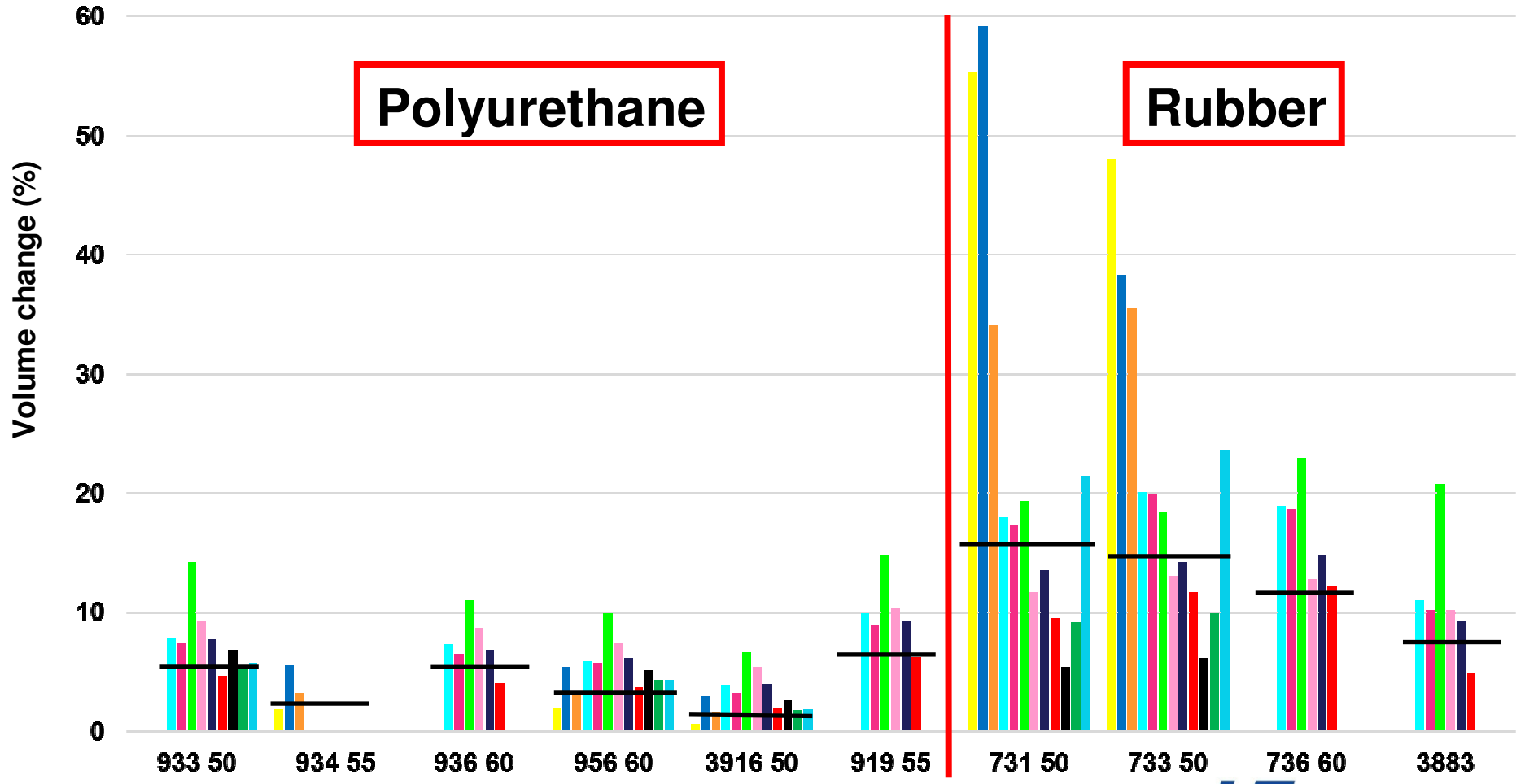
Systems ▶▶ Packaging

Case Study 1:
Coating Cylinder Coverings
in
3-piece Canmaking

Böttcher Systems

Systems ▶▶ Packaging

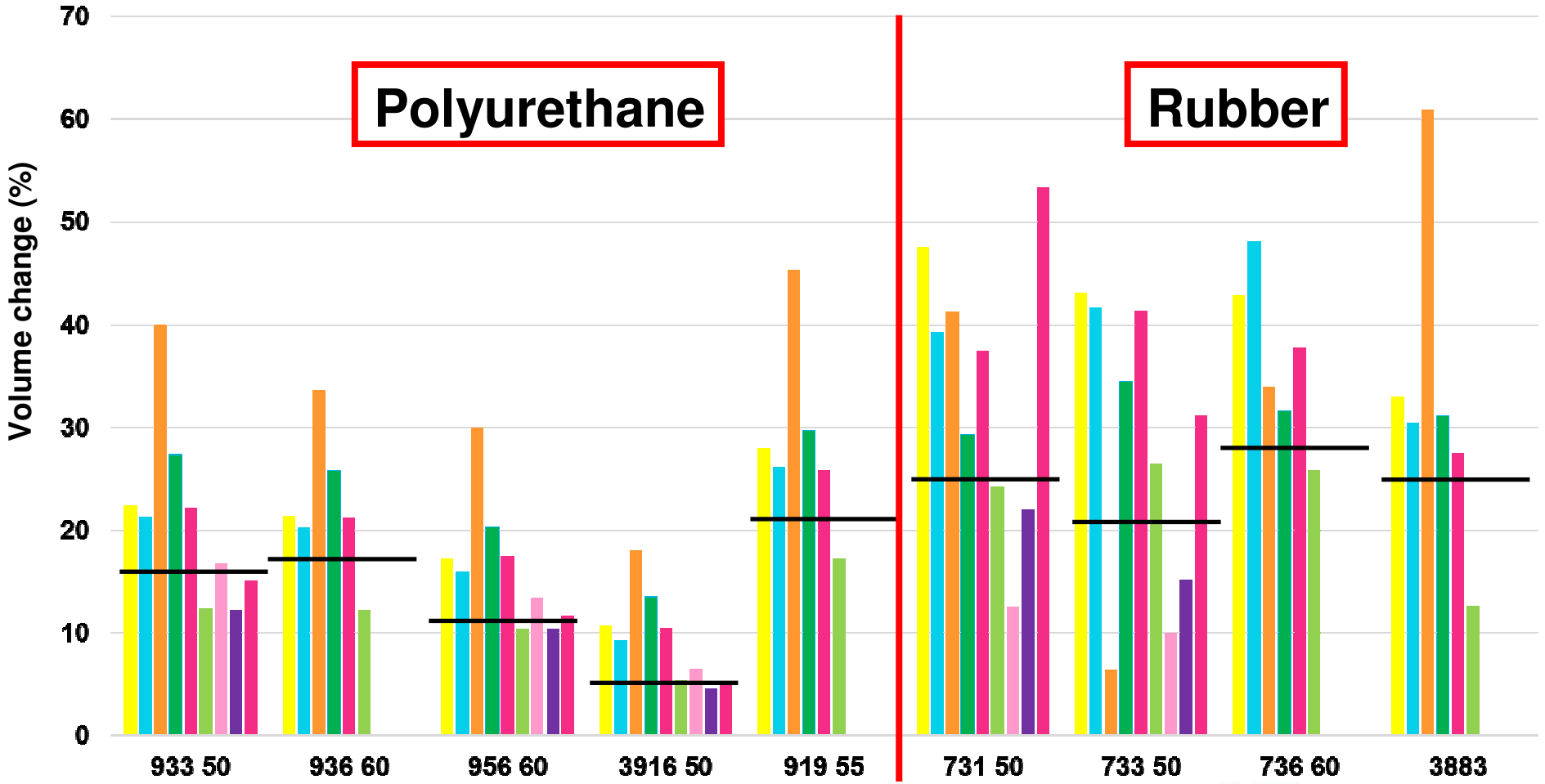
Swell Rates (1 Day)
Diverse Compounds/Coatings



Böttcher Systems

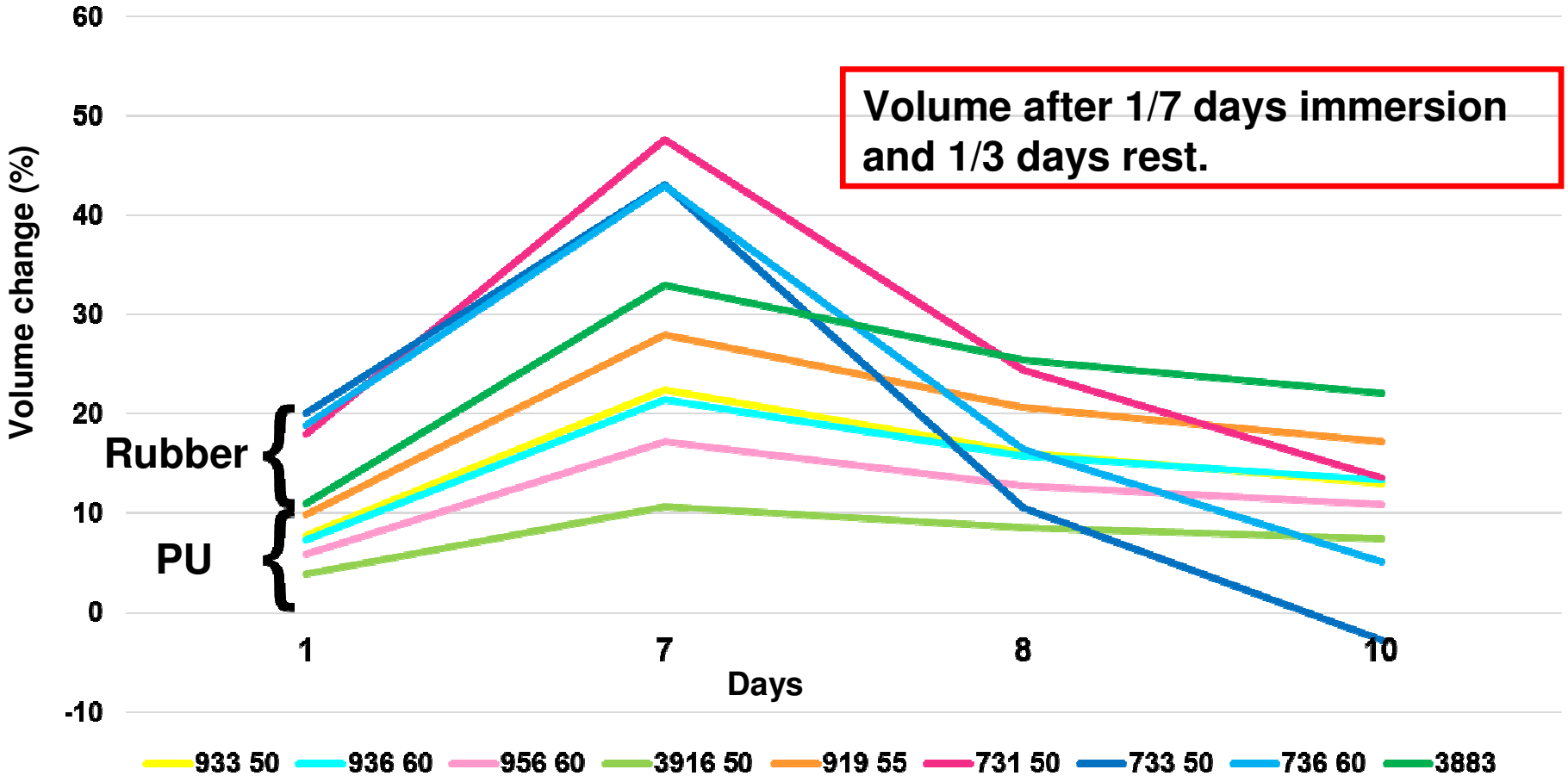
Systems ▶▶ Packaging

Swell Rates (7 Days)
Diverse Compounds/Coatings



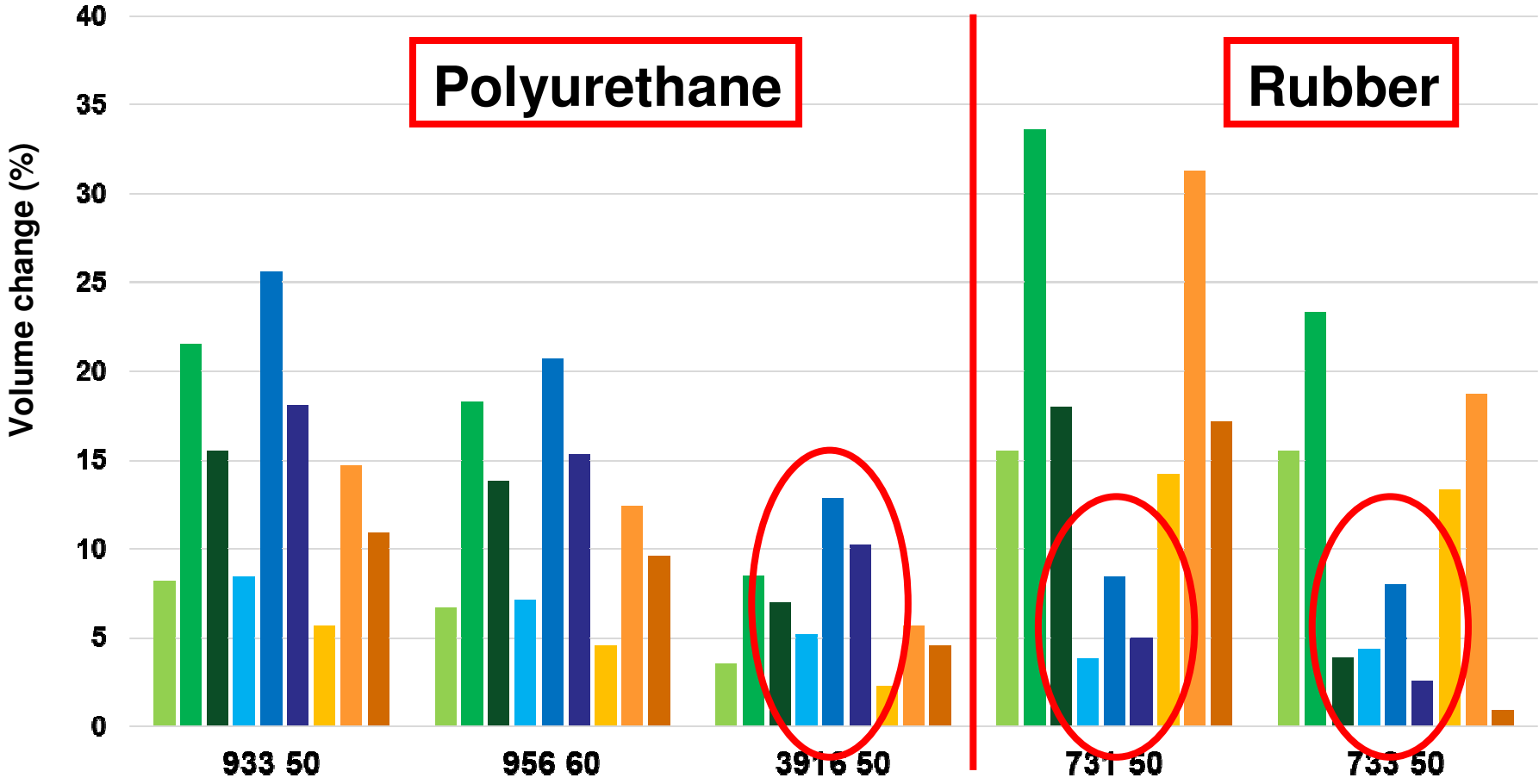
Böttcher Systems

Swell Rates After 1/7/8/10 Days White Lacquer



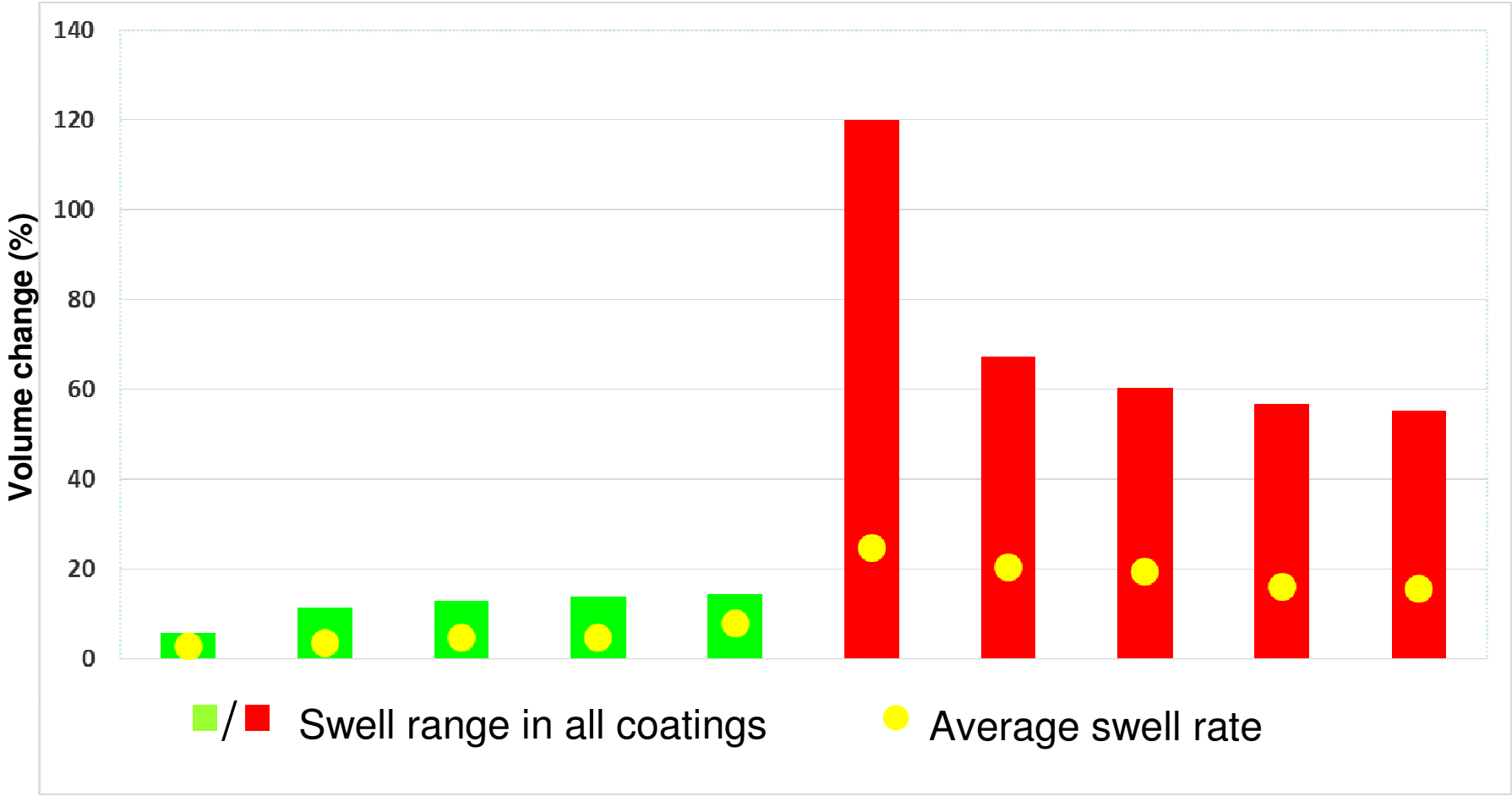
Systems ▶▶ Packaging

Food Can Plant
Swell Rates (1/7/8 Days)



Böttcher Systems

Best/Worst in Class Coatings (Minimum/Maximum Swell)

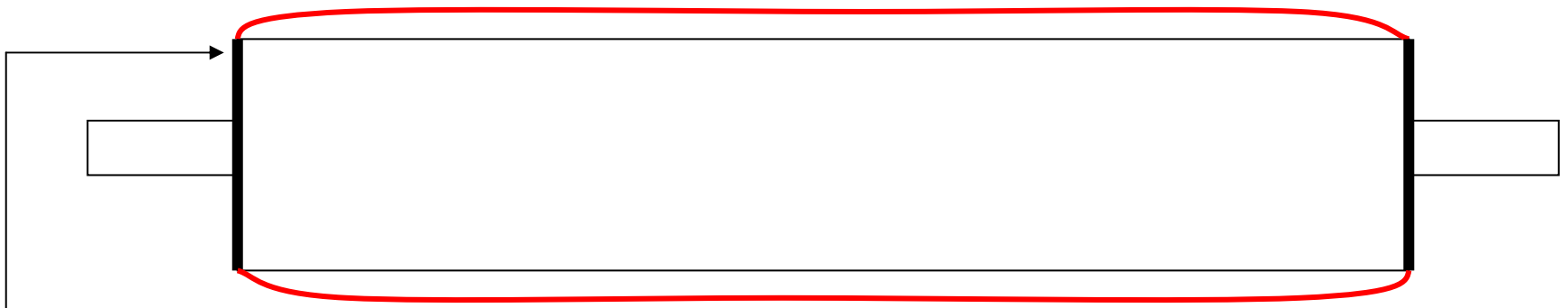


Systems ▶▶ Packaging

Case Study 2:
Inker Rollers
in
2-piece Canmaking

Böttcher Systems

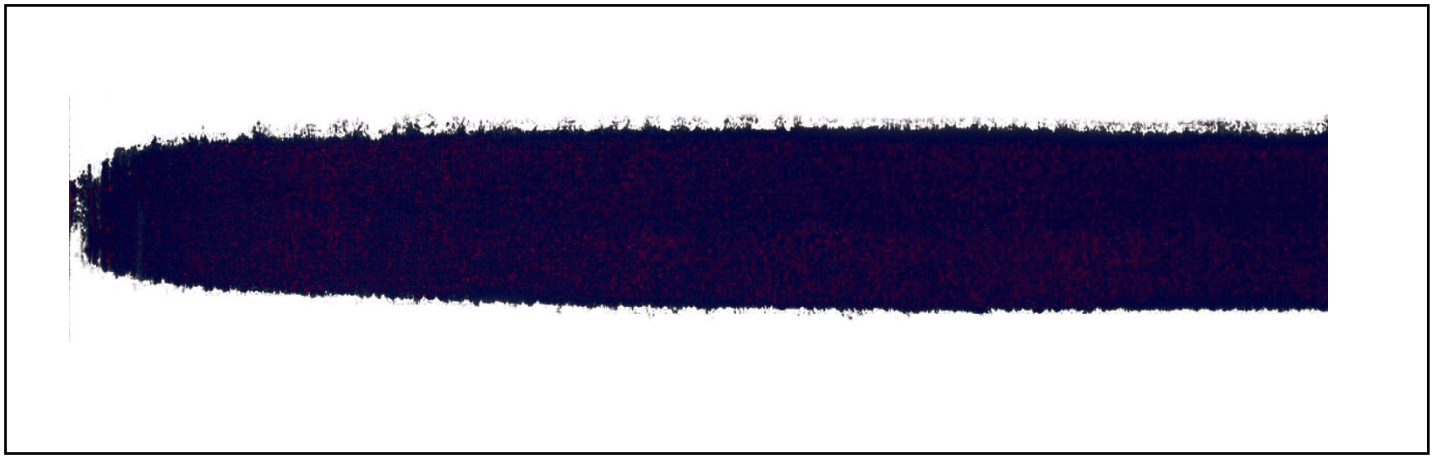
Roller Swell (“Cigar Effect”)



Shoulders of rubber covering not exposed continuously to fresh ink, often „sealed“ by dry ink, dust etc., therefore less swelling at the ends.

Systems ▶▶ Packaging

Roller Swell (“Cigar Effect”)



Böttcher Systems

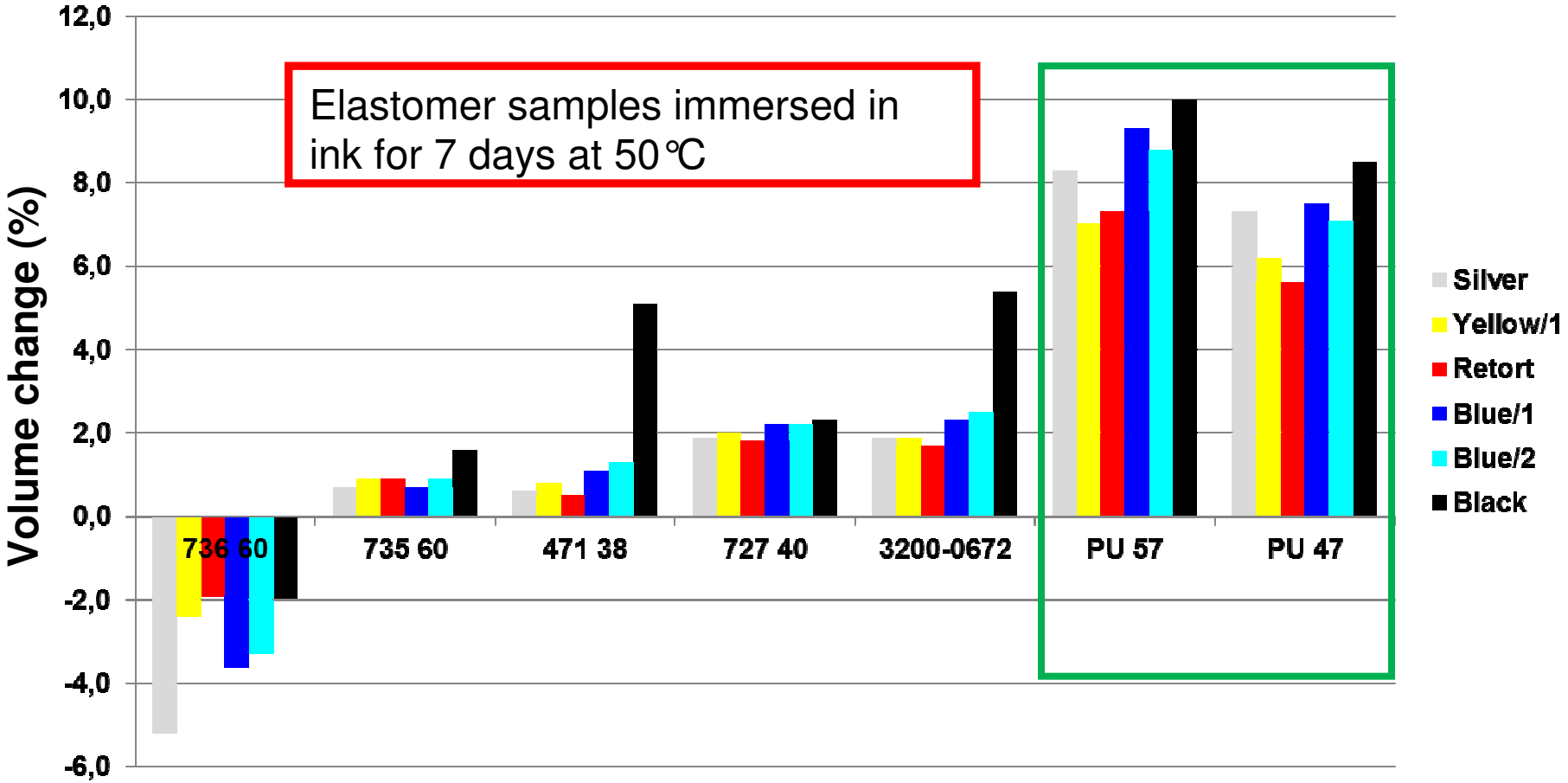
Systems ▶▶ Packaging

Effects of Roller Swell: Dynamic Overload

Böttcher Systems

Systems ▶▶ Packaging

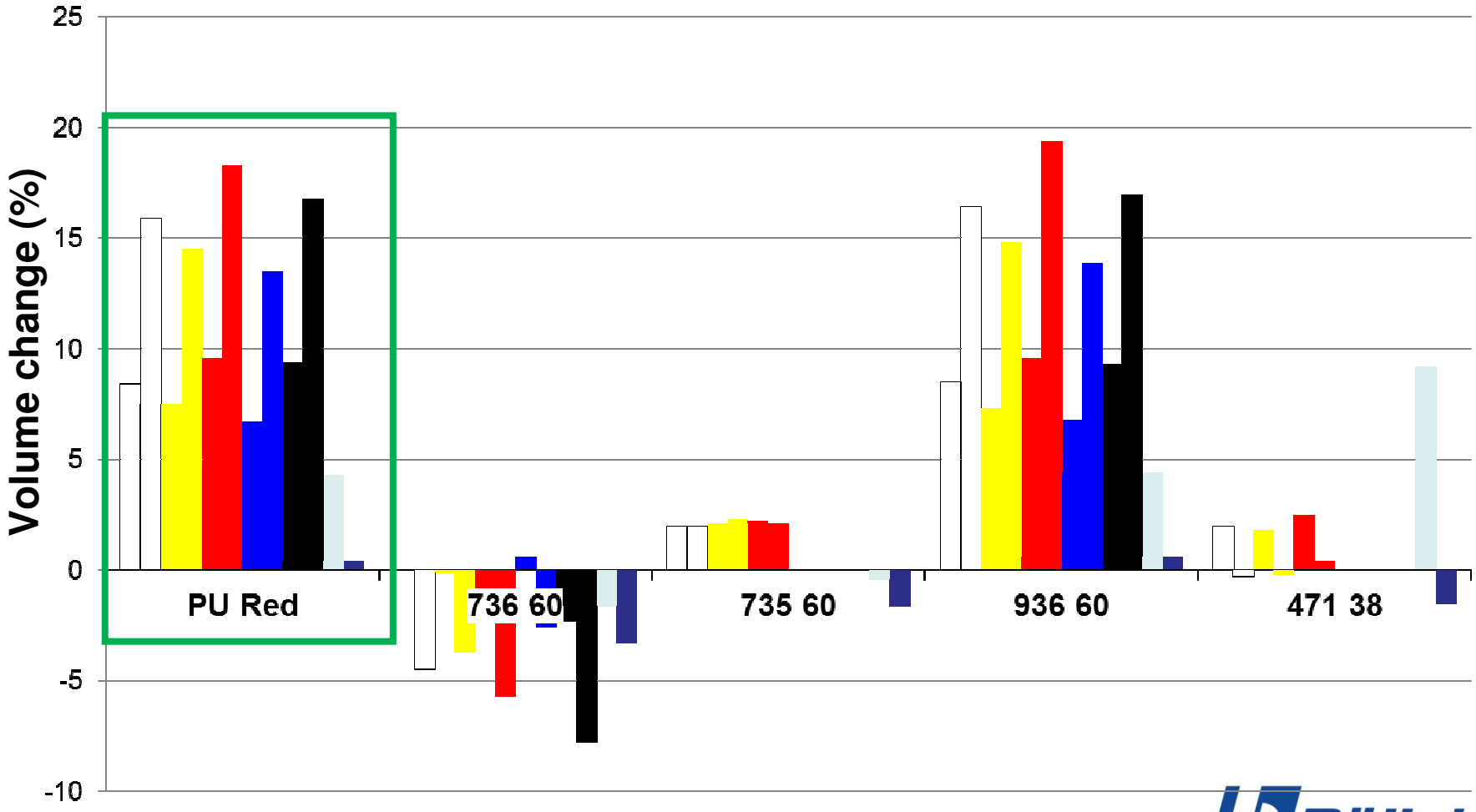
Beverage Can Plant, Germany



Böttcher Systems

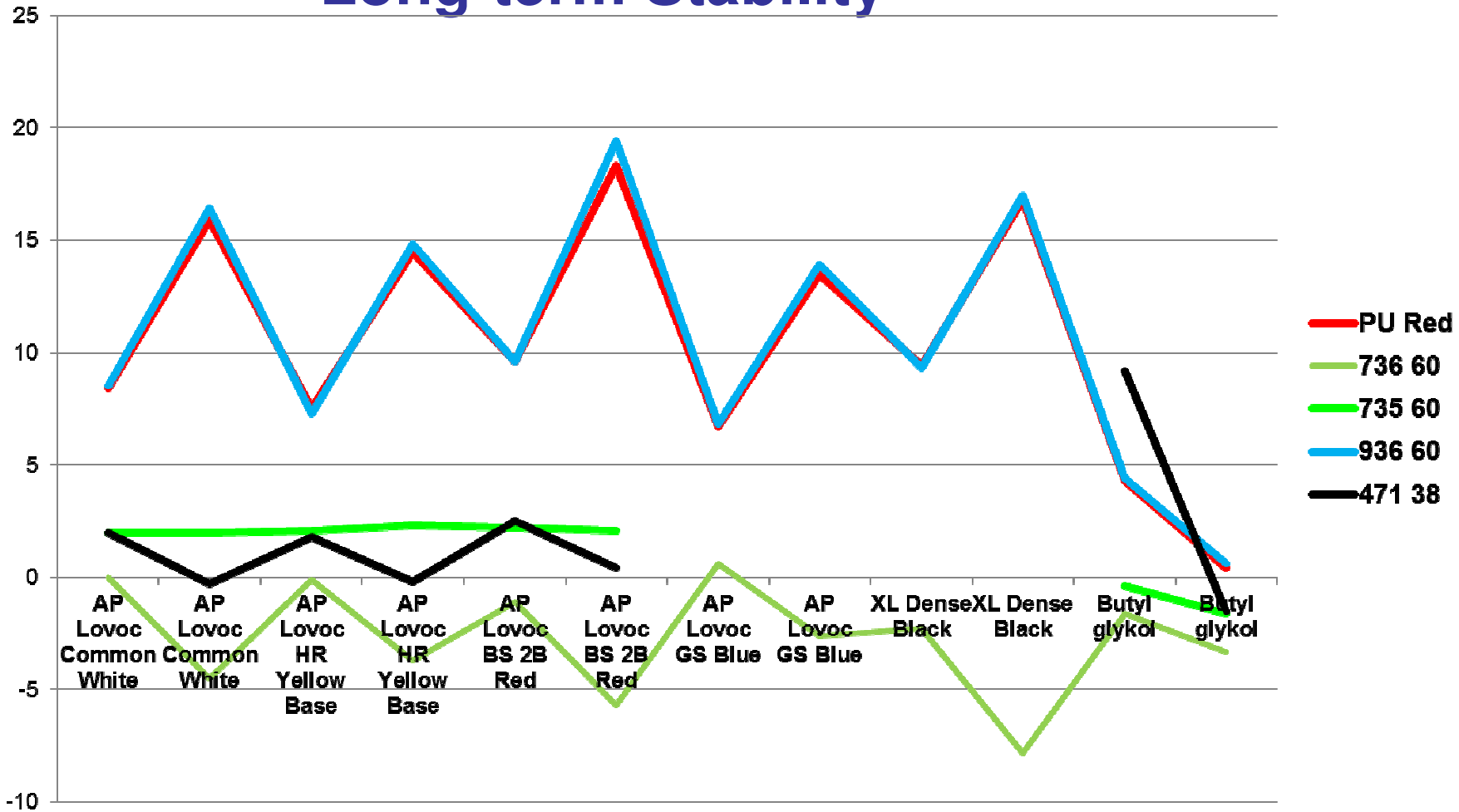
Systems ▶▶ Packaging

Beverage Can Plant, Poland

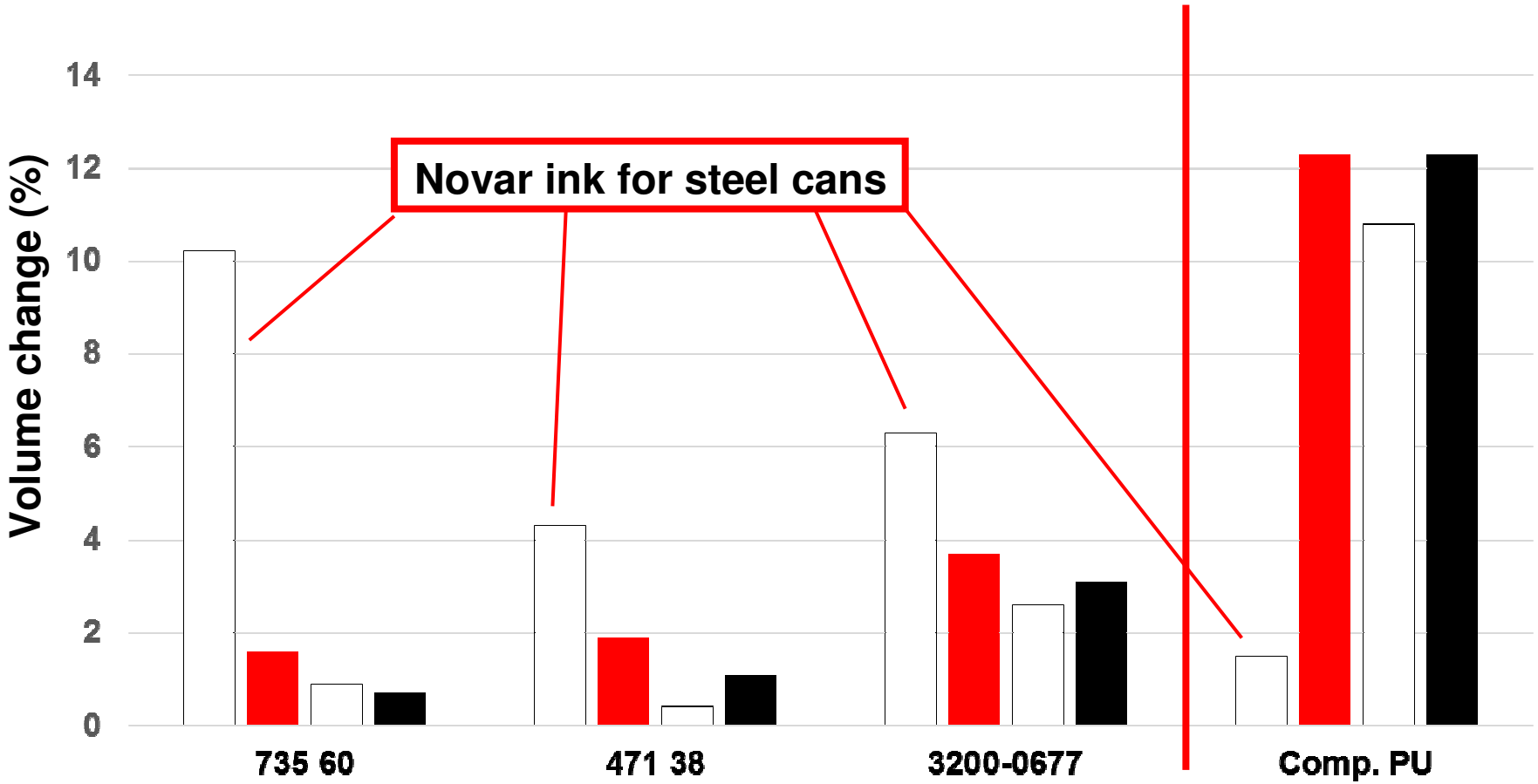


Böttcher Systems

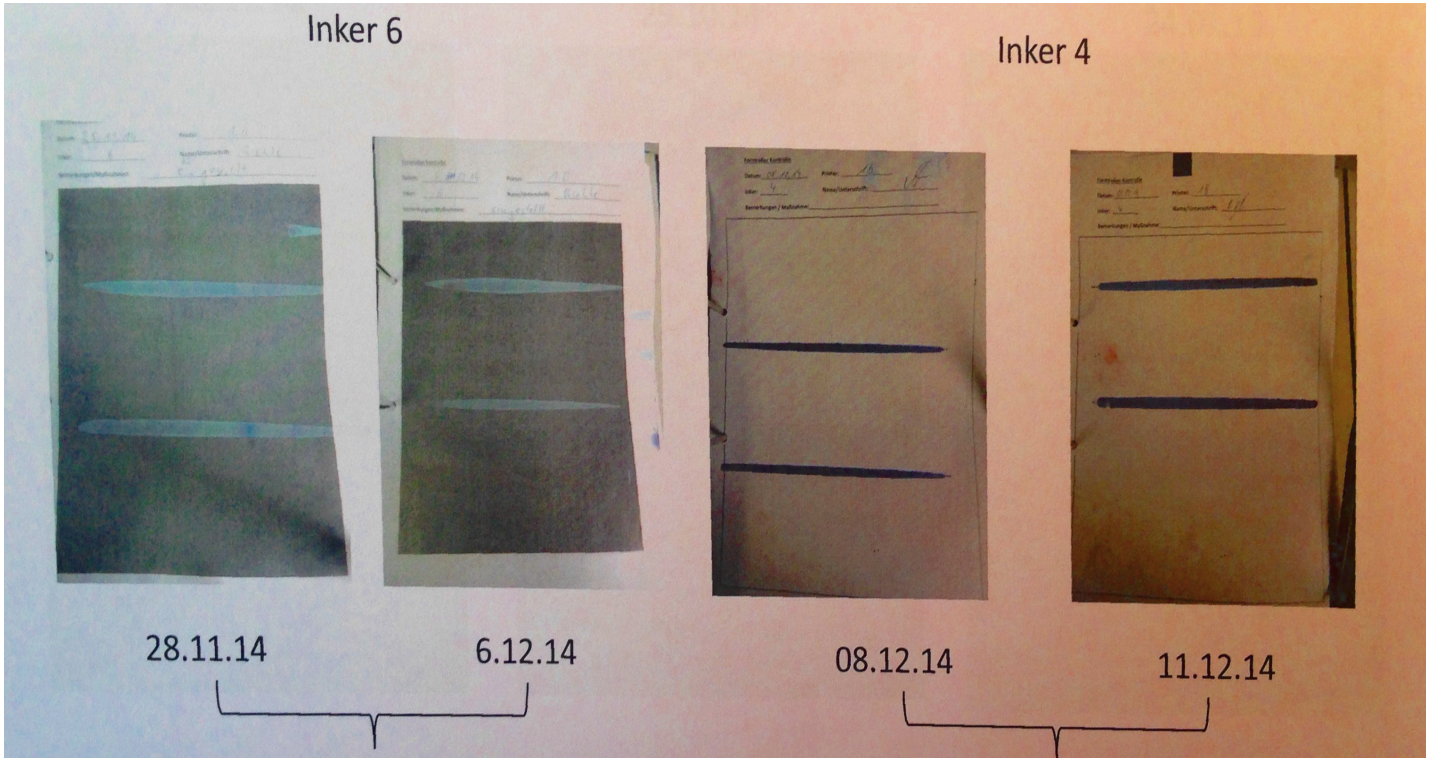
Beverage Can Plant, Poland
Long-term Stability



Beverage Can Plant, UK
Steel/Aluminium Cans



Roller Swelling with Competitive Rollers

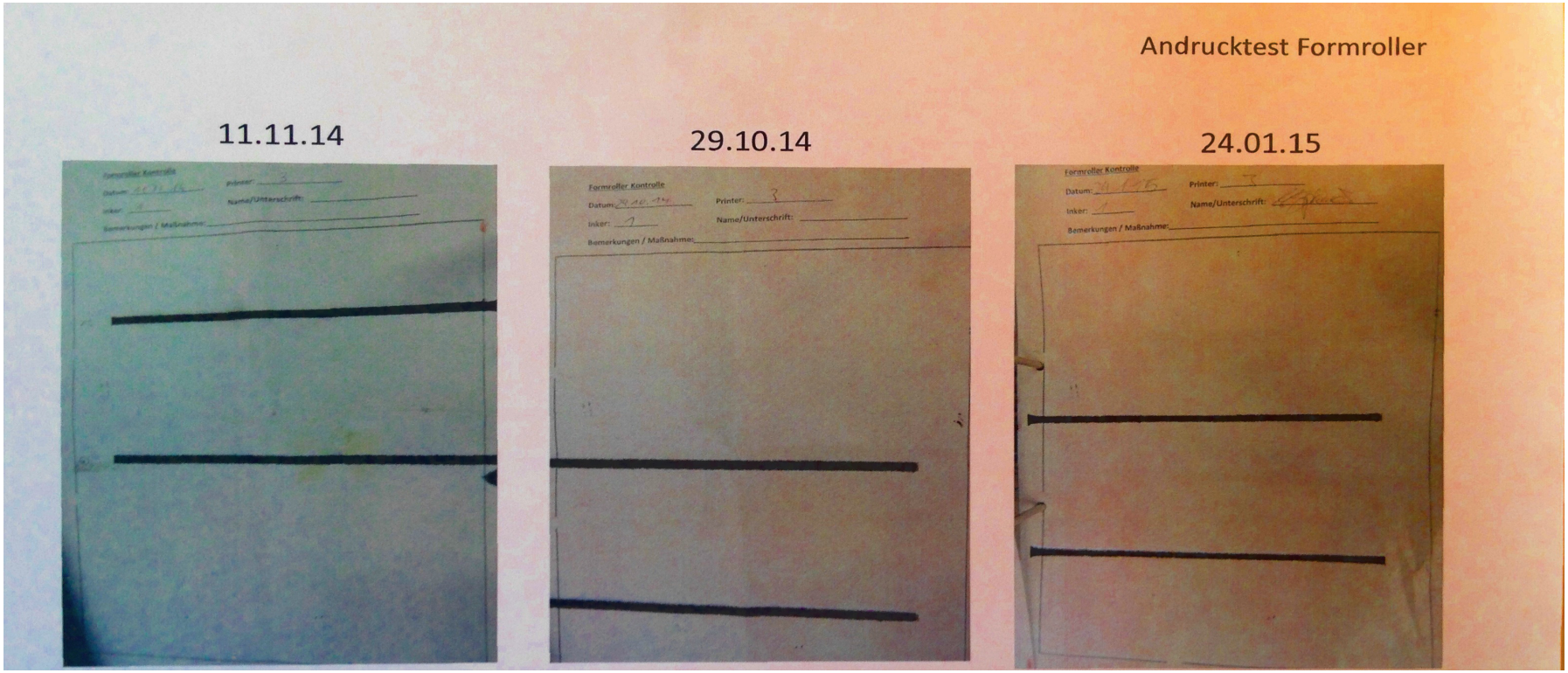


Roller stripes show signs of swellling within 1 week

Rollers had to be set harder, danger of blowing up

Tests carried out at plant in Germany, original comments from maintenance manager.

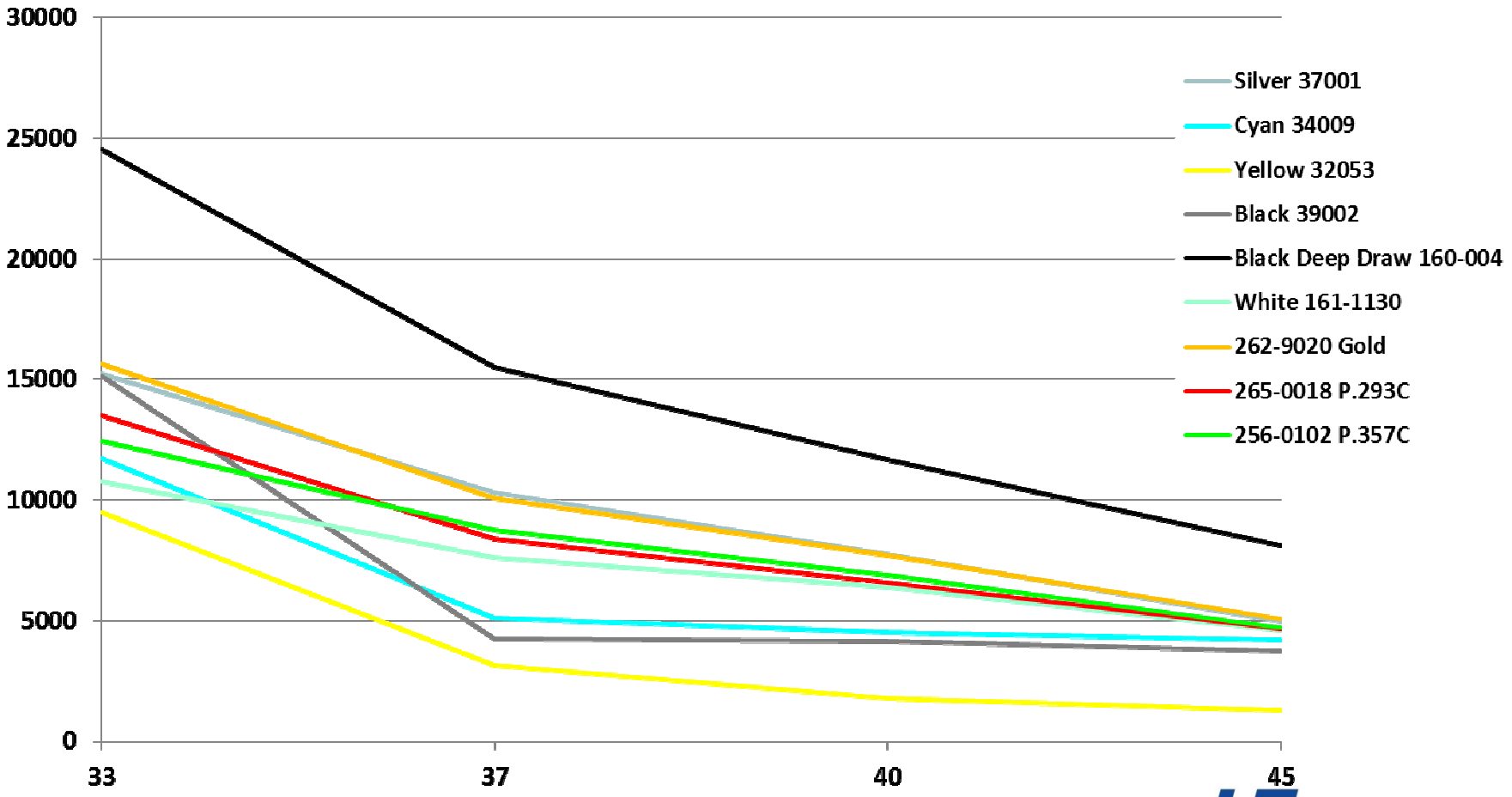
Roller Stripes with 735 60 after Three Months



Böttcher form rollers show almost no signs of wear after three months

Systems ▶▶ Packaging

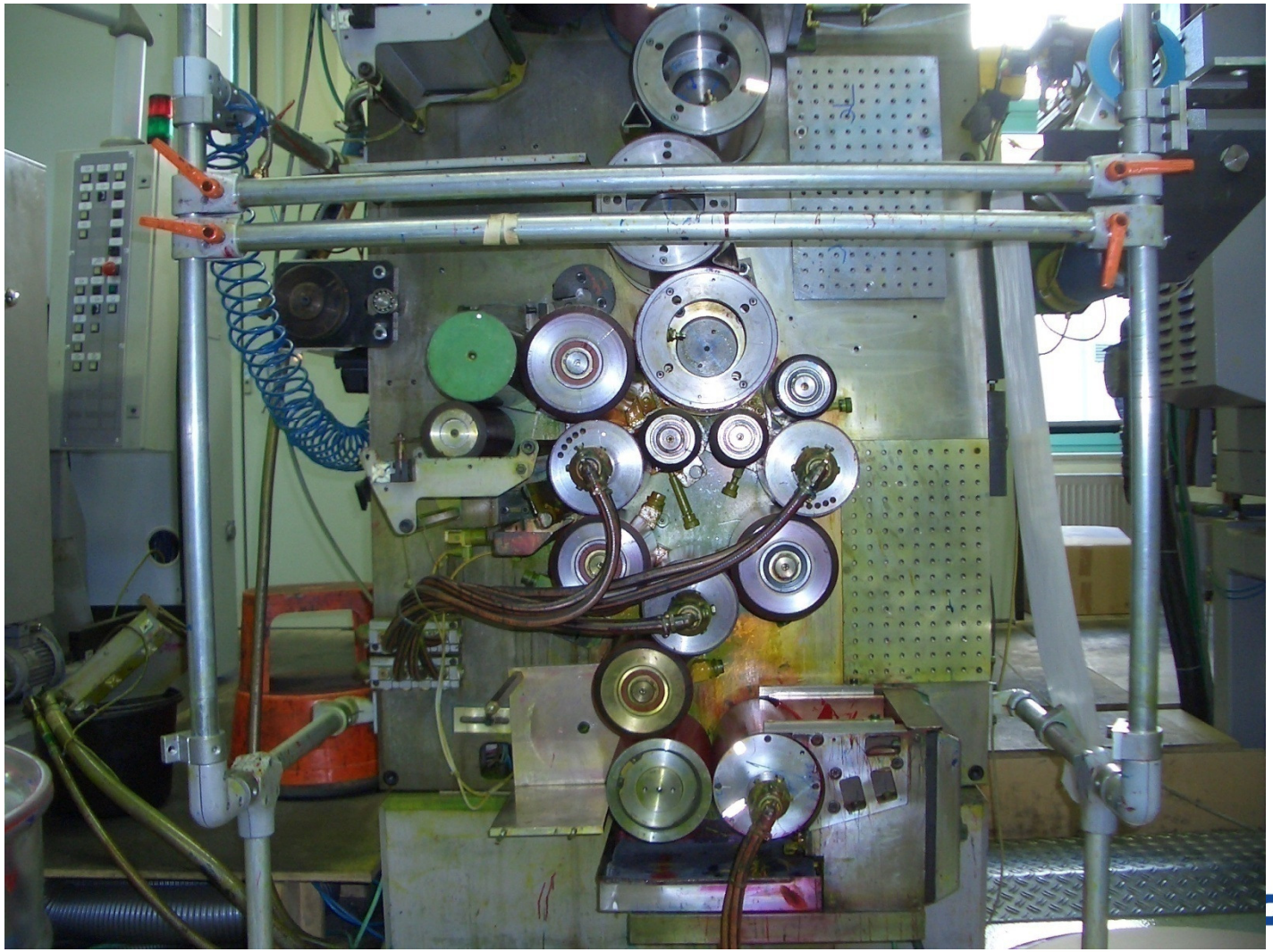
Viscosity of Can Decorating Inks in Relation to Temperature



Böttcher Systems

Systems Packaging

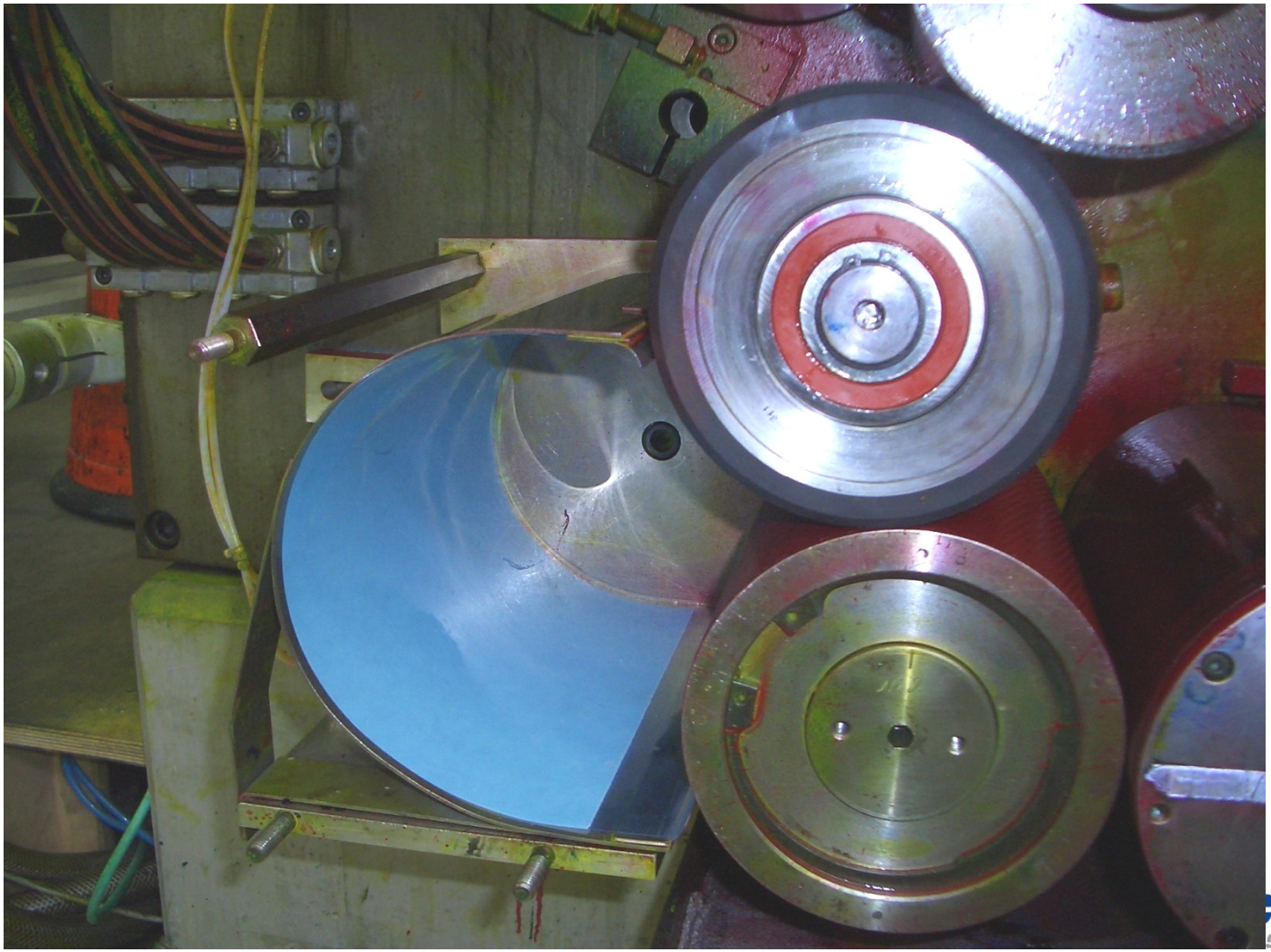
Test Series on Laborman



cher Systems

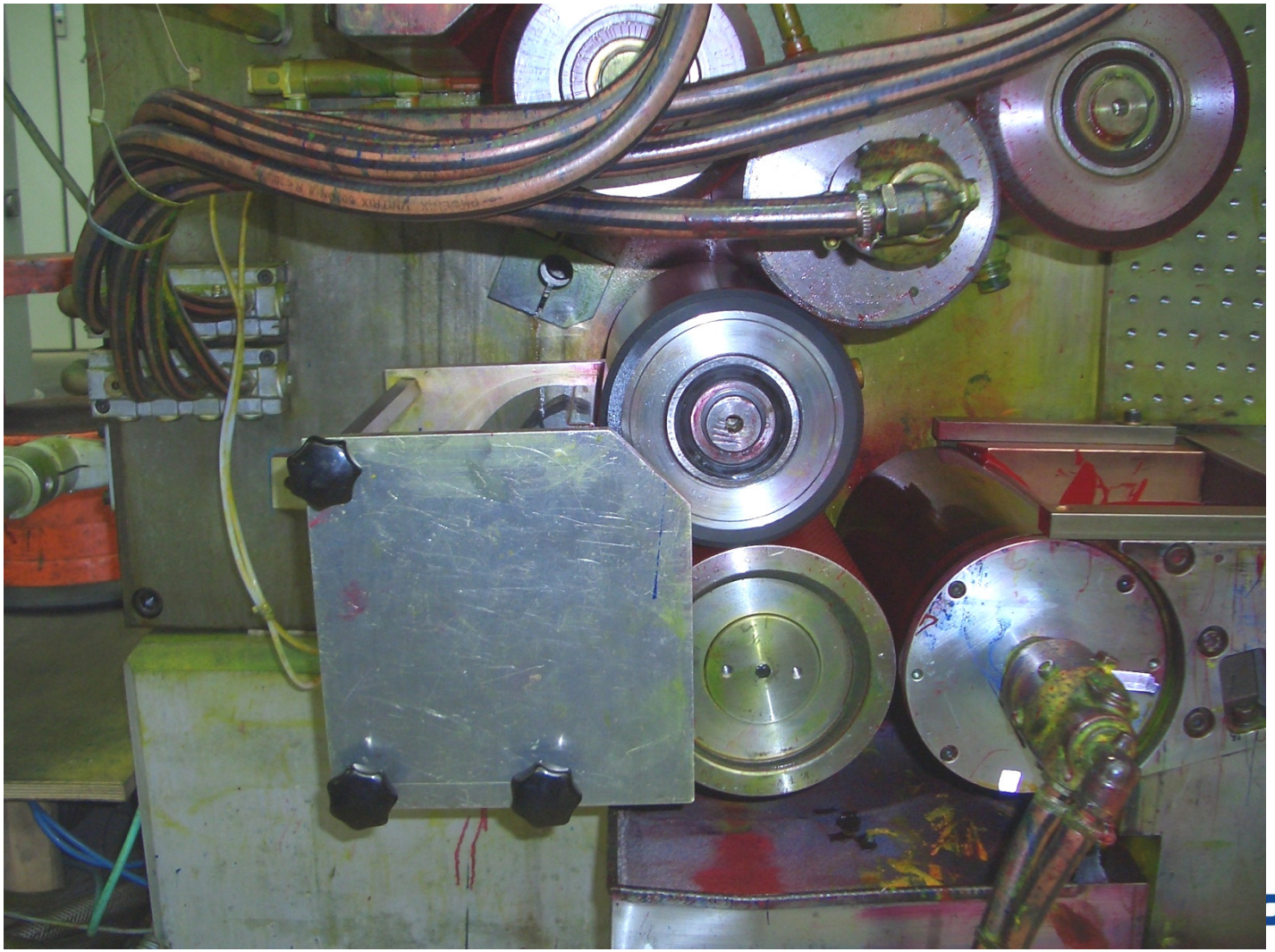
Systems Packaging

Test Series on Laborman



Systems Packaging

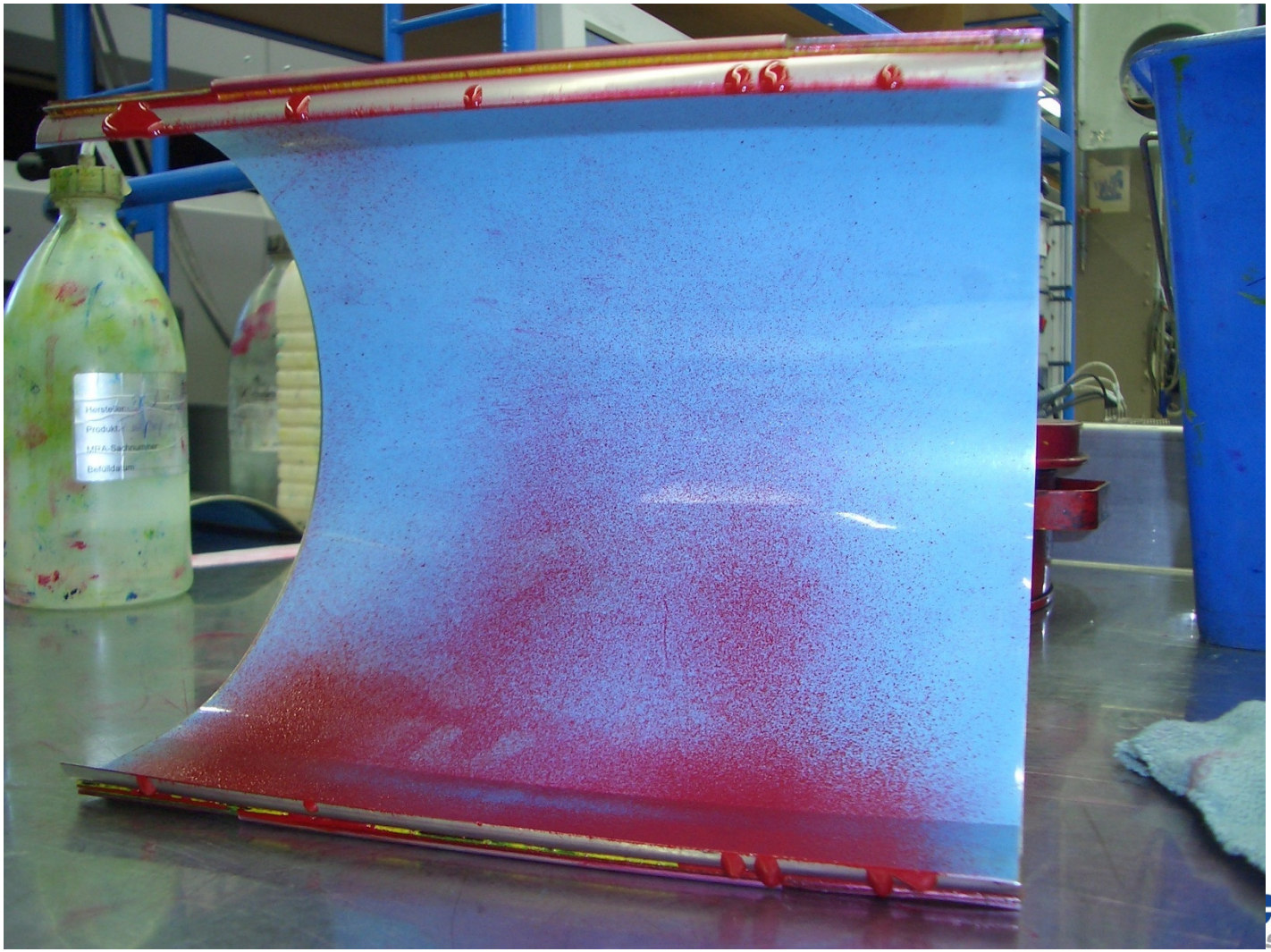
Test Series on Laborman



cher Systems

Systems ▶▶ Packaging

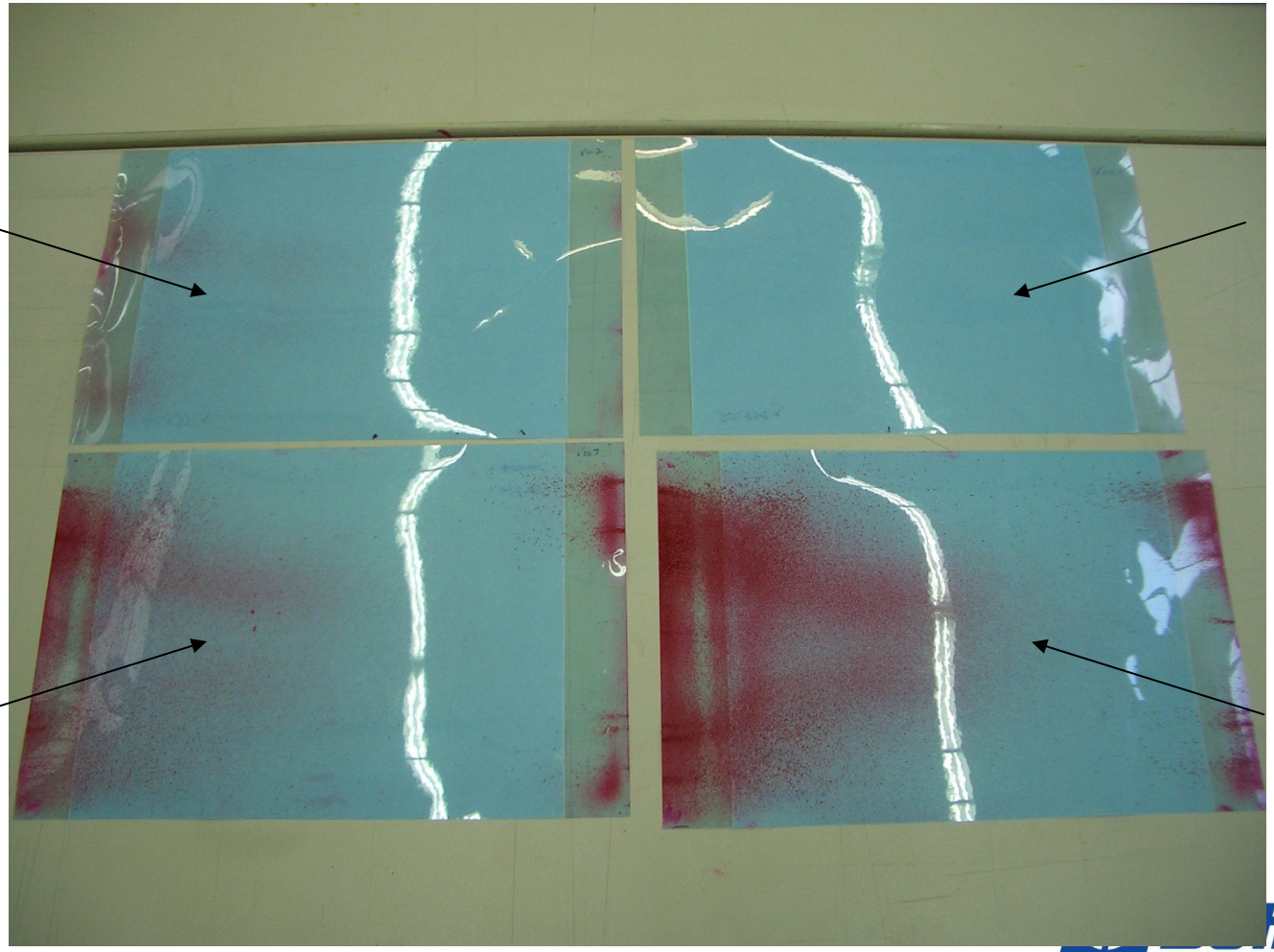
Test Series on Laborman



Influence of press speed and roller temperature

Press speed [m/s]	Ink mist volume [mg]	Roller temperature [°C]
5	6	23
10	38	26
15	92	31
15 warm start	266	43

Test Series on Laborman



10 m/s
26 °C
38 mg

5 m/s
23 °C
6 mg

15 m/s
31 °C
92 mg

15 m/s
43 °C
266 mg

Results with Different Roller Compounds

Parameters: 15 m/s
Warm start

Compound	Ink mist volume [mg]	Roller temperature [°C]
311 35	190	40
304 35	240	43
374 35	335	44

Systems ▶▶ Packaging

Summary

- In both 3-piece and 2-piece canmaking, material compatibility is a vital factor in determining quality and productivity
- Ignore it, and higher waste and downtime can ensue
- Work with your suppliers to analyse and optimise it, and you will be rewarded with more stable processes and results

Böttcher Systems

Systems ▶▶ Packaging

Böttcher Systems