Advances in Corona Treating Technology for Improving Ink Adhesion

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Overview

- Basics of corona treating
- Why it’s important to corona treat prior to printing
- How to determine treatment parameters and measure changes in surface energy
- Review data that explores why all films don’t respond the same to corona treatment and the relationship between watt density, surface energy and equipment cost
- Advancements in corona treater technology through the years
What is a corona treater?
How a Corona Treater Affects Surfaces

- Cleans surface of contamination & debris
- Forms low-molecular-weight (LMWOM) on film’s surface
- Oxidizes film’s surface
- Forms positive and negative sites by adding and deleting electrons
Corona Treater Configurations
Why Films Need Treatment
(variables outside of your control)
Why Films Need to be Treated

Low Energy → Surface Contamination → Limited Bonding Sites → Migrating Additives → Hydrophobic
Dyne Levels Decay

Pretreated Dyne Level

Dyne Level Reducing Factors Over Time

Contamination
Additives
Humidity

Desired Dyne Level For Converting

Bump Treat Prior to Converting
Do all films respond to corona treating equally?
Watt Density

You Control the Amount of Treatment
(aka watt density)

\[ Wd = \frac{PSO}{EW \times LS \times NST} \]

- **Wd** = Watt Density (W/ft² or m²/minute)
- **PSO** = Power Supply Output (W)
- **EW** = Electrode Width (feet or m)
- **LS** = Line Speed (ft or m/minute)
- **NST** = Number of Sides Treated
Watt Density

You Control the Amount of Treatment
(aka watt density)

\[ 2.0 \text{ Wd} = \frac{5,000 \text{w}}{5 \text{ft} \times 500 \times 1} \]

**Wd** = Watt Density \((W / \text{ft}^2 \text{ or m}^2 / \text{minute})\)

**PSO** = Power Supply Output \((W)\)

**EW** = Electrode Width \((\text{feet or m})\)

**LS** = Line Speed \((\text{ft or m} / \text{minute})\)

**NST** = Number of Sides Treated
Dyne Levels Provide a Quick Check

Dyne levels do not guarantee adhesion
You cannot use watt density to predict dyne levels

System parameters | Material parameters | Process parameters
Differences in Film Responsiveness

Films respond differently to the same level of treatment.
Differences in Film Responsiveness

LDPE DYNE LEVEL CHANGE AT INCREASING WATT DENSITY

Watt Density adds cost to your corona treater
How Watt Density Increases Corona Treater Cost

- Power supply needs increased capacity
- Additional electrode assemblies may be required
- Larger ground roll is required to dissipate the heat
- Larger system frame
- Increased air flow – larger exhaust blower
Do you need higher watt density?

Dyne level?

As requested by who?

Have you defined your application?
Advances in Corona Treater Technology
Electrode & Ground Roll Advancements

- Transition from metal electrodes with covered roll surfaces to ceramic electrodes with bare rolls.
  - Enabled the treatment of conductive or metallized films
  - Eliminated roll covering failures
Electrode & Ground Roll Advancements

- Development of dual dielectric system using ceramic electrodes and a conductive ceramic ground roll cover
  - *Reduced maintenance that bare rolls require due to oxidation*
- Enercon’s introduction of a proprietary non-conductive coating
  - *Provides a more uniform and homogenous treatment with reduced filamentary discharge. (More consistent treatment and minimized chance of pinholes.)*
  - *Better management of heat reducing film wrinkling and backside treatment*
Electrode & Ground Roll Advancements

- Ceramic electrode developments allowing us to apply more power in a smaller area
- Round (50wpi), P (60wpi), PV (85wpi), EV (100wpi), E2(150wpi)
  - Benefit: Reduced Footprint from the…..
    - Possibility of reducing number of electrodes required
    - Possibility of a smaller diameter ground roll
    - Possibility of a smaller frame
Next Generation of Power Supplies

- Industry 4.0 Ready
- USB port – upload logs/download software updates
- Custom maintenance reminders
- On-screen troubleshooting
- Remote support options
- Integrated artificial intelligence
- Supervisory Lockout
Summary

- Corona Treatment is used to clean a surface from contaminants, improving ink adhesion.
- Surface treating is available in a variety of technologies (corona, plasma, and flame) and a variety of configurations.
- Films respond differently to treatment for reasons inherent to the film type.
- Advances in corona treater technology:
  - *Ceramic electrode advancements enable treatment of conductive or metallized films*.
  - *Ceramic electrode advancements allowing more power in a smaller footprint*.
  - *New power supplies are Industry 4.0 ready and can communicate operating and fault data over network control infrastructures*. 
Questions?

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Thank You