HANDEL
The pad printing supplier

Importers & Suppliers to the Printing Industry

Melbourne Office
50 Renver Road
Clayton VIC 3168
t +61(0)3 9544 2433
f +61(0)3 9543 7528
info@handel.com.au

Sydney Office
705 Parramatta Road
Leichhardt NSW 2040
t +61 (0)2 9568 3322
f +61 (0)2 9550 0387

A GUIDE FOR SURFACE PRE-TREATMENT

Printing on polyolefins (polypropylenes and polyethylenes) requires their surface to be treated before ink is applied. The surface of these materials has poor adhesion characteristics due to its low surface energy. Simply - the higher the surface energy of the material, then the better ink adheres to the surface. The science behind surface treatment is truly fascinating but we will stick to the very basics in order the get a better understanding of this procedure.

The pre-treatment of polyolefins can be described in four distinctive methods. As with any process, each method has its pros & cons. We will explore each method here and give you a guide as to which process would suit your requirements.

CHEMICAL PRIMER

Chemical primers are by far the simplest and cheapest form of surface pre-treatment. These chemicals can be used as precursor to printing. The adhesion Promoter ***PP Primer*** is a chemical specially developed for polypropylene (it has limited success on other polyolefins). The simplest method is to apply ***PP Primer*** directly on the surface with a brush or wipe it on with a clean cloth. For longer print runs, it can be sprayed with a pressurised misting gun.

PROS

+ Inexpensive
+ Simple to apply
+ Can be printed one minute to a few months after application
+ Flexible for short runs

CONS

- Only works best on polypropylene
- D.G. classed chemical
- If applied too thick then it loses its efficiency
- Only viable for low volume production
- Can alter the surface of some polymers - TESTING IS ESSENTIAL
- Personal protection equipment and ventilation is required

INK ADDITIVES

Coates Screen's FX 209 is an ink additive which improves adhesion on un-treated polypropylene. ***FX 209*** is added to TP 300/NT ink for promoting adhesion on un-treated polypropylene.

PROS

+ Simply add the recommended amount to ink
+ Faster production rates
+ Does not alter the surface of the polymer

CONS

- Only works on polypropylene (but not all) - TESTING IS ESSENTIAL.
- D.G. classed chemical

Quality System
Quality Endorsed Company
QEC 21962
SAI Global

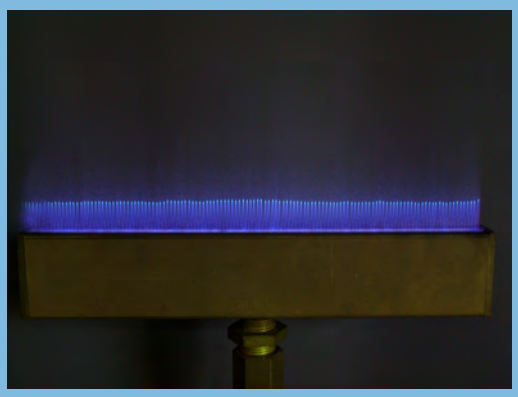
www.handel.com.au

GAS FLAME

Gas flame is the preferred method for treating polyolefins because the process can be utilised to treat most shapes and objects and on small or large production run. The flaming of an object changes its surface energy, thus making it “wettable” for printing. The operator needs to get the correct gas/air mixture, line speed and flaming distance to get the optimum surface treatment. These settings can be difficult to an un-trained operator but if good equipment with all the correct fittings and controls is utilised, most of the guess work can be eliminated. Simply heating the plastic with an ordinary gas flame does **NOT** change the surface characteristics to improve adhesion.

PROS

+ Versatile - able to do large range of materials and objects
+ Can be used as a stand alone system or integrated into an auto print line
+ Excellent treatment results achieved with good equipment
+ Cheapest method for large production



Finely tuned gas flame

CONS

- Exposure to naked flame and CO_2 gas
- Equipment must be checked and certified by gas authorities
- Flame must be tuned and checked regularly for optimum performance
- Treatment levels may decrease over time after initial treatment
- Flame can affect the look and feel of product
- Heat can distort product
- Harder to treat 3D object with deep recesses

CORONA DISCHARGE

Blown film manufacturers have been using this technology for a few years now to treat packaging materials; this same principle is now used to surface treat 3 dimensional objects. Corona creates the same effect as a gas flame by using high voltage electrical current mixed with air to create a corona discharge. Corona treatment is seriously challenging gas flame because of the inherent risks when using naked flames and the relative ease of operating the corona discharge unit. Another major advantage is that corona discharge has the ability to switch on and off rapidly and as required by the production line.

PROS

+ Able to treat a wide range of polymers
+ Easier to treat complex 3D parts
+ Easy to integrate into automated printing lines
+ No need to tune the corona discharge
+ Easy set up (plug & play)
+ Low heat output
+ Very quick discharge start up & shutdown

Corona discharge over 3D part

CONS

- High capital investment
- Ozone gas needs to be collected and treated
- Higher maintenance requirements
- High voltage device, heads require safety guarding
- Conductivity of environment needs to be considered when specifying the unit

CHECKING THE SURFACE TREATMENT

To achieve optimum ink adhesion, it is recommended that there is a minimum of 38 mN/m (dyne) of surface energy on the product. So how do you check this reading? It is possible to check surface tension by using a couple of drops of tap water to check surface wettability but the most accurate and industry standard method is using a test pen or test liquid. The pens and liquids are graded according to the surface energy reading (usually in the range of 28 mN/m to 56mN/m) and are as accurate to + 1mN/m. The pens are the preferred method because they are easy to use. To check, just simply run the pen over the product surface, if the line mark stays unchanged or does not bead, then the surface energy value is the same as or higher than the type of pen that is used to check. Always check the material surface before and after pre-treatment.

Un-treated Treated