Polytype Converting Company Set-up

- Global supplier of coating technology and coating equipment
- High-end and performance-driven engineering with more than 50 years industrial experience
- 2 world class Technical Centers in Switzerland and Germany featuring 4 pilot lines in total
- Joint Venture between Olbrich and Jagenberg, allowing Olbrich and Polytype Converting to draw synergies out of their technology portfolios

A strong bond of solid partners to the coating and converting industry
Electrostatic Reduction of Misting in Roll Coating

- Introduction
- Experimental
- Results
- Conclusions
Introduction

Misting from film splitting

- Liquid passing through a nip
- Development of droplets upon splitting
- High splitting speed
- Particle size $<< 50 \mu m$
- Health, quality, cleanup, and cost issue.
Introduction

Misting from film splitting

Ribbing lines in forward roll coating

Dontula 1996

Extended ribs break up

Michel S. Owens 2004
Current options for handling the misting (example: silicone coater)

- Chemical anti-misting additives
- Mist particle evacuation

Introduction

Novel electrostatic approach from Eltex: Misting Tacker

F. Knopf, Eltex Elektrostatik GmbH, WO2014030077(A2), DE102012207148A1
Introduction: Misting Tacker

Low Energy DC–Plasma Electrode

DC-Plasma Deposition Unit
view into a cross-section

Electrode Tip

Plasma Cone

Counter Electrode

ca. 10 mm
Misting Tacker: Low Energy DC–Plasma Electrode

deflection instead of suppression
Experimental

Raw Materials

Silicones from Bluestar:

• Thermal curing 100% system
  – Curing at 180°C
• UV curing 100% system
  – No initiators added, cured using e-beam

Substrates:

• Craft Paper 35 µm, Cobb 30 g/m²
• BOPP 50 µm
• PET 12 µm
Experimental

5 roll silicon coater and electrode placement
Techma coater – web upstream view (backside)
Experimental – Data Collection

Measurement around Application Unit – Electrodes off
(600m/min)

Total Concentration of Particles PM1, PM2.5, and PM10

(max. >150 mg/m³)
Measurement around Application Unit – Electrodes on (600m/min)

Total Concentration of Particles PM1, PM2.5, and PM10

(max scale of graph: 1.8 mg/m³)
Experimental – Data Collection

Aerosol sensor placed at fixed point between roll W2 and W3
Results – Data Collection

Measurement of Aerosols at fixed point
step by step increase of web speed up to 1000 m/min

(max scale of graphs: 35 mg/m³)

Total Particle Concentration -- 100-300-600-800-1000 m/min

Masking Nip W0/W1
Nip below aerosol sensor covered
Results – Data Collection

UV: Effect of misting from second nip (W0 / W1)
- Run8: nip unmasked
- Run9: nip masked

![Graph showing the impact of W0-W1 masking (PET-EB) with machine speed and web speed values.

<table>
<thead>
<tr>
<th>Web speed</th>
<th>W1 speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>300 m/min</td>
<td>210 m/min</td>
</tr>
<tr>
<td>400 m/min</td>
<td>280 m/min</td>
</tr>
<tr>
<td>500 m/min</td>
<td>350 m/min</td>
</tr>
</tbody>
</table>
Results – Thermic Silicone

Comparison of electrostatic to chemical method
- Run2: no measure
- Run6: chemical additive
- Run5: electrostatic DC-Plasma

![Graph showing Method Influence Overview (Thermic)]
Results – Thermic Silicone

Comparison of electrostatic to chemical method
- Run5: electrostatic DC-Plasma
- Run6: chemical additive

Electrostatic vs Chemical Method (Thermic)
Results – Thermic Silicone

Comparison of effect by different substrates
- Run5: 35 µm Paper
- Run7: 12 µm PET
Results – UV Silicone

Comparison of electrostatic to chemical method
- Run12: electrostatic DC-Plasma
- Run13: chemical additive
- Run10: no measures taken

Method Influence Overview (UV)

Silicone mist (mg/m³) vs. Machine speed (m/min)

- Run12-DC Plasma
- Run13-Additive
- Run 10-none
Comparison of electrostatic to chemical method
- Run12: electrostatic DC-Plasma
- Run13: chemical additive
Results – UV Silicone

Comparison of effect by different substrates
- Run9: 12 µm PET
- Run12: 35 µm Paper
- Run11: 50 µm BOPP
Conclusions

- The electrostatic DC-plasma system by Eltex worked very efficiently:
  - On all tested substrates
  - With both tested silicon types
  - It can be used instead of any chemical antimisting additive
    - Worked as efficient in Thermic silicones
    - Worked better for the UV silicones

- all three nips in 5 roll coater need an antimisting device, especially if high web speeds are targeted.

- the deflection of misting by the DC-plasma system might be used where no chemical means are available

- Two industrial implementations already in progress
  - Silicon coating and coating of a thin wax layer

- Studies to explore the deeper understanding of all the variables would be welcome
Acknowledgements

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– Bluestar Silicones (Saint Fons, France)
– Techma Team at Polytype Converting AG
Electrostatic misting reduction

Questions?