

Introduction to Surface Tension and Corona Treatment

Understanding surface tension

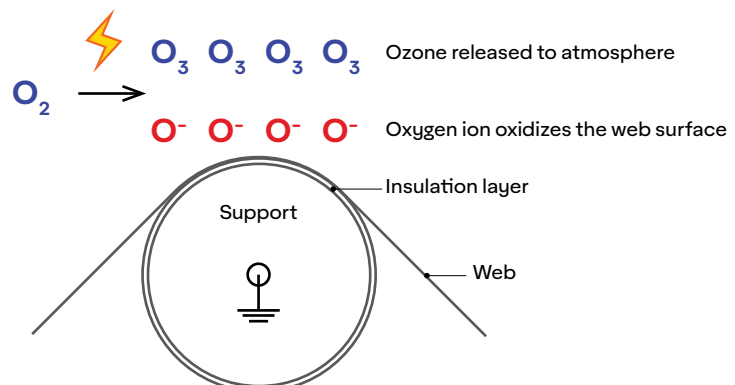
Surface tension is a phenomenon where the surface of a liquid, in contact with gas, acts like a thin elastic sheet. This effect is caused by the cohesive forces between liquid molecules. In the context of printing and label production, surface tension becomes a critical factor when we consider the wetting and adhesion properties of materials.

When you apply ink or adhesives to a substrate, the surface tension of the substrate dictates how well these materials spread and adhere and in extent the printability of the material. If the surface tension of the liquid is higher than that of the substrate surface energy, it will not wet out properly. Conversely, if the substrate surface energy is higher than the surface tension of the liquid, optimal wetting and adhesion occur.



Corona treatment

Corona treatment is an industrial process used to increase the surface energy of a substrate. In the context of label printing and converting, corona treatment is integral to improve the printability of non-topcoated filmic materials. During corona treatment, the film is passed over a roller through an air gap between a fixed electrode and a dielectric where the film is exposed to a very high voltage potential at a very high frequency, which causes ionization of air. The ionized air breaks down into ozone molecules and nascent oxygen ions. Oxygen ions then oxidizes the surface of the film creating a layer of high surface energy material.



Factors affecting the corona treatment process

The effectiveness of corona treatment in altering surface tension is determined by several factors:

- **Initial dyne level of substrate:** The pretreatment energy level of the substrate surface can influence the treatment intensity required.
- **Web width and thickness:** These physical dimensions of the substrate can affect the electric supply required, a thicker and wider web width will require a higher electrical supply
- **Web speed:** The speed at which the substrate passes through the corona treating station needs to be managed to ensure adequate treatment.
- **Electric supply stability:** Variations in electric supply can impact corona treatment consistency and effectiveness.

Manufacturers and operators must carefully calibrate their equipment to consider these factors, ensuring consistent treatment across all runs.

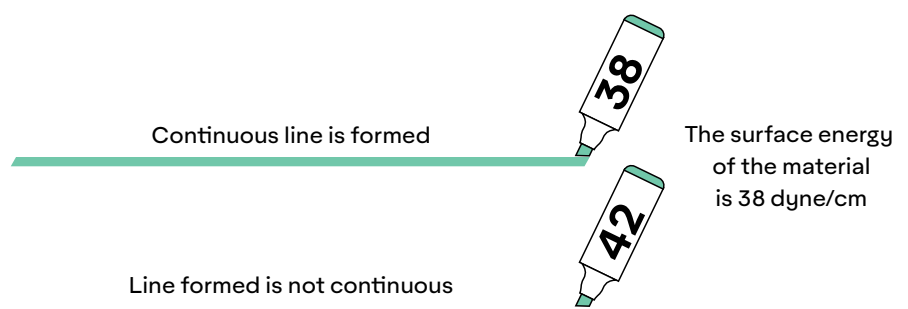
Gauging the efficacy of corona treatment

The treatment process efficacy is often gauged by measuring the surface energy in dynes per centimeter (dyne/cm). Adherence to industry standards regarding dyne levels ensures that the substrates are treated properly for their intended usage. In the context of the label industry, differing printing techniques on various substrates have varying levels of surface energy suggested.

Suggested surface energy level post corona treatment (dyne/cm)

Materials	Flexographic			Screen Printing		
	Water	UV	Solvent	Water	UV	Solvent
LDPE	36-40	39-44	40-50	39-44	42-48	46-60
HDPE	35-40	38-44	38-50	38-44	42-48	46-56
PET	40-46	44-52	42-54	42-48	48-60	44-62
PP	36-40	38-44	40-50	38-44	42-48	48-60

To assess the effectiveness of corona treatment, implement the dyne level test. Using a Dyne test pen, draw a line across the print surface. If the ink forms a continuous line after 3 seconds, the substrate will have a minimum surface energy of that ink value. To determine the exact surface energy of the surface, apply a range of increasing or decreasing values of dyne test fluids.



Conclusion

Understanding surface tension and effectively using corona treatment are essential in achieving high-quality printing and labeling outcomes. For label printers and converters seeking to optimize their processes, mastering these concepts can lead to improved product performance and customer satisfaction. With the right knowledge and equipment, manufacturers can ensure that their labels exhibit excellent ink wettability, adhesion, and overall print quality.

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