

esseCI FLAME TREATMENT TECHNOLOGY

WHY BEING HAPPY WITH THIS ?



Peeling test on Sun Chemical Pluri-Euro series ink, applied without adhesion promoter, after **CORONA TREATMENT** and oven drying for 10" at 70°C.

WHEN YOU CAN GET THIS ?



Peeling test on Sun Chemical Pluri-Euro series ink, applied without adhesion promoter, after **FLAME TREATMENT** and oven drying for 10" at 70°C.

FLAME TREATMENT BENEFITS

1. HIGHER WETTABILITY THAN CORONA TREATMENT;
2. HIGHER SURFACE ENERGY THAN CORONA TREATMENT
3. SIGNIFICANTLY LOWER TREATMENT DECAY COMPARED TO CORONA TREATMENT
4. BETTER AND LONGER LASTING METAL ADHESION IN CASE OF METALLIZATION PROCESS;
5. BETTER AND LONGER LASTING ADHESION OF UV INKS ON THE TREATED FILM;
6. NO DAMAGES ON WEB BARRIER PROPERTIES;
7. NO BACKSIDE TREATMENT;
8. NO OZONE PRODUCTION.

When comparing flame treatment to corona treatment (that are the two most commonly used pretreatment methods for improving polymers surface adhesion), even if both based on oxidation of polymer surface, following differences can be underlined:

- ❑ When using flame, the depth of Oxygen incorporation in the treated PP is between 5 and 10 nanometers versus a depth of about 50 nanometers in case of corona treatment. So with flame there is a more extensive oxidation concentrated in a shallower surface region, that results in an **higher wettability**. Moreover, the higher oxidation depth, when using corona, causes also delamination phenomenon (weakening of oxidized layer), not observed when treating PP by flame.
- ❑ Most important, using flame treatment is not possible only to get a higher and more concentrated oxygen quantity, but also a **better oxidation quality**. Corona treated PP (and in general polymers as PET, PE, and others) are characterized by the presence, on their surface, of LMWOM. This presence is much higher when increasing corona watt density applied to the material (literature refers this as overtreatment). LMWOM stands for Low Molecular Weight Oxidized Materials. These oxidized materials are produced on corona treated PP surface because of C-C links breaking (this reaction is known in literature as β -scission reaction) and consequent weight lowering of oxidized materials present on web surface. LMWOM are water soluble or other solvent (as acetone or methanol) soluble and generally more weakly anchored to the PP surface. In a PP flame treated surface, instead IMWOM (Intermediate Molecular Weight Oxidized Materials) are present, that are bigger than LMWOM, with higher weight, not soluble to water and other polar solvents and so more strongly anchored to the PP surface. This fundamental difference between corona and flame treatments, along with the fact that corona produces a deeper treatment than on a web treated by flame (see above point), is the cause for an **higher surface energy** of a flame treated film than a corona treated one.
- ❑ Presence of LMWOM first of all can explain high **treatment decay** observed in corona treated surfaces respect to flame treated ones. Treatment decay or aging depends much also on film composition and additives presence inside it, but, considering same type of film, corona treated will always decay faster than flame treated, because of the presence of the above reported LMWOM.
- ❑ **Metallised Films** after corona will present poor performances both in terms of barrier to water vapour and to oxygen if compared to the ones of flame treatment. Metal adhesion after flame will be at least 30% higher after flame than after corona and also much more lasting with the time. Inks adhesion on **Printable Films** is higher after flame than after corona, as shown on previous page, since higher is the contribution coming from flame to the surface energy.
- ❑ Flame produces only water vapour and carbon dioxide, **no ozone** (that is dangerous both for the operators and the machines). It also does not produce **pin-holing** on treated surfaces and does not affect the opposite side of the treated one (there is never **backside treatment** after flame).

