A new concept to simulate commercial print trials on lab scale

Introduction of a lab printing device

Intention and motivation

Main targets of the market

- High quality appearance of printed products

Evaluation of the print quality during development and optimization

- Key factor in accomplishing a high quality product in different markets

A variety of lab test exist for simulating all kinds of print aspects

- Many are unsuitable for print quality prediction
- Many are lacking in their overall applicability
- Many are strongly limited towards troubleshooting to a given and well-known print problem

Intention and motivation

Simulation on a lab scale of typical commercial print phenomena requires

- reel-to-reel printing production
- simulation under consistent conditions
- reproducible drying processes on commercial printing machines
- use of commercially available printing plates
- suitability for a broad range of substrates (e.g. packaging materials)
- application of commercial inks
- runnability and converting performance – (key factors nowadays)
- dimensionally equivalent electrostatic print assist (ESA) for rotogravure evaluation

Intention and motivation

Commercial print trials are

- Expensive
- Time consuming
- Inflexible in terms of experimental design

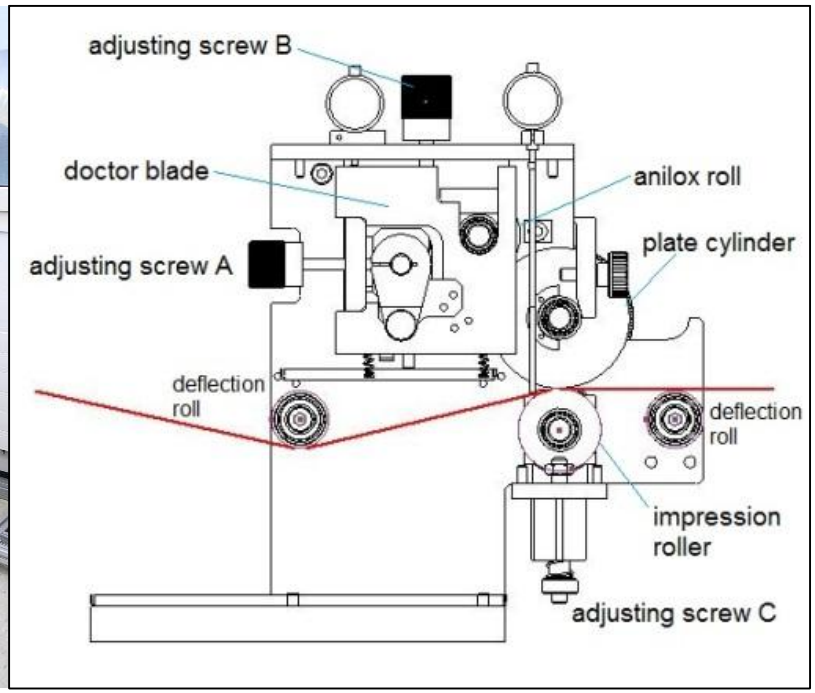
Decision

- Constructing a reel to reel lab printing press to simulate commercial printing trials with regard to print quality and runnability

Demands on the system

- flexible setup for different printing technologies
- flexible handling of a broad range of substrates to print on
- usage of a wide range of printing plates
- usage of an extensive range of commercial inks for print trials
- different printing technologies (e.g. water-based, solvent-based, UV-curing inks etc.) applicable
- flexible drying setup
- flexible adjustment of machine speed at a reasonable level (to match commercial printing speeds)
- printing width has to match the existing in-house machinery (e.g. lab coating system, lab calendering)

Machine setup laboratory flexo



Process parameters laboratory flexography

Press Setup

- 2 print units with or without in-between drying
- Wet on wet or wet on dry

Speed

- Process speed continuously up to 100 m/min

Plate/Sleeve characteristics

- Any conventional photopolymer or rubber plate
- Thicknesses of 1.14 mm and 2.54 mm

Anilox Roller Characteristics

- 120, 260, 340 l/cm, ~ 15.2 to 4 cm^3/m^2 (URMI), 60° hexagonal

Ink supply

- Inks are circulated in a closed loop (no loss of solvent)
- Chambered doctor blade

Process parameters laboratory flexography

Printing concept

- Reel to reel
- Web tension control and web edge control

Printing width

- 150 mm

Substrates

- Variety of different substrates applicable, e.g. coated or uncoated Liner

Ink system

- Water and solvent based ink can be used

Comparison of a flexographic print trial

Lab printing machine

Example of a flexographic print trial

Testliner base

- Two ply 140 g/m^2 fiber liner of the production line
- Ground ply: recovered paper grades
- Top ply: high recovered grades, surfaced sized with starch and copolymer
- Optical brightening agent in the top ply

Coating of testliner

- Film press (4 g/m^2)
- Rod (10 g/m^2)
- Double coated (precoat rod 9 g/m^2), topcoat blade 8 g/m^2)

Calendering

- Pilot supercalender

Example of a lab flexographic print trial

Printing plate

- Flint ART 2,54 mm

Viscosity

- 22 sec. (4 mm cup)

Mounting tape

- Lohmann 200

Anilox roller

- 340 L/cm, 4.5 cm^3/m^2

Ink

- Water based flexo ink from Huber – series Hydro X

Testform flexo trials and evaluation parameter

Print gloss

- 100 % magenta, 100 % cyan

Optical density

- 100 % magenta, 100 % cyan

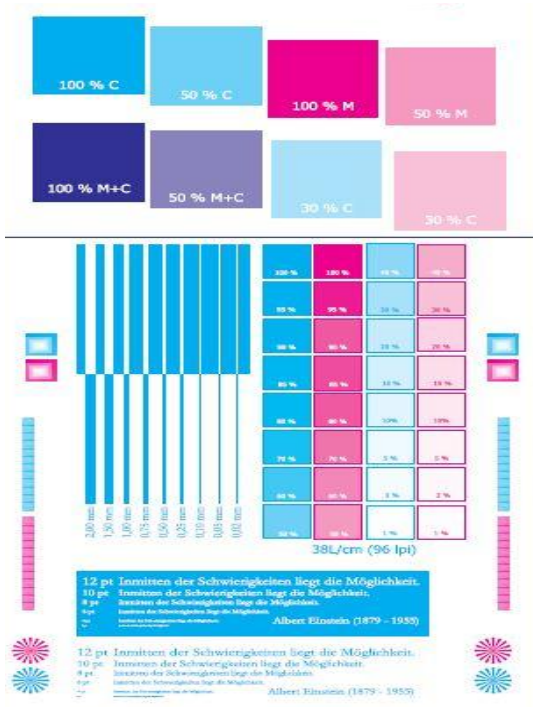
Mottling

- 100 % cyan

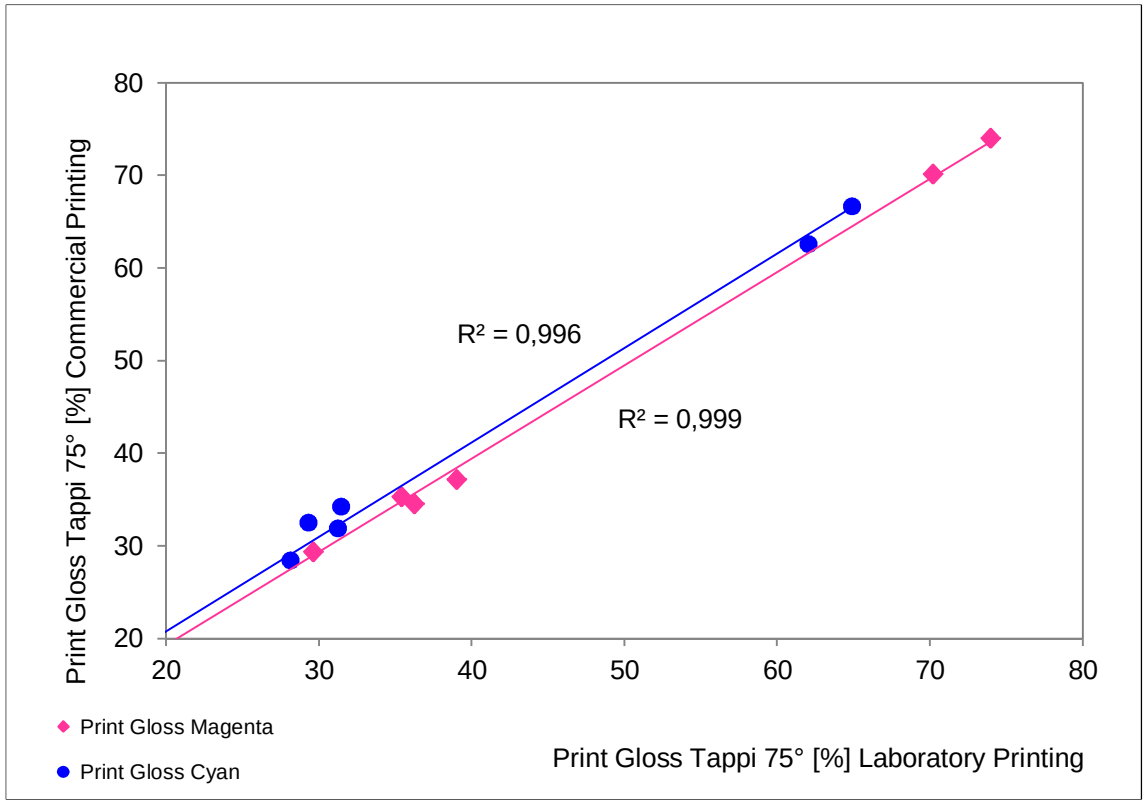
Testform flexo trials and evaluation parameters

Testform commercial printing

Testform lab printing

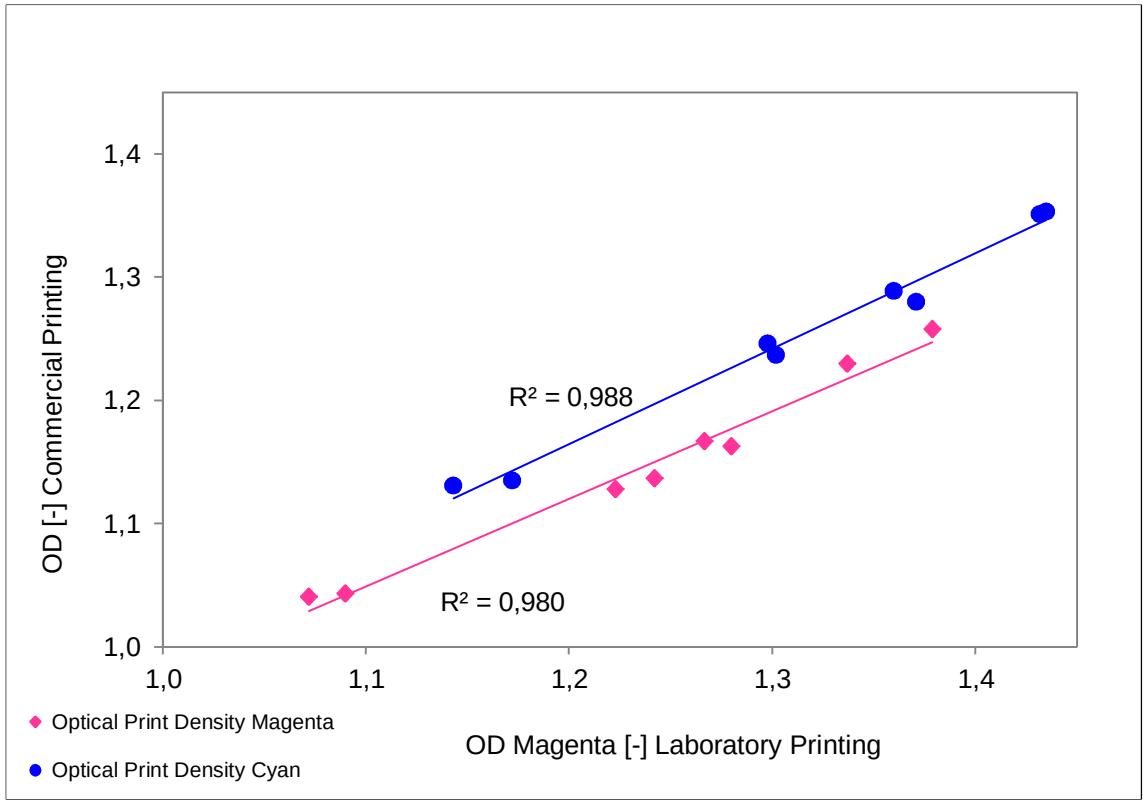


Results print gloss



- Good correlation between commercial and laboratory printed samples
- Values are comparable 1:1

Results optical density (OD)



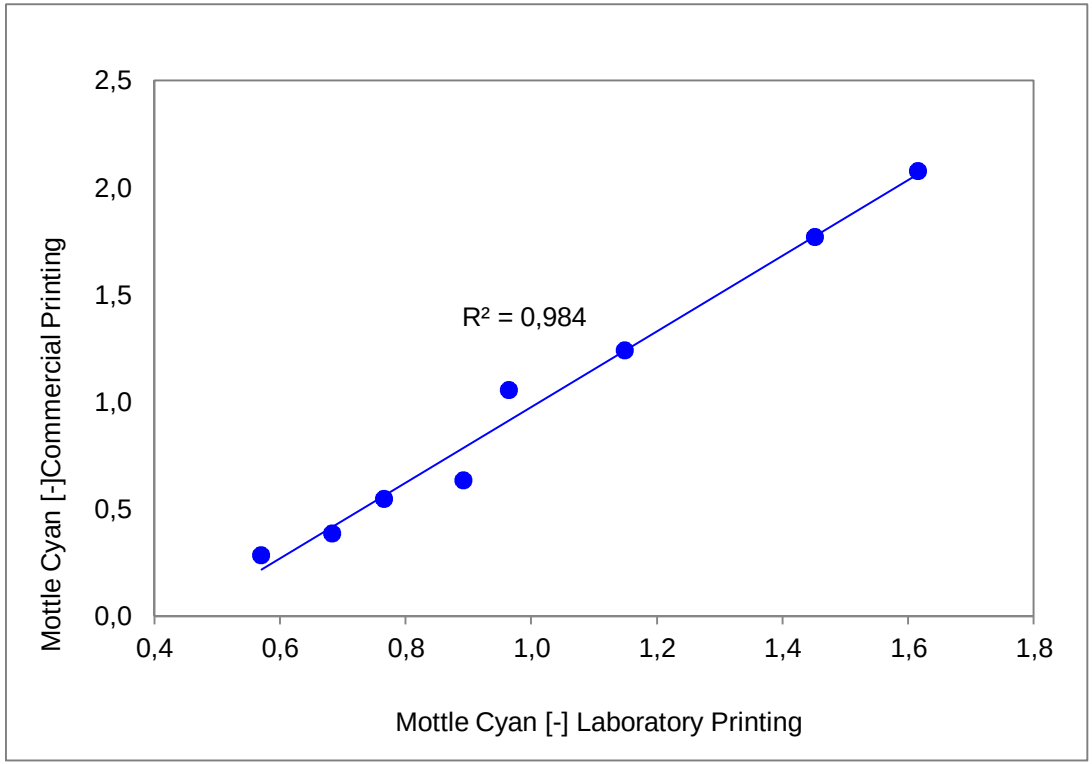
- Lab prints show a higher optical density for magenta and cyan
- Good correlation between commercial and laboratory printed samples
- Offset between the OD`s of commercial and laboratory print trials

Results Optical Density

Possible reasons observed divergences

- Higher print speed at commercial press leads to shorter contact times between all printing components
- Shorter relaxation behaviour at higher print speed has an influence onthe ink transfer
- Anilox rollers has nominally the same parameters, but not necessarily the same ink release behavior
- The impression might not be exactly the same

Results mottle



Measured with Verity I/A from prüfbau Dr.-Ing. H. Dürner GmbH

- Mottling only for Cyan because of an insufficient print out of magenta mottling field
- Good correlation between commercial and laboratory printed samples
- Different densities means different ink coverage on the substrate
- Higher mottling at higher OD

Summary and Outlook

Reel to reel laboratory printing press

- Closes the existing gap between lab methods and commercial printing
- Allowing predictions of the resulting print quality of commercial prints

Results of gloss, mottle and optical density

- Good correlations were observed

Further studies

- Evaluation of the phenomen in a new print trial with comparable conditions for printing speed and impression
- Developing a new test form with defined elements to visualize the impression

Summary and Outlook

Besides Flexo

- Machine can be equipped with rotogravure printing units

Rotogravure

- Validation of this printing technology and comparison to a commercial press has started and will be finalized
- Good correlations observed

Possible print units

- High speed inkjet
- Offset

Questions

Thank you for listening

Do you have any questions?