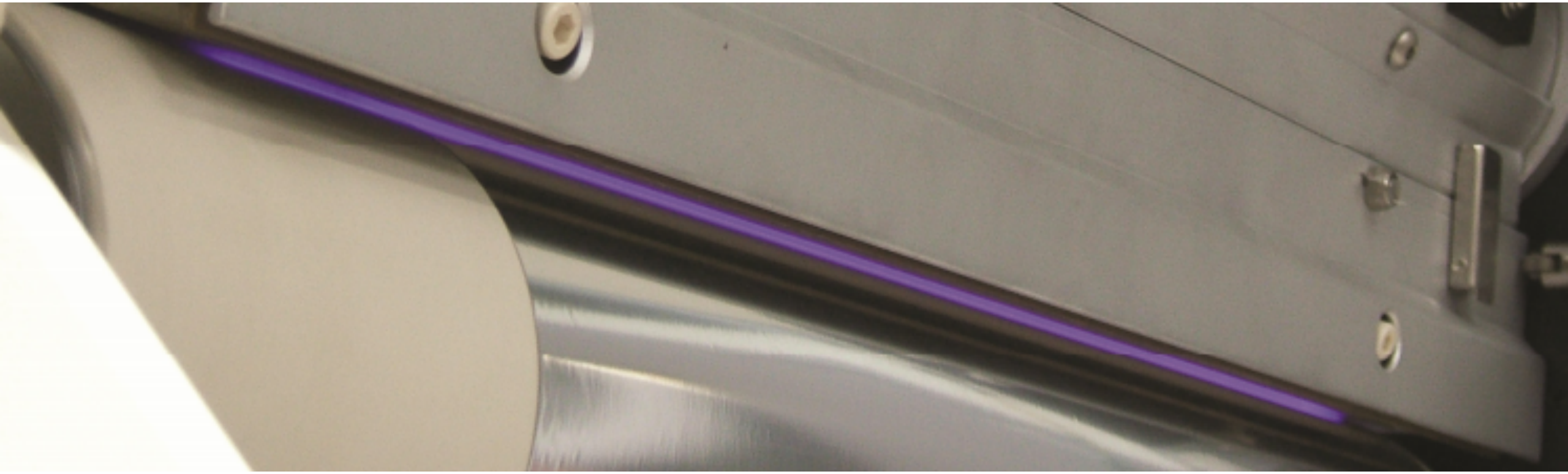
Best Practices for Preparing Film Stock for Ink Adhesion

Overview

- What does corona treating do?
- How corona works to improve ink adhesion
- Do all films need treatment?
- Which materials benefit from treating?
- How to eliminate surface energy as an operational variable
- Understanding dyne levels and watt density

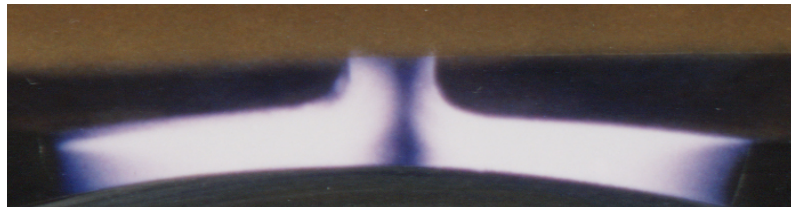
What does corona treating do?

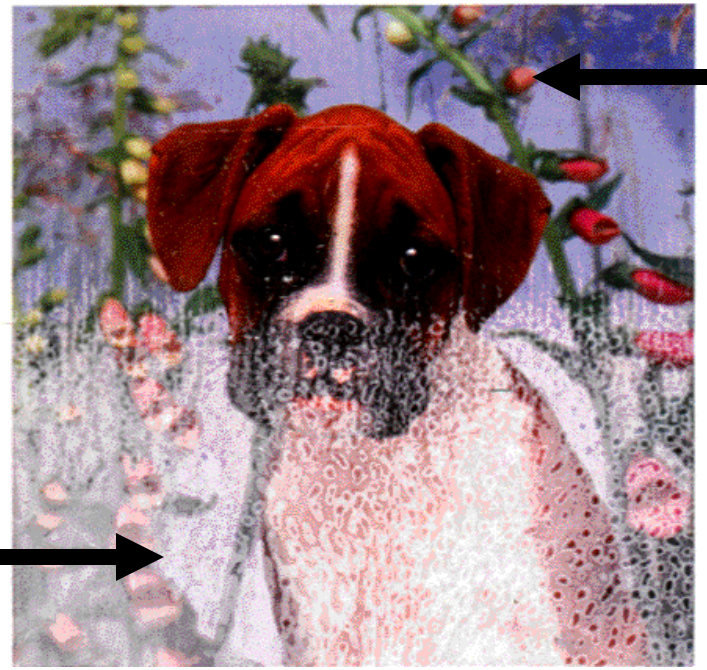


What does corona treating do?

Technically, it:

- Ionizes air
- Forms low-molecular weight (LMWOM) on film surface
- Oxidizes film surface
- Forms positive and negative sites by adding and deleting electrons

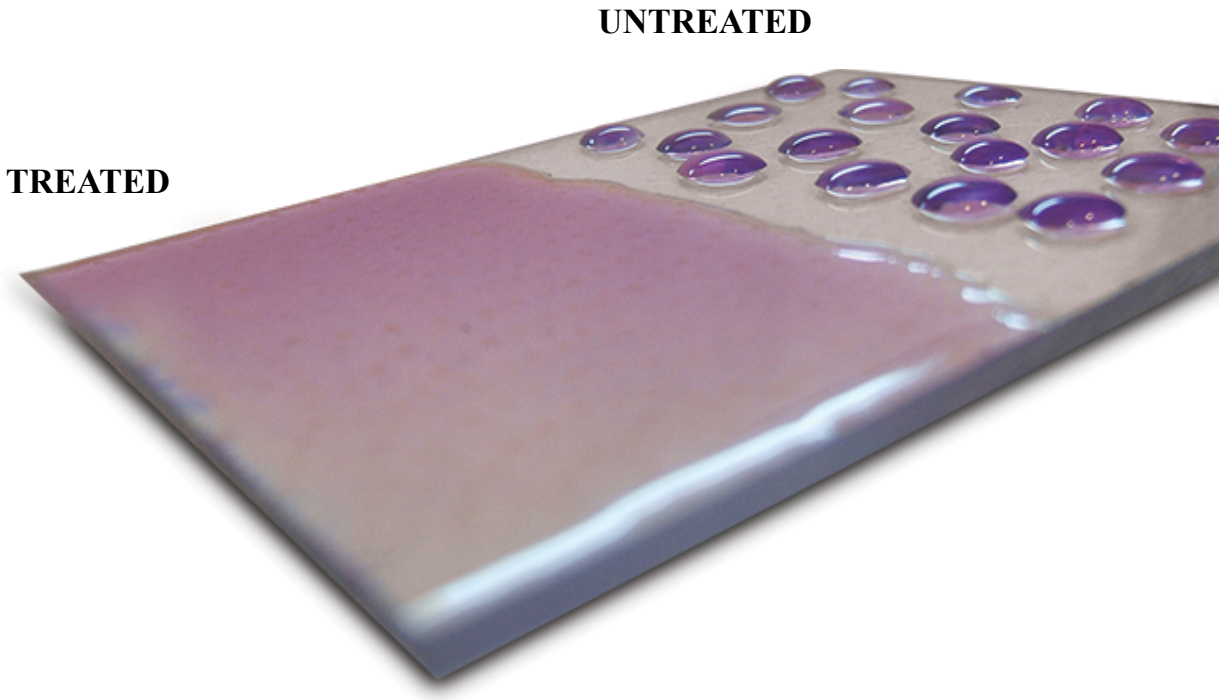




What does corona treating do?

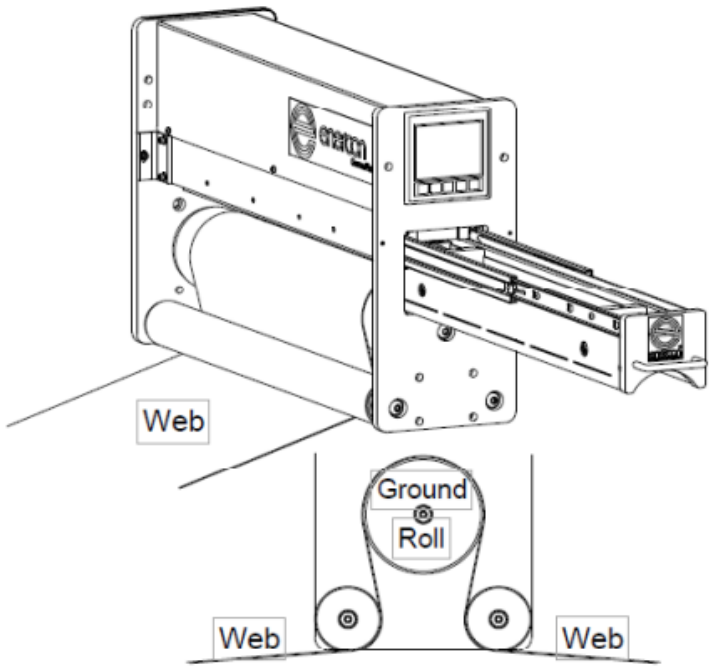
Benefit to Printing

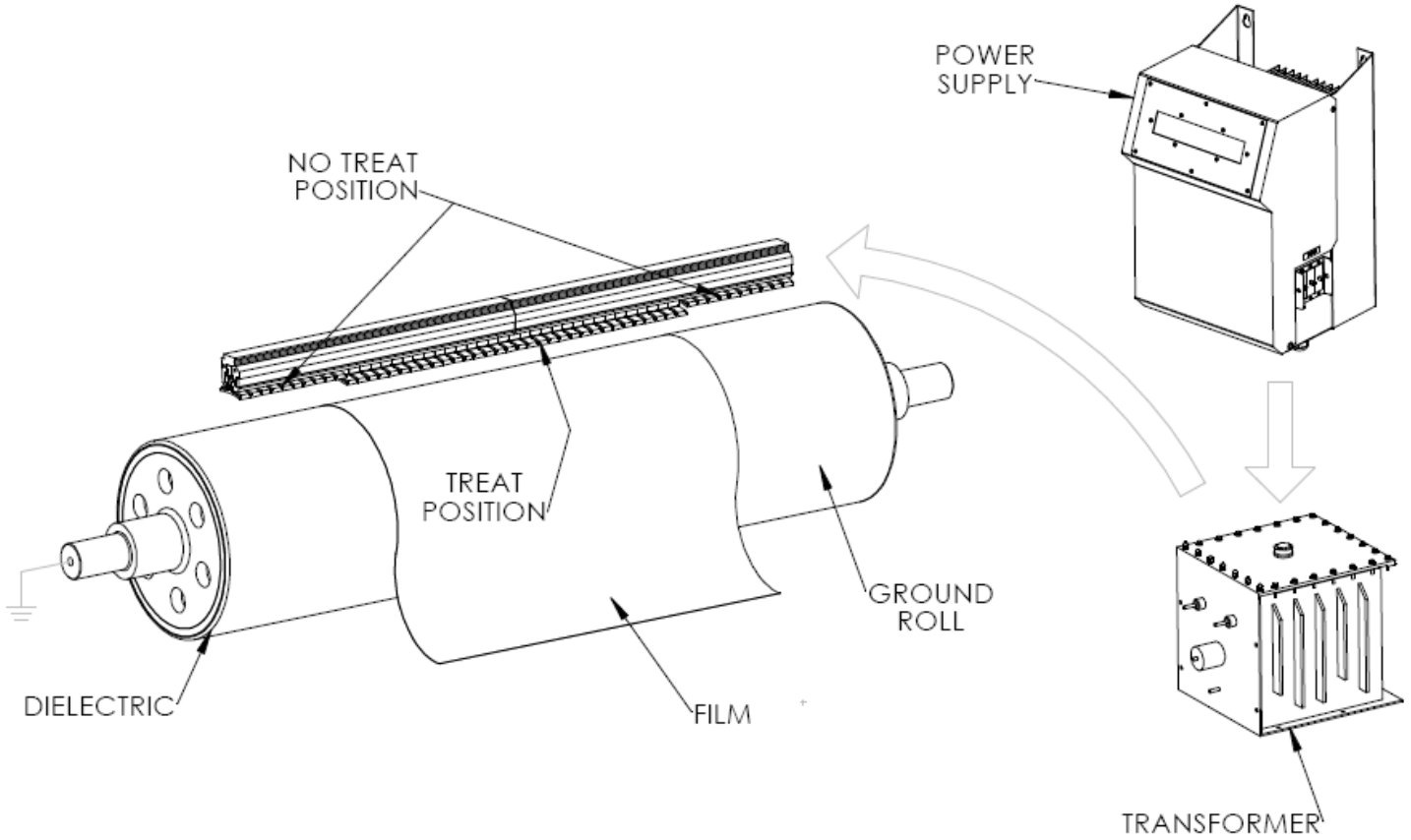
- Increases surfaces wettability
- Promotes ink adhesion
- Increases run speeds
- Insurance against waste and reruns



How is corona created?

Corona Treater Components

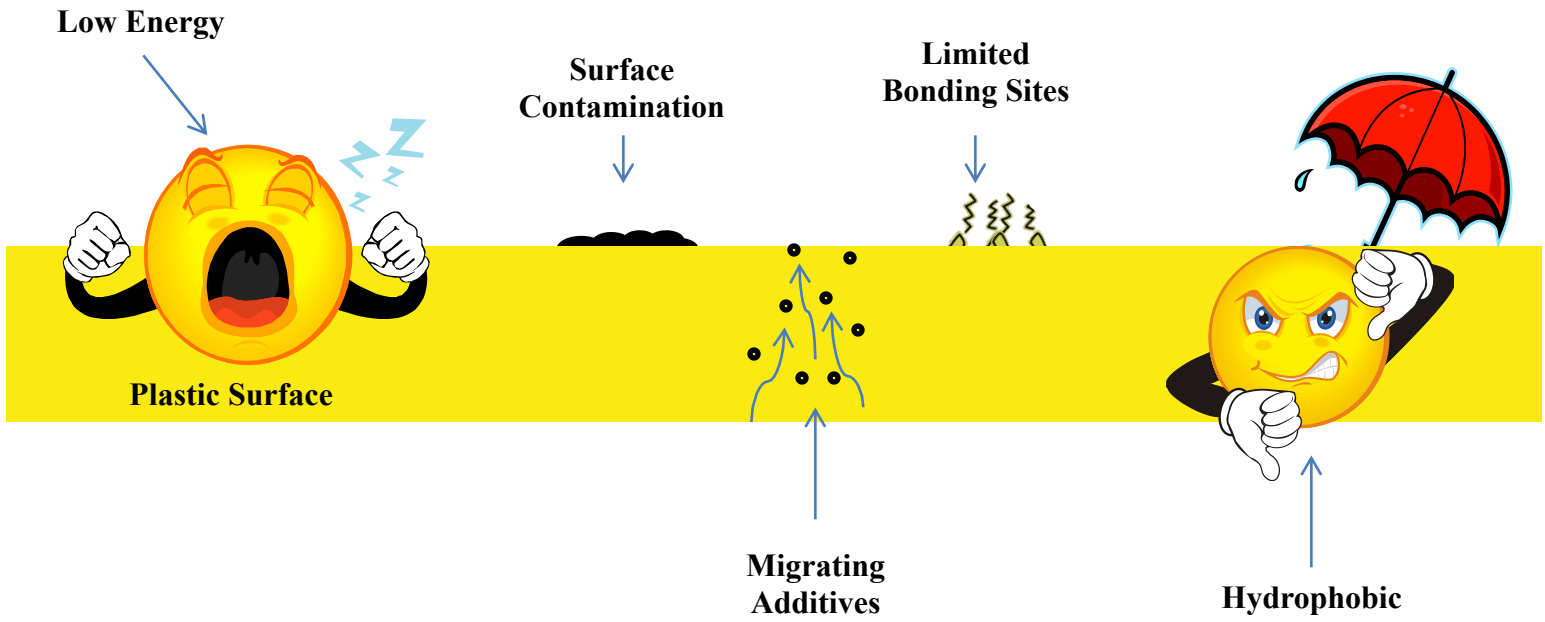




Do all films need to be corona treated?

- All films should be corona treated at the time of extrusion
- Commonly referred to pretreated film
- This increases their receptiveness to treatment at the time of converting

What's in your film?



Do all films need to be corona treated?

- Most printers “bump” treat immediately prior to printing
  - Some films cannot be printed without bump treatment
  - Films that can be printed without bump treatment still benefit from treatment
    - Bump treating eliminates the variable of surface energy from the printing process & provides additional quality insurance

How much corona treatment do I need?

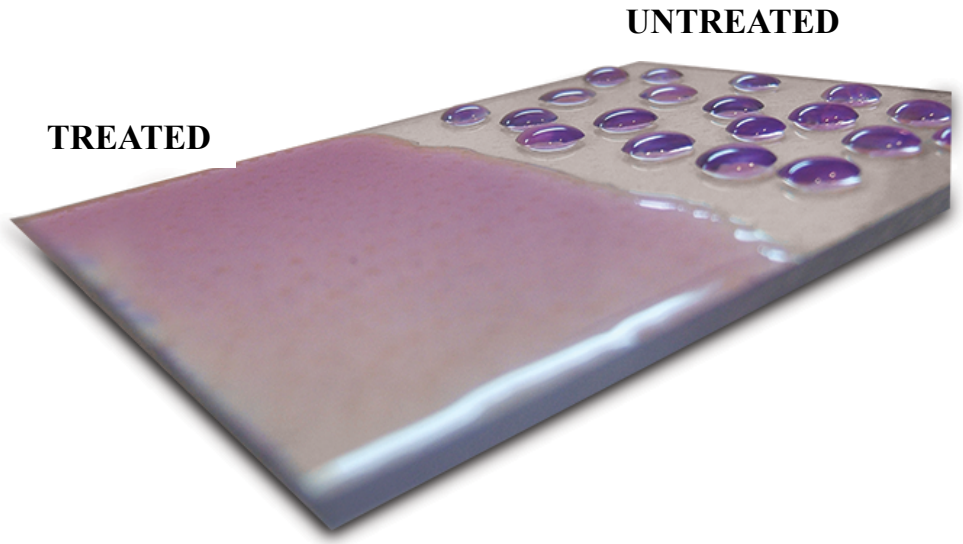
- Its always best to apply the minimum amount of corona treatment needed to achieve the desired results
- How do I determine this?
  - Ultimately your adhesion tests
  - Begin with target dyne levels
- Output of a corona treater is measured in kW
- Applied treatment is measured in watt density

Understanding Dyne Levels

Dynes are a measurement of the surface energy of a substrate.

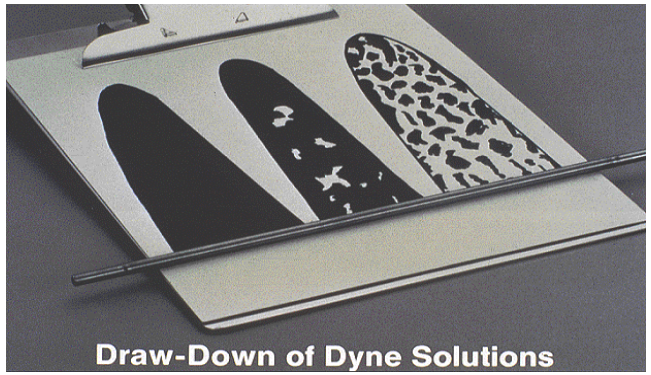
Untreated PP and PE have a low dyne readings (usually 30 to 32 dyne).

Dyne Level indicates wettability. It **does not** guarantee adhesion



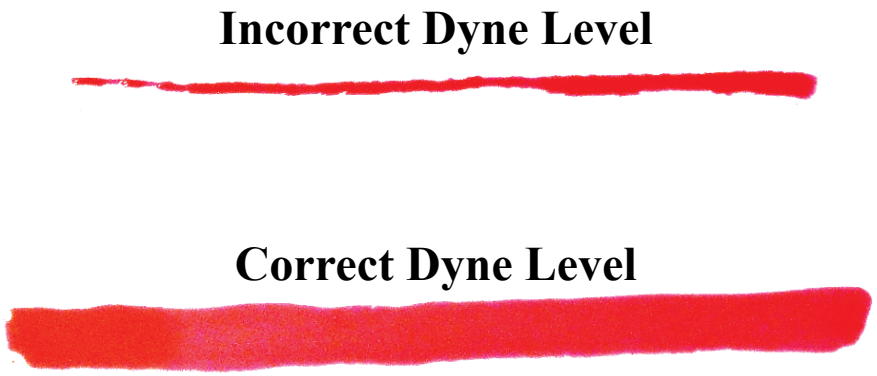
Types of dyne level tests

- Wire-Wound Draw-Down Rod
- Dyne Pens – Quick Checks
- Contact Angle



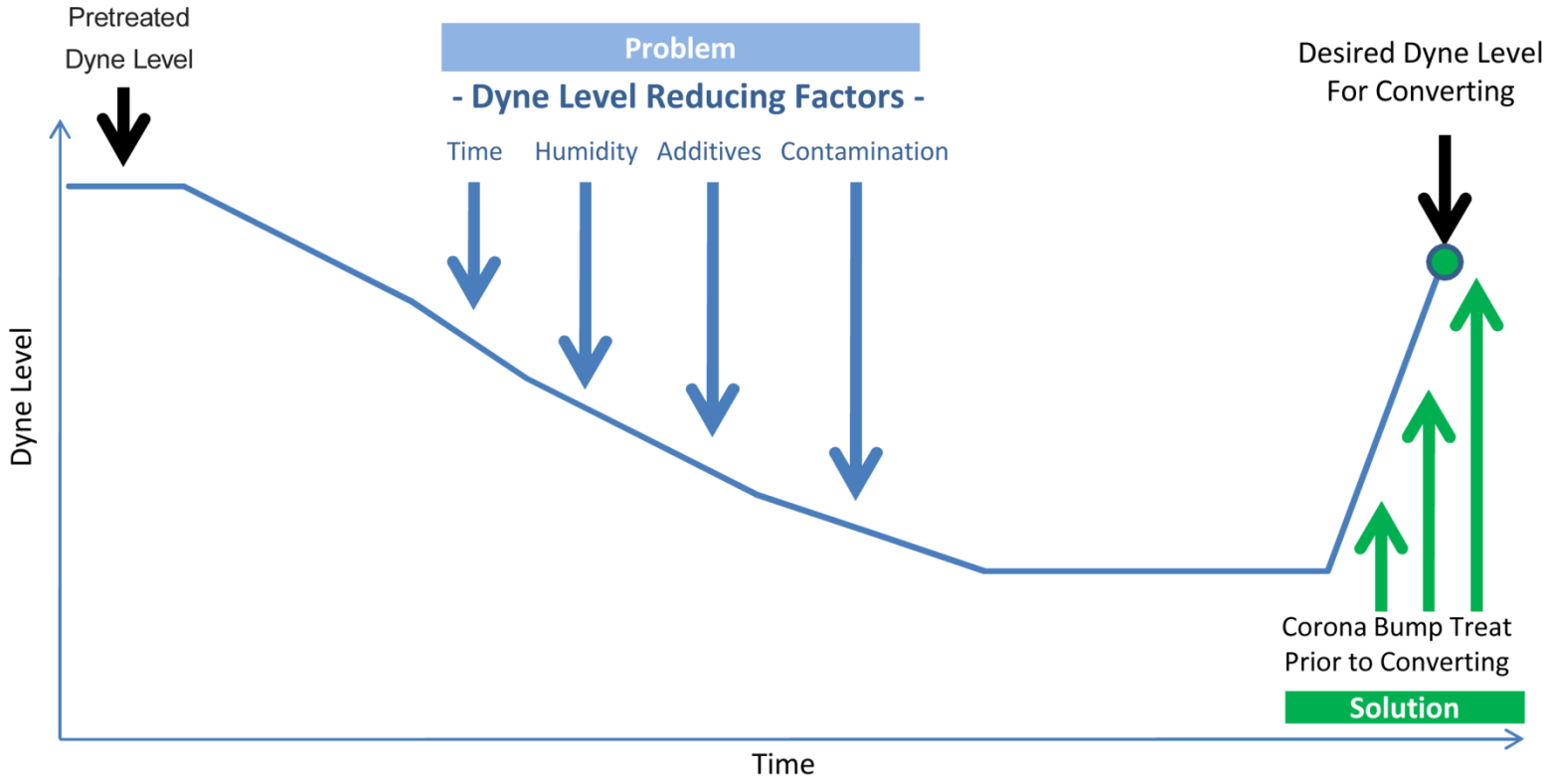
Pitfalls of Dyne Levels

- Dyne level provides an indicator of your chances of adhesion success
- Tests only a small sample of the film
- Subject to an operator's interpretation
- **Does not guarantee adhesion!**
  - Material & Process Variables Contribute to Adhesion Success!



Dyne Level Reducing Factors

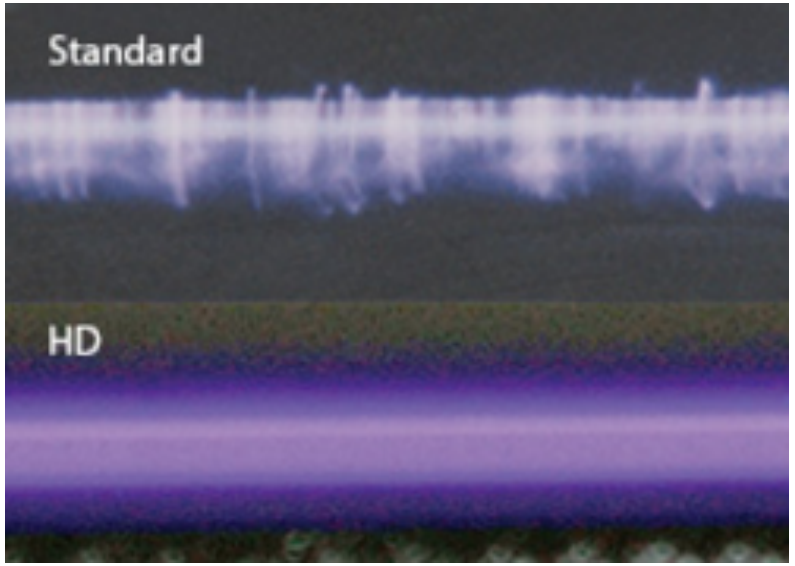
1. Set realistic expectations for your film suppliers.
2. Collaborate!
3. Use pretreated film.
4. Take control of your process.



Calculating required treatment levels

- Measure film's incoming dyne level
- Treat film- record line speed & kW
- Measure dyne level after treatment
- Adjust power until you reach target dyne level
- Run film through press with treater: check adhesion
- Remember:

  Adhesion is based on numerous process & material factors in addition to surface energy



Recording Results Application Recipe

Treat Width	**28”**
Speed	**100 fpm**
Power Supply	**1KW**
Sides Treated	**One**
Material	**Pretreated 1mil PP**
Application	**Water Based Printing**
Watt Density	**?**

Calculating Watt Density

Watt Density is a measurement of the amount of energy being applied to the web.

It is measured in Watts/ft2/minute.

Watt density takes into account:

- ✓ Power Level
- ✓ Line Speed
- ✓ Line Width
- ✓ # of Sides Being Treated

$$Wd = \frac{PSO}{EW \times LS \times NST}$$

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

Typical Watt Densities

Printing/Coating /Laminating

	Solvent	Water	UV	Solventless
Pretreated LDPE	1.5-2.0	2-2.5	2-2.5	1.0-1.3
Pretreated LLDPE	1.5-2.0	2-2.5	2-2.5	1.0-1.3
PET	1-1.5	1-1.5	1-1.5	1.0-1.3
Pretreated BOPP	2-2.5	2.5-3.0	2.5-3.0	1.0-1.3

Recommended treatment

Printing/Coating /Laminating

Recommended treatment ranges (dynes/cm^2)								
Flexo/Gravure	**PE**	**PP**	**PVC**	**PET**	**PS**	**PVDC**	**PU**	**ABS**
Water	38-44	38-44	38-44	44-52	38-44	42-46	40-46	42-46
Solvent	36-40	38-40	36-40	40-46	35-40	38-42	30-42	40-44
UV	38-50	40-50	36-50	42-54	42-48	42-52	38-50	40-52

What to do when adhesion fails

Review application specs

Slow the line down and run the treater at full kW

- Did the dyne level improve?

Ask what's changed?

Materials?

Process?

Verify treater set-up

Exhaust installation

Proper duct material

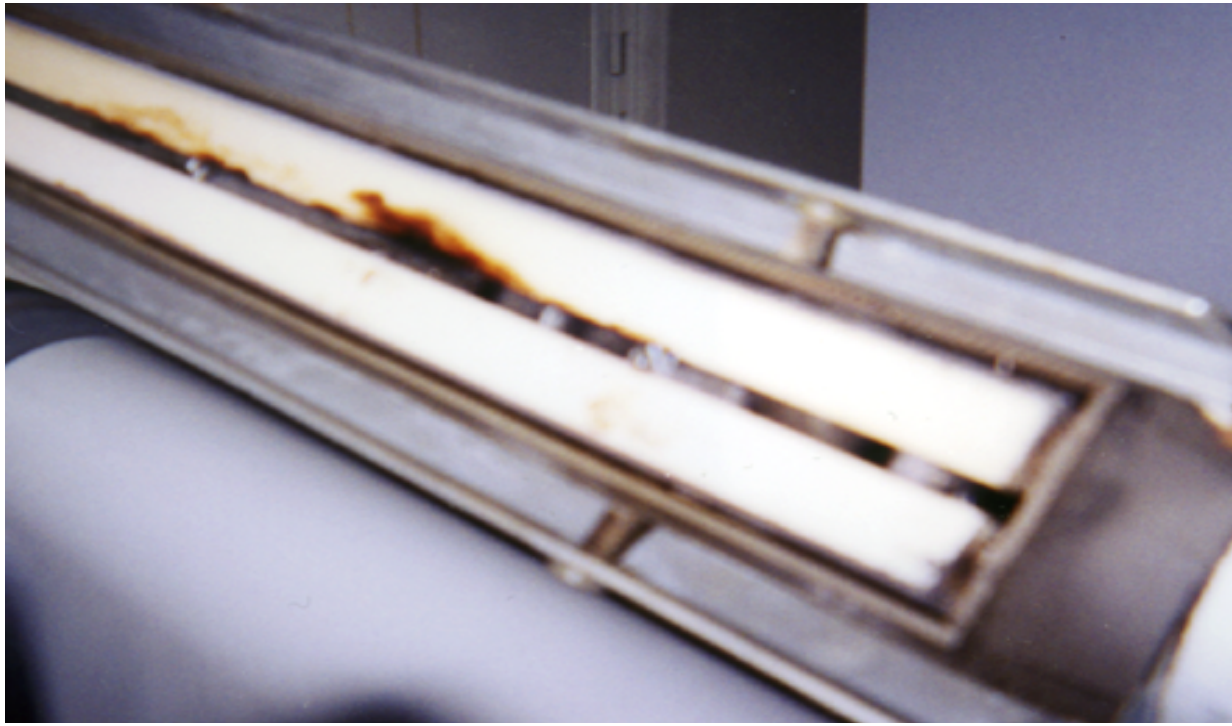
Aluminum, stainless steel & PVC

Avoid lengths of corrugated duct

Correct duct dimensions

Minimize elbows

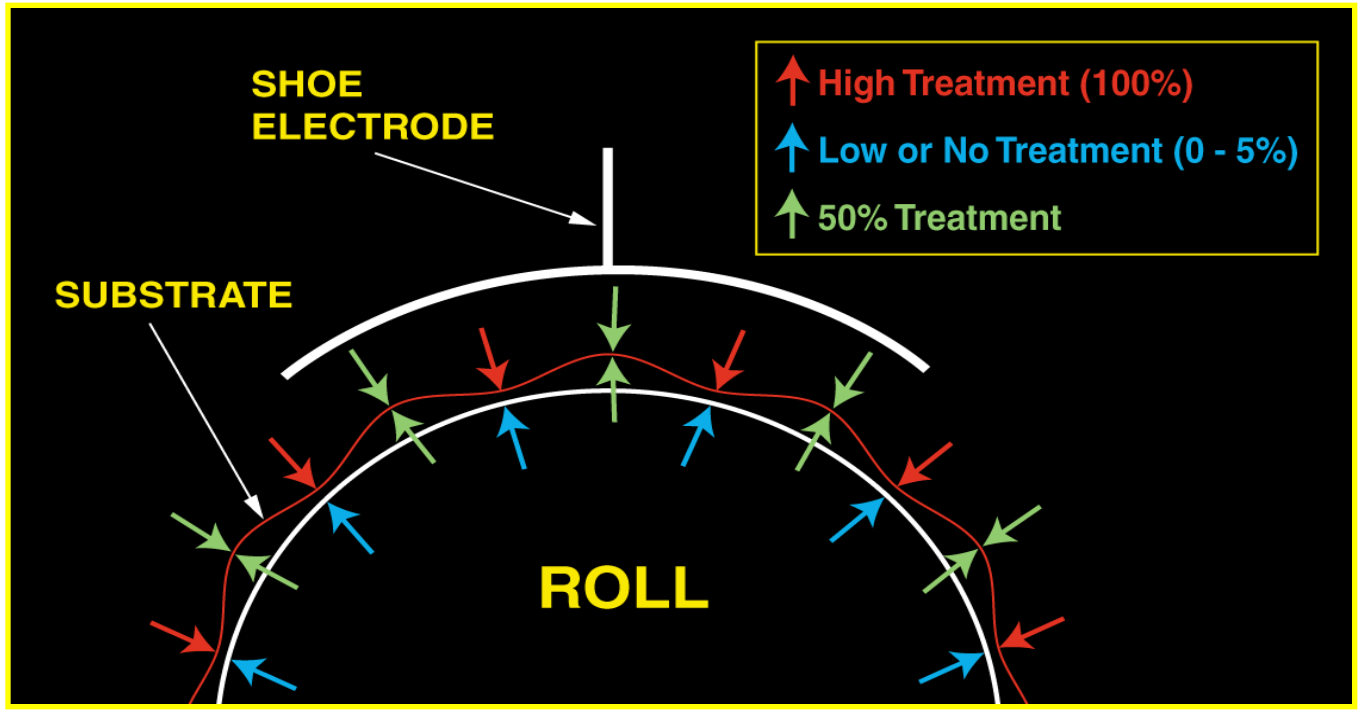
What happens when you don’t maintain your corona treater?



Problems Attributed to Neglected Stations

Variations in treat levels Backside treatment

- **Backside Treatment** occurs when air is entrapped between the backside of the web and the ground roll.
- The air beneath the web becomes ionized & corona treatment occurs.



Problems Attributed to Neglected Stations

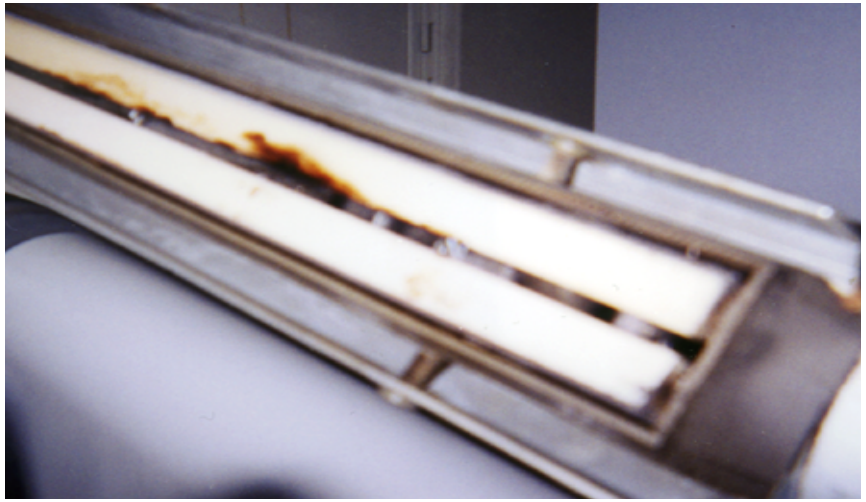
Ground rolls

Poor treatment

Contamination on web

Roll covering failure

Electrodes



Electrode failure

High Voltage Arcing

Review

- Corona treaters improve wettability
- Bump treating eliminates surface energy as a printing variable
- Dyne Levels measure surface energy but **do not** guarantee adhesion
- Watt density measures applied surface treatment
- Document your application recipes
- Maintain the cleanliness of your equipment
- When adhesion fails on a repeated application –
  - Ask what's changed? Set-up? Materials? Process?

Questions

Todd Krupa
National Sales Manager
Enercon Industries Corporation
www.enerconind.com/treating
1- 262 255-6070
tkrupa@enerconmail.com