ZELLER+GMELIN

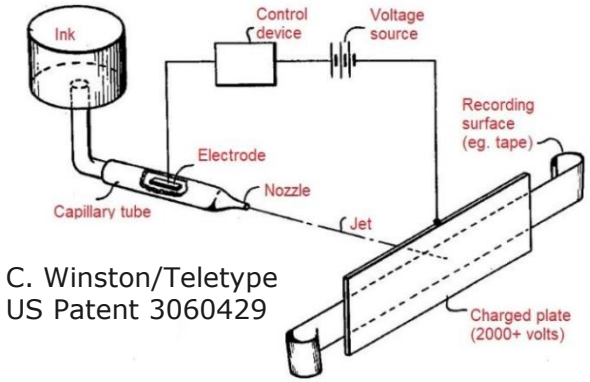
Inkjet Printing

International Sales Conference 2024

EXPERTLY DONE.

Inkjet – a long journey up to now

Continuous Inkjet - 1962



C. Winston/Teletype
US Patent 3060429

First Inkjet Printer - 1984

HP Thinkjet

Monochrome
2 pages/min.
Patent Canon 1977

Large Format Inkjet - 1991

IRIS 3047

Fine-Art Printer
710mm working with
up to 1,6m²/h

BHS Jetliner Corrugated– NOW

2,800 mm working width
up to 300 m/min printing speed

EXPERTLY DONE.

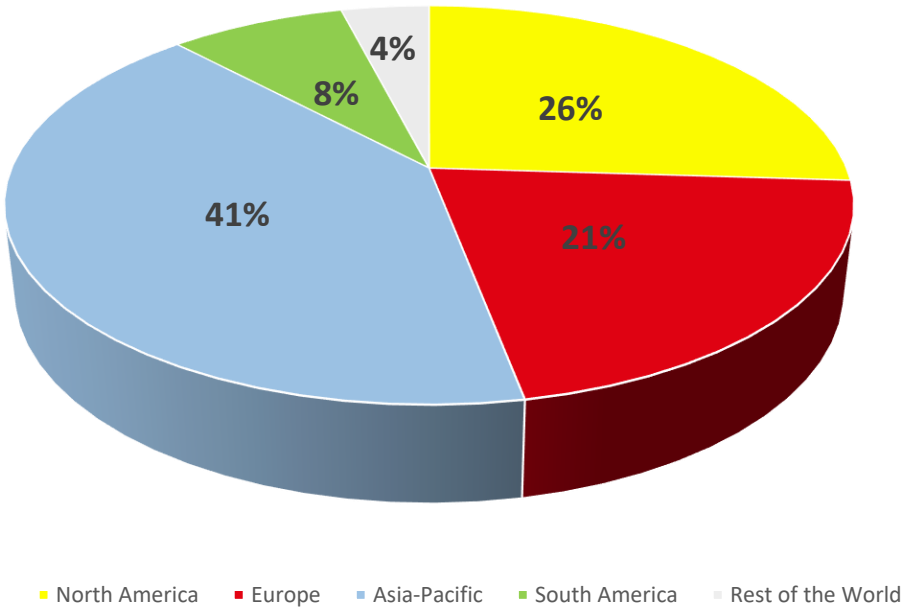
Why industry goes digital now?

+ Flexibility - Increase of short runs and lower MOQs
+ Bigger supply chain efficiencies and reduction of capital lockup (TCO)
+ Differences in labelling requirements
+ Lower environmental impact
+ Technology improvements leading to higher quality and reliability
+ Improvement of productivity (printing speed)
+ Reduction in work in process (WIP) and waste
+ Hybrid Printing

+ Highest Barrier ➔ Production costs of inks for High-Volume Business

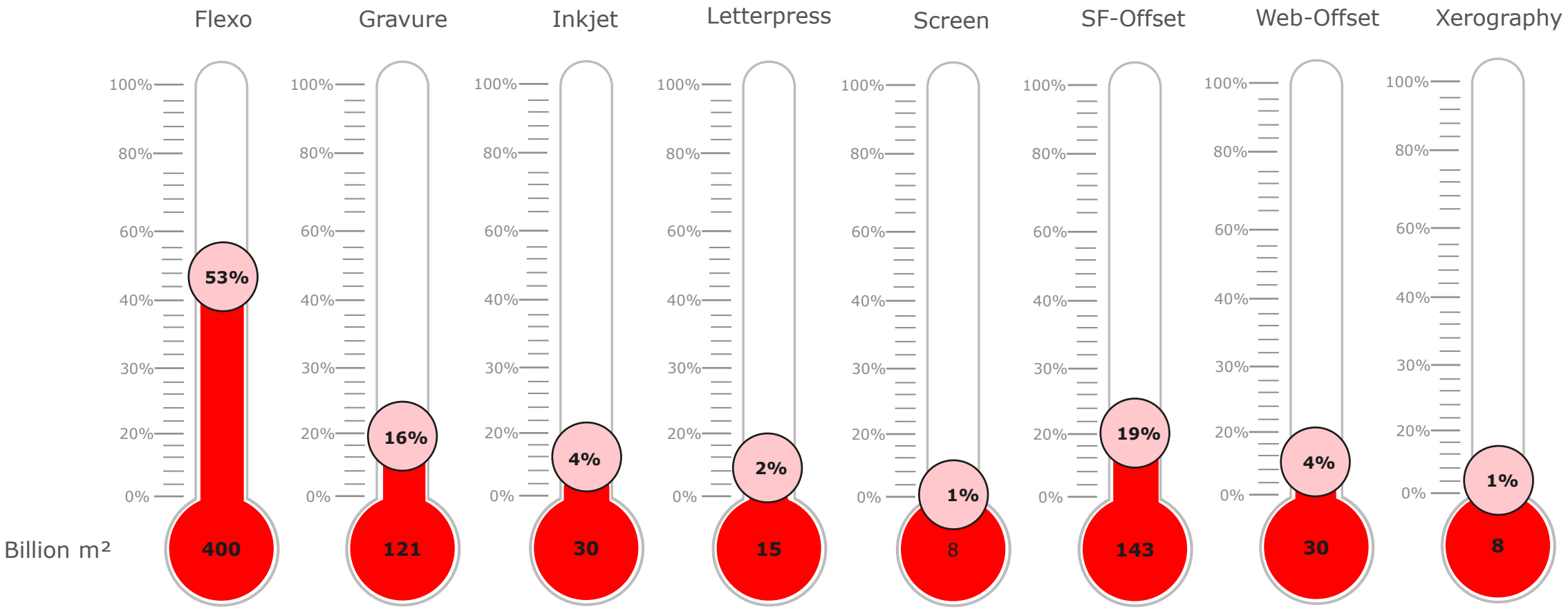
Source: Survey 2023 Smithers

Global digital printing market size 2030 in US-dollars



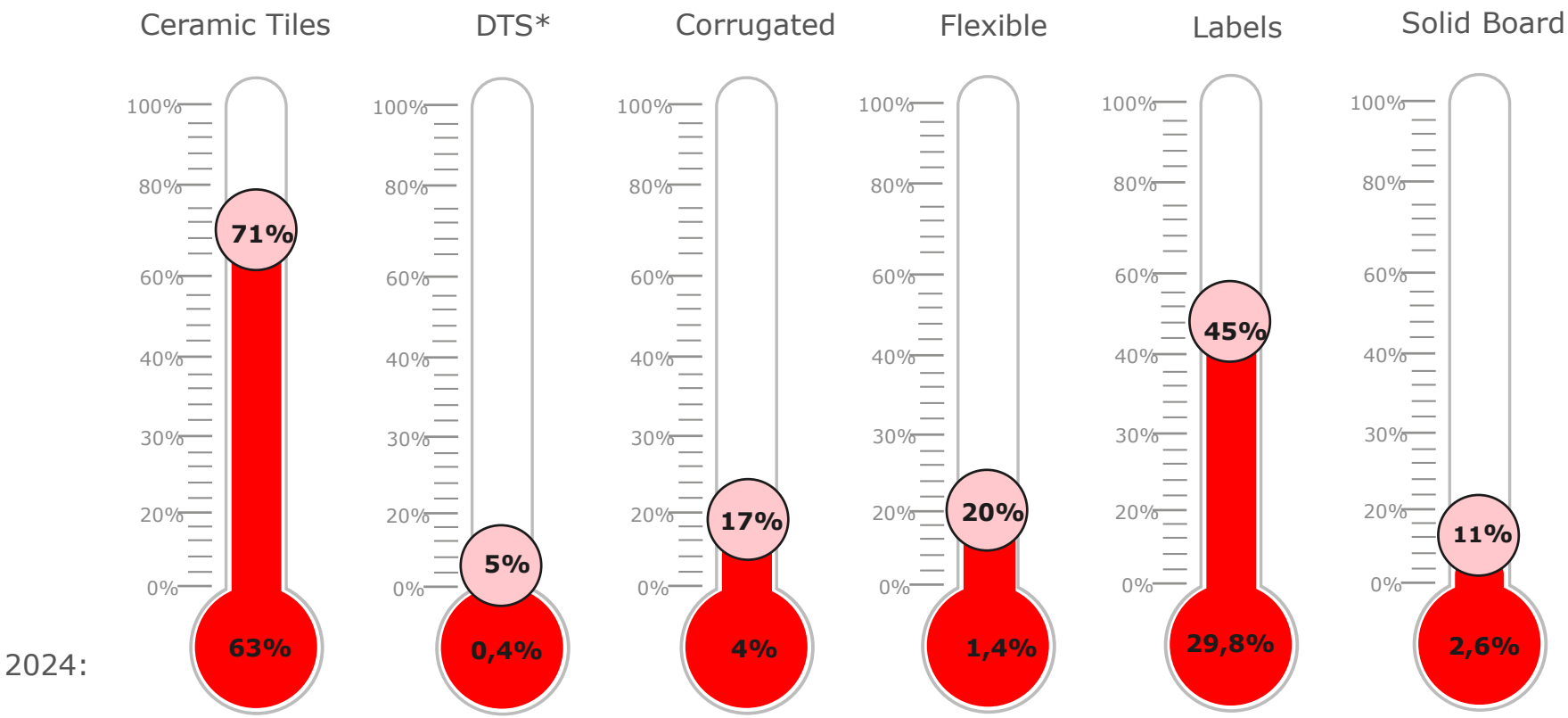
Source: IndustryARC

Packaging printed worldwide in billions of m² in 2023



Source: Smithers; Chat GPT

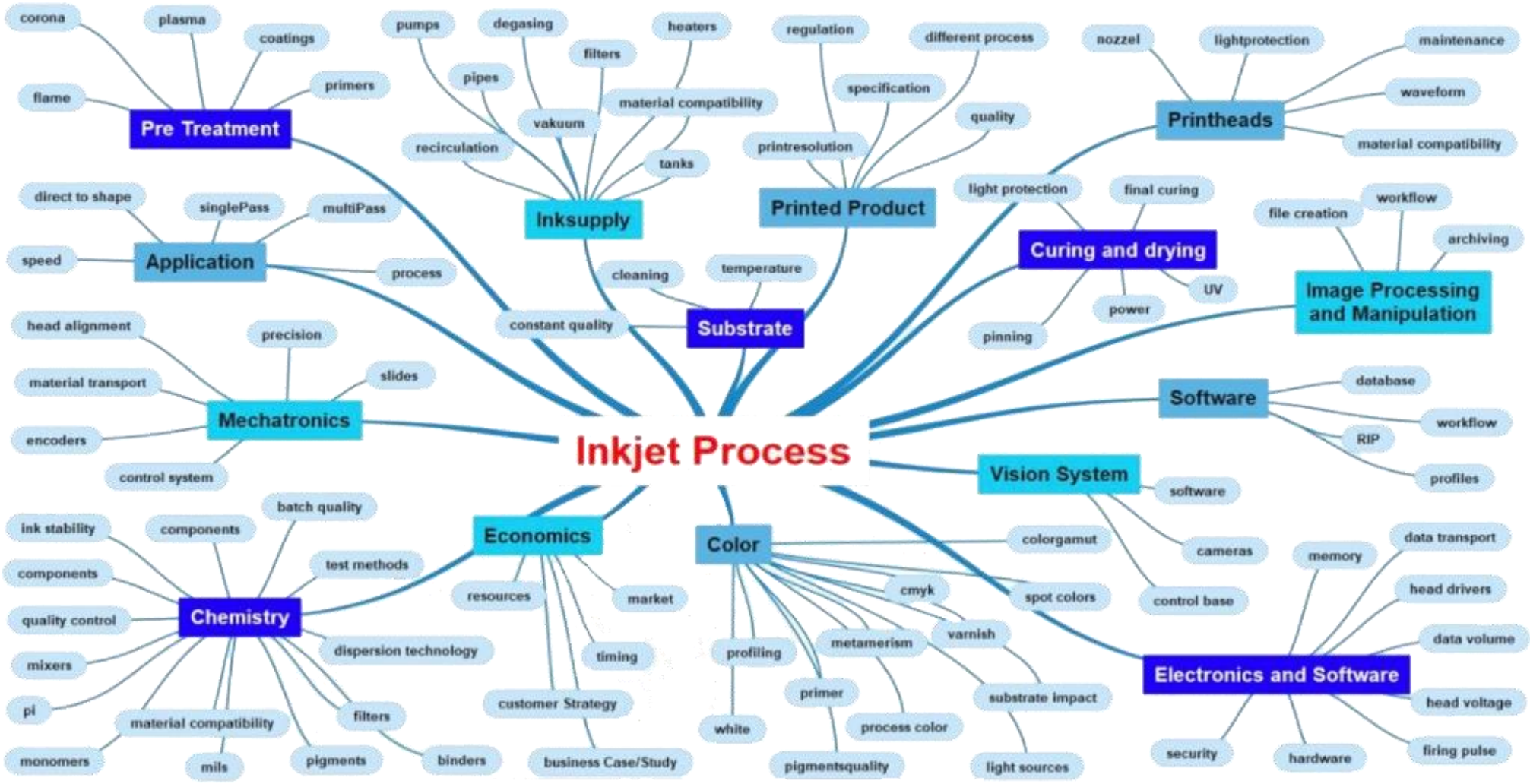
Digital printing share of segment printing volume in value by 2030



*Direct to Shape: Metal, Rigid Plastics, Glass

Source: Smithers; Chat GPT

INKJET MINDMAP



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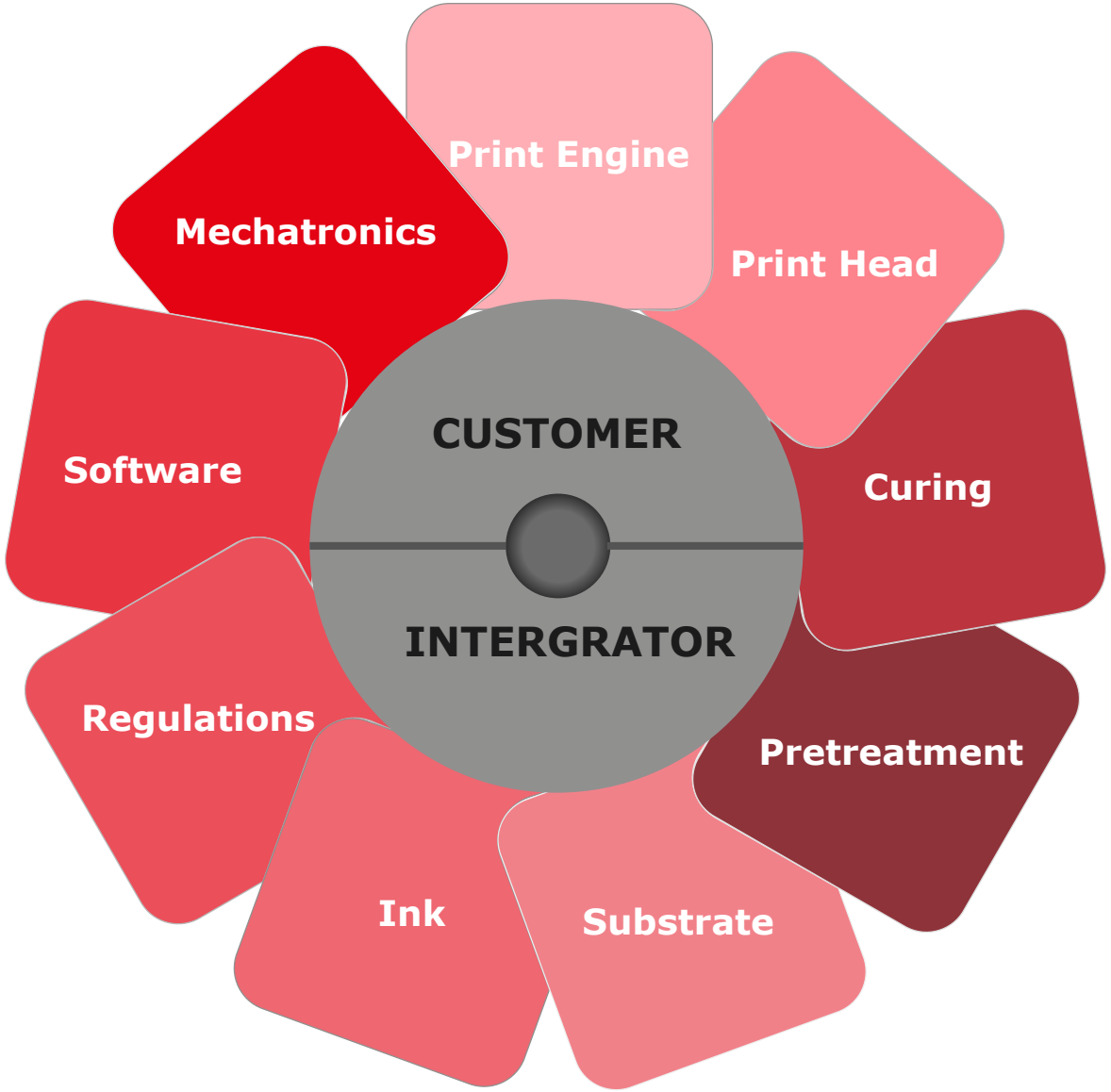
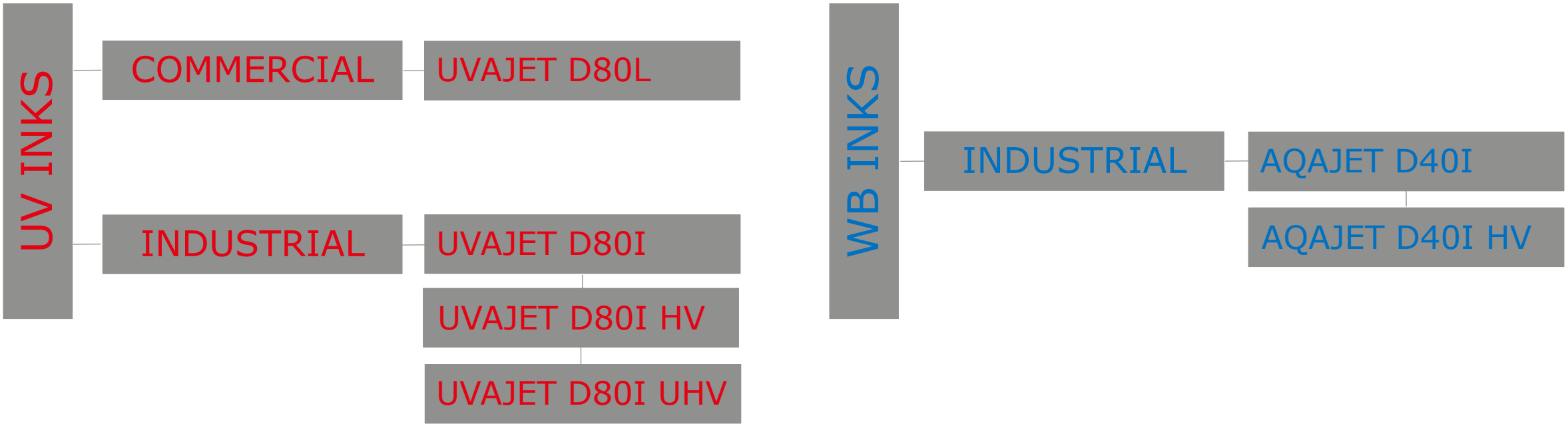
STAKEHOLDER MAPPING

Industrial Inkjet puzzle pieces



INKJET DEVELOPMENTS
TECHNOLOGY PORTFOLIO OVERVIEW



INKJET DEVELOPMENTS
UV-INKS INDUSTRIAL

UVAJET D80I

- **Piezo-electric print heads**
  - XAAR 1000 Series
  - KONICA MINOLTA 1024
  - SEIKO RC1536, 508GS
- **Viscosity**: ≈10mPas/45°C
- **Colours**: CMYK, LM, LC, W, V
- **Mercury**
- **LED-Curing**

- **Access to the market**
  - Low-Energy-Surfaces
  - No chemical pre-treatment
  - PP, PET, PE, PC, PVC, Glass, Metals
- **Barberan Jetprint**

INKJET DEVELOPMENTS
UV-INKS INDUSTRIAL

UVAJET D80I HV

- **Piezo-electric print heads**
  - XAAR 1000 Series
- **Viscosity**: ≈20mPas/ 45°C
- **Colours**: CMYK, W, V
- **Mercury + LED-Curing**

- **Access to the market**
  - Glass
  - Productivity
- **Digital Embossing**

INKJET DEVELOPMENTS
UV-INKS INDUSTRIAL

UVAJET D80I UHV

- **Piezo-electric print heads**
  - XAAR 1003/12
- **Viscosity**: ≈60mPas/50°C
- **Colours**: K, W, V
- **LED + Mercury-Curing**

- **Access to the market**
  - Opacity
  - Productivity
- **White blocking**

INKJET DEVELOPMENTS
WB-INKS INDUSTRIAL

Physical Properties:

Viscosity:	3,6 – 9 Cp
pH-Value:	> 8
Surface Tension:	29 - 31mN/m
Specific Weight	ca. 1032g/l
Colors:	CMYK, W
Storage temperature:	10 – 25° C
Storability :	12 month

Print heads:

- EPSON — AQAJET D40I
- KYOCERA
- FUJI SAMBA
- RICOH — AQAJET D40I HV
- KONICA MINOLTA

INKJET DEVELOPMENTS
WB-INKS INDUSTRIAL

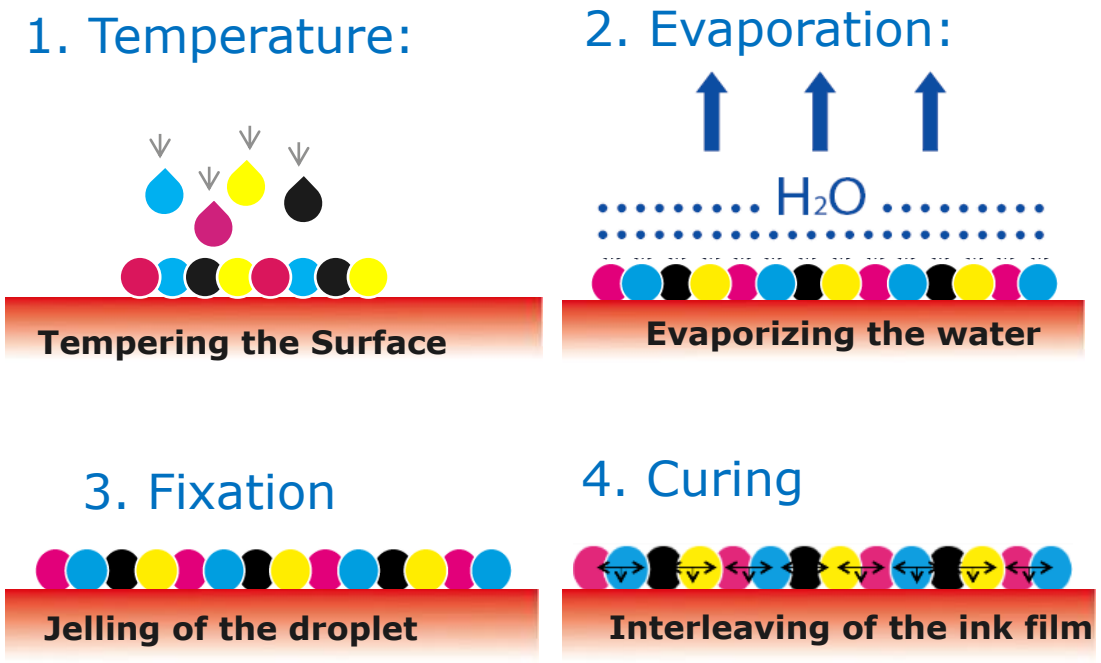
Mode of operation:

1. Pre-Drying process

Dot forming and fixation
Water evaporates
Print out is touch dry

2. Post-Drying process

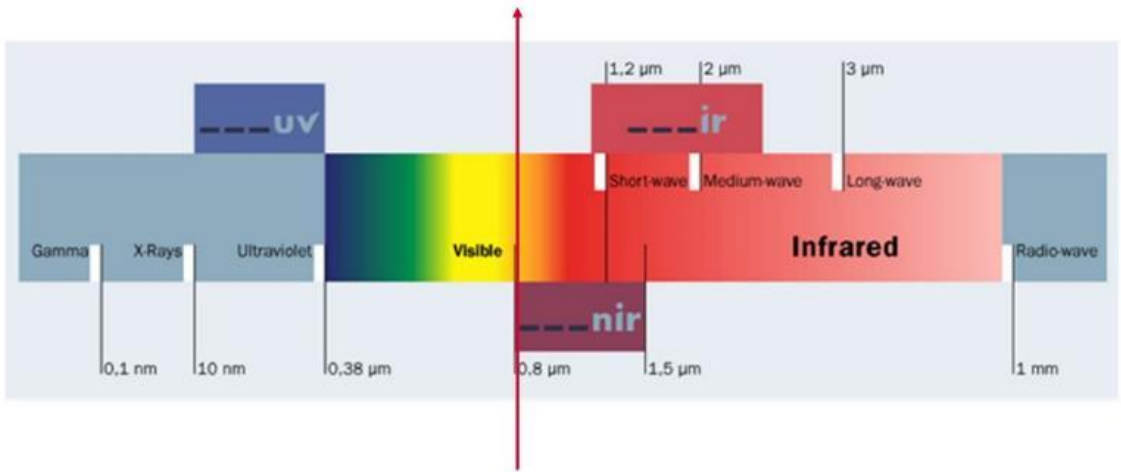
Resin particles coalesce
Pigments are encapsulated
Interleaving of the ink film is initiated



INKJET DEVELOPMENTS
WB-INKS INDUSTRIAL

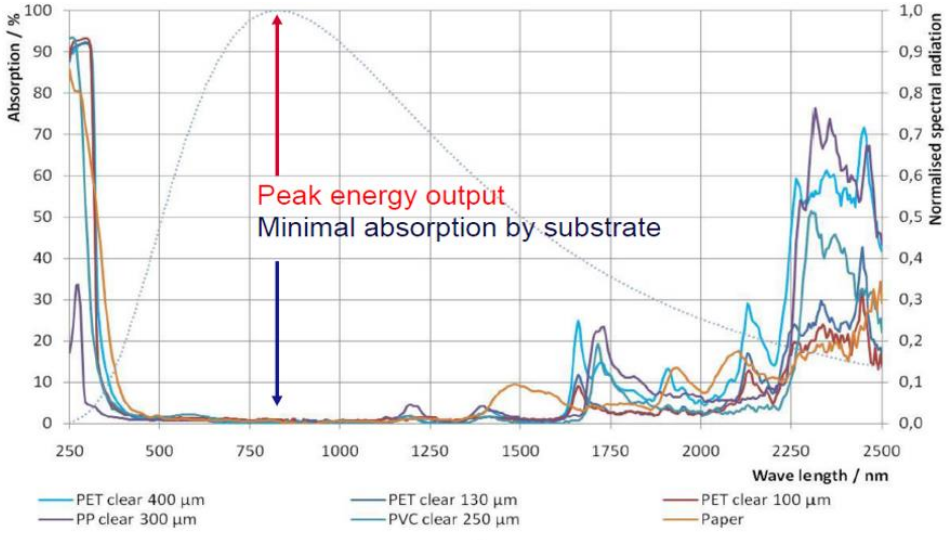
Post-Treatment Near-Infra-Red (NIR)

Wave lengths vs. Efficiency



Optimum Energy Output

Absorption behavior of different substrates

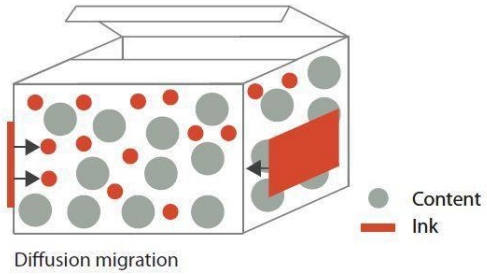


INKJET DEVELOPMENTS
WB-INKS INDUSTRIAL

Fields of Application

- Melamine paper (flooring, panels, table ware)
- Non-Woven material (hygiene products, diapers)
- Wall covering
- Cardboard, corrugated boards (packaging, displays, marking)
- Flexible packaging, Labels
- Artificial leather (polyurethane; handbags, interior design)

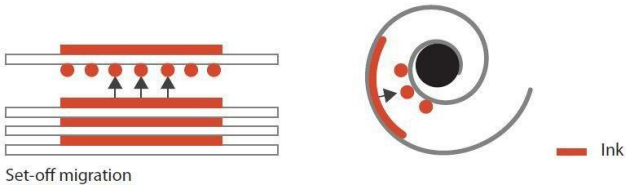
INKJET DEVELOPMENTS
LOW MIGRATION INKS



Diffusion migration

- **Diffusion Migration**

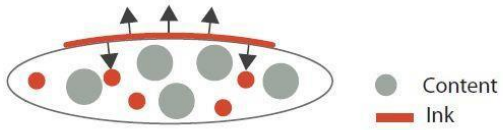
  Migration through the substrate to the reverse side



Set-off migration

- **Set-off Migartion**

  Set-off from the print to the reverse side



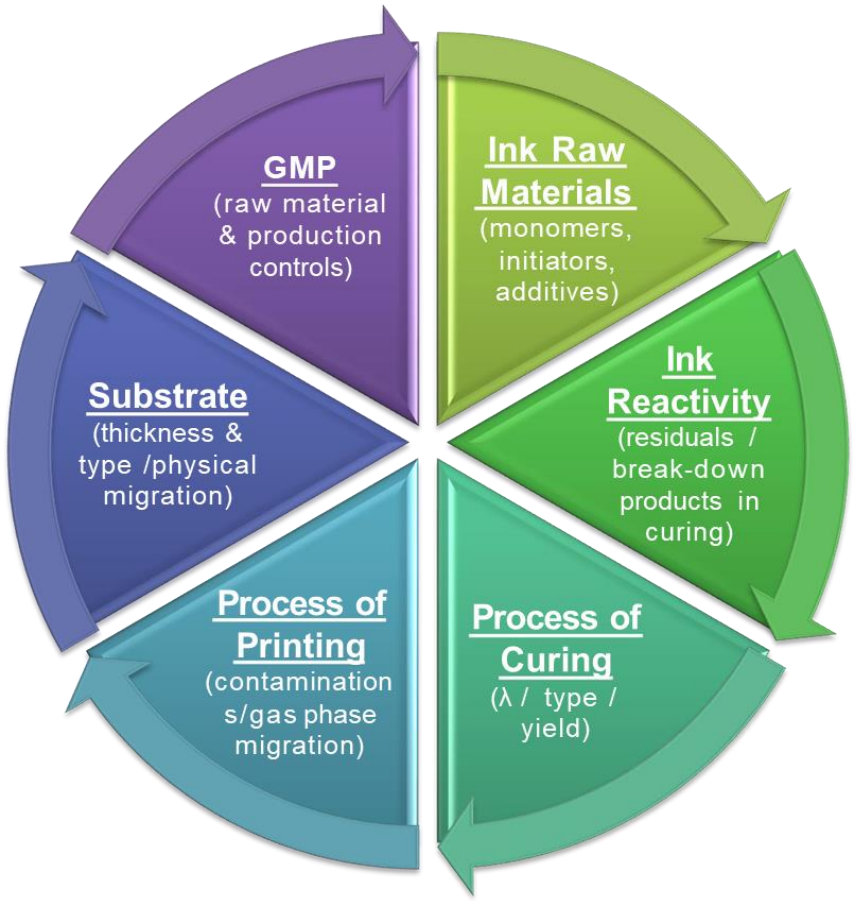
Gas phase migration

- **Gas Phase Migration**

  Volatilization or condensation of compounds by heating

INKJET DEVELOPMENTS

LOW MIGRATION INKS



- A Low Migration Systems results from coordinated development of ink, printing machine and substrate
- Conformity is proven by samples
  - Set-Off properties
  - Cell extraction with simulant materials
  - Final testing by 3rdP accredited laboratory
- Analytics to meet regulatory migrations limits: EUPIA GMP, SWISS ordinance, EC Regulations
- GMP: Internal controls in production processes and raw materials

INKJET DEVELOPMENTS
LOW MIGRATION INKS

Challenges with Inkjet

- Low viscosity leads to fast diffusion
- Low molecular weight monomers tend to migrate
- Limited raw material availability
- Low viscosity & high chemical resistance difficult to combine
- Low molecular weight raw materials / low functionality

INKJET DEVELOPMENTS
LOW MIGRATION INKS

Paths towards innovative "Low Migration Systems"

- **Substrate**
  - Pre-Coated-Barrier
- **Printing process**
  - High Curing Yield using Inert-Gas-Systems
  - Electron beam curing technology (new ink / high curing yields)
- **UV-Ink**
  - Synthesis of tailor-made monomers with low migration behavior
  - Additionally selected initiators with known break-down components
- **Waterbased Ink System**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Thank you!