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Printed film

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Problems with printed film

General

Due to marketing demands many of Autopack customers will choose to use printed film to shrink wrap their product. Having taken this step, the customer should know that printed film introduces three extra variables to the shrink wrapping process which at times may lead to problems with welding/sealing and positioning of print. These generally appear as machine related but the real cause may be the film itself.

These problems can be mostly avoided if the customer and the film supplier follow the guidelines set out by Autopack.

Important! To avoid production loss and related costs, it is best that all parties involved try to understand the whole process starting with film extrusion, treatment and printing of the film, through to unwinding, forming of the sleeve and welding (sealing).

Film extrusion

Shrink film can be made from a variety of materials each having different strength, shrink characteristics, transparency and lustre.

PolyEthylene (PE) and PVC (PolyVinylChloride) are the most commonly used materials for Sleeve wrapping with LDPE (Low Density Polyethylene) being the best suited for general packaging applications due to its relatively high strength and low cost.

Polyethylene Shrink film is manufactured in a vertical extrusion process where ethylene granules are heated under pressure to produce the Polyethylene polymer.

The polymer is forced upwards through a circular extrusion die to produce a very thin walled continuous tube of material, still in a semi-molten state as it emerges from the die.

A controlled supply of air is fed up through the centre of the die to stretch the tube in the radial direction, thus forming a bubble. At the same time the tube is stretched in length by winding the film faster than it is extruded.

As the film cools, the induced stretch is "memorized" in the film. Upon reheating, the film, if unrestrained, will shrink a certain percentage in the width, referred to as % shrink in TD (transverse direction), and in the length, % shrink in MD (machine direction).

At the top end of the bubble the film tube is cool enough to be flattened and slit to produce a flat sheet.

What is Film Treatment?

Printing on shiny plastic surfaces requires surface preparation by either:

a) "Treatment" of film on the side to be printed, or
b) Use of aggressive ink solvents which “penetrate" the surface of plastic during the printing process to gain better adhesion.

Some customers choose printing on the inside of the pack to stop the print rubbing off during product handling. In this case treatment is not possible and only aggressive inks must be used, leaving clear areas for sealing of film.

Treatment is still most commonly used and it is like a spark erosion process, normally done during the manufacturing of film. In this process a high voltage electrode is placed near the surface of the film causing continuous corona discharge making the surface "rougher" and thus easier for the ink adhere.

Welding (Sealing)

While film treatment improves printing, it makes welding of this surface nearly impossible and generally, the following rules apply:

a) Untreated to Untreated – Best

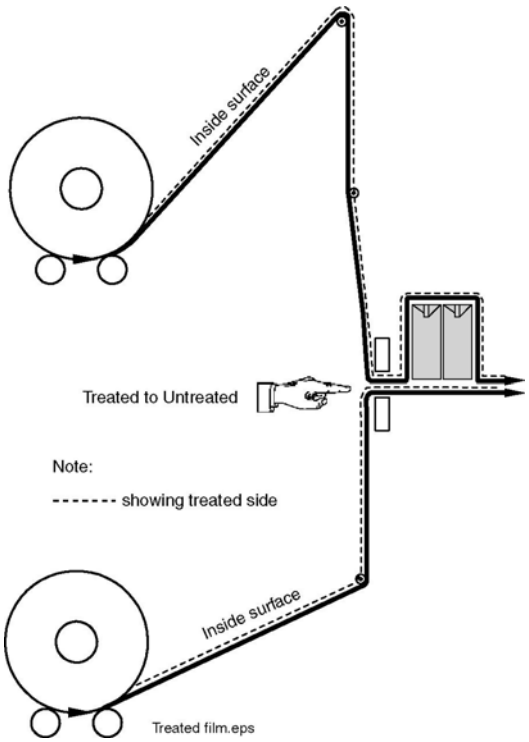
c) Treated to Treated – may weld but not very strong- will open in tunnel if full shrink is achieved.

b) **Treated to Untreated** - the worst case -**WILL NOT WELD AT ALL**, it will just peel apart on application of small tension

Film unwind system

Autopack standard film supply system is arranged so both top and bottom rolls unwind the same way - off the bottom and into the machine. This makes it easy for operator to remember how to load the film.

This also means (see diagram below) that when the top and bottom films meet for welding, the outside of the top roll and the inside of the bottom roll will come in contact. If both rolls are treated on the same side - **the films will not weld.**



Autopack standard film unwind system

(simplified)

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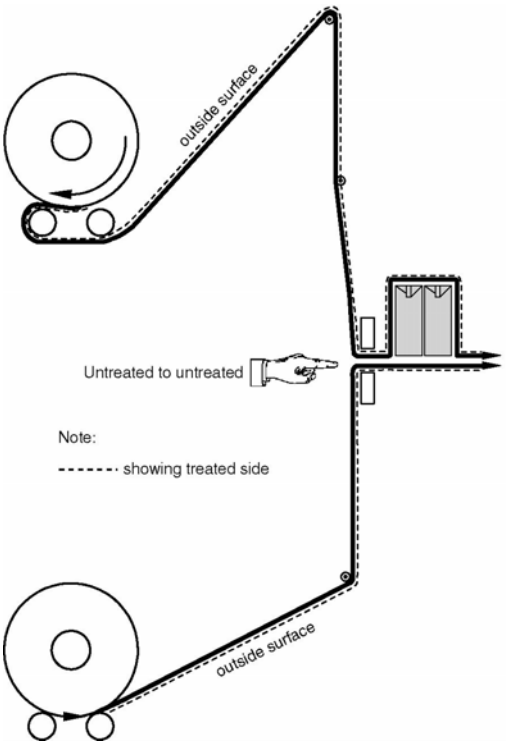
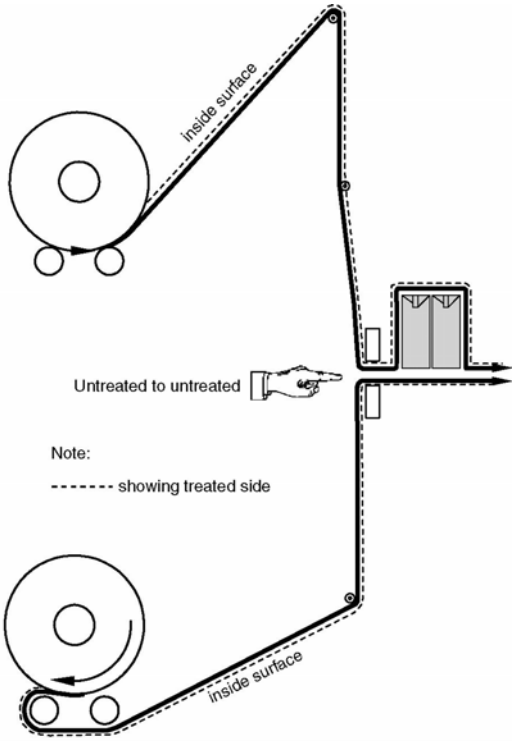
One may ask, if only the top roll is printed why are the bottom, unprinted rolls ,treated also?. The answer is simple: when film is made it is slit to correct width to suit the product. If the operator knows that film will be printed, he will generally treat the whole batch of rolls. Sometimes the operator forgets to turn off the treatment device.

Autopack can modify the film feed system as below to help solve the treated film problem.

However, if the film is reverse printed on the inside of the pack, on treated film, there is not much one can do about this.



Modified film unwind system to allow sealing when *outside* of the top roll is printed or treated.



Modified film unwind when *inside* of the rolls are printed or treated.

Why does Autopack make such a fuss about it?

The above seems logical once someone understands. But when a problem starts to appear and operators cannot fix it, production stops, Autopack service is called and the costs start to mount up. Hence it is important that machine operators, production managers and purchasing officers are aware of what can happen.

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How to know we have a Treated film welding problem.

Detection of problem is not easy as:

a) one cannot see which side is treated, unless you have a special pen to test it.

b) sometimes both sides are treated.

c) the problems are not consistent and will depend on the pressure, temperature and other factors and to someone who has no experience in it before, it will look like a machine problem.

What are the symptoms?

The first complaint is that when the pack goes through the tunnel big holes will appear in the sleeve and the pack may even fall apart. When inspected the weld/seal will look good but it will pull apart on applying tension and big holes appear as it passes the shrink tunnel.

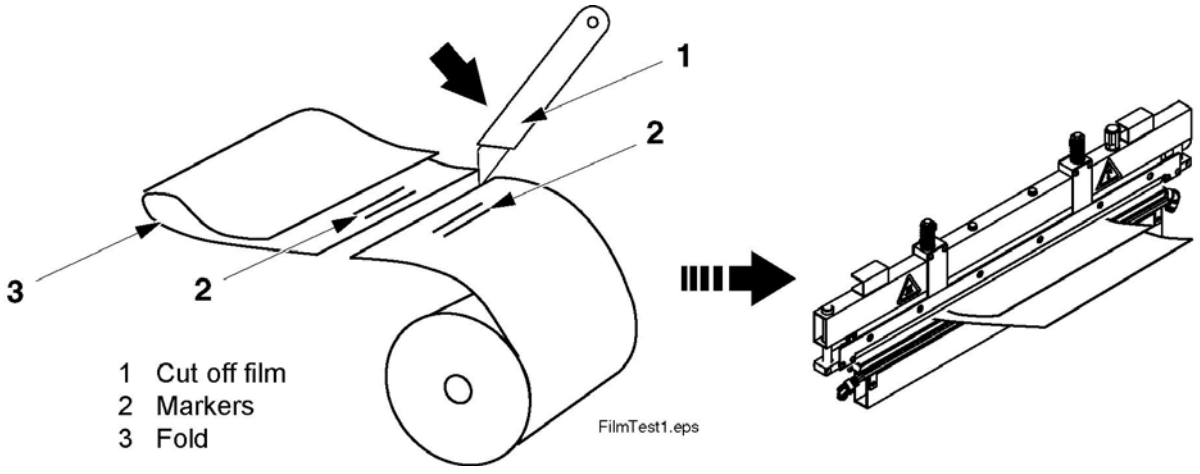
In this case, **THE CAUSE IS FILM TREATMENT.**

One may be also misled by the fact that the sleeve may be held in places by a thin line where both films were cut with the hot knife. In this area the seal is stronger as films are mechanically intermixed by the hot knife.

5-Quick test

To check which side is treated, do the following:

a) Unwind say 500mm of film from the roll - cut off (1) and mark (2) which is outside of roll. Then fold (3) it over with Outside of film being Inside of fold, then make a seal manually.



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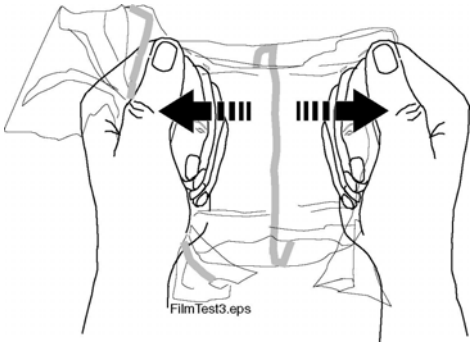
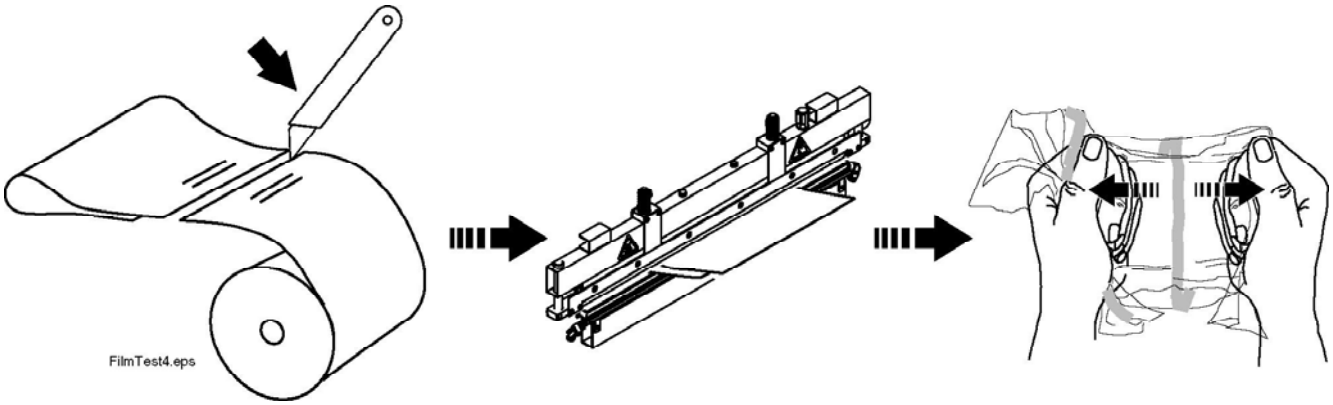
b) Cool it well then open up the film and try to peel it apart by applying tension. If the film is treated on the inside it will peel apart.



c) Fold the film over the other way, with Outside of film being on the Outside of the fold. Repeat the welding operation and test the strength.

d) In general, if the film is untreated, the weld will break but not peel apart. If one side is treated, this side must go outside of the pack



d) Repeat the above operation with the bottom roll.