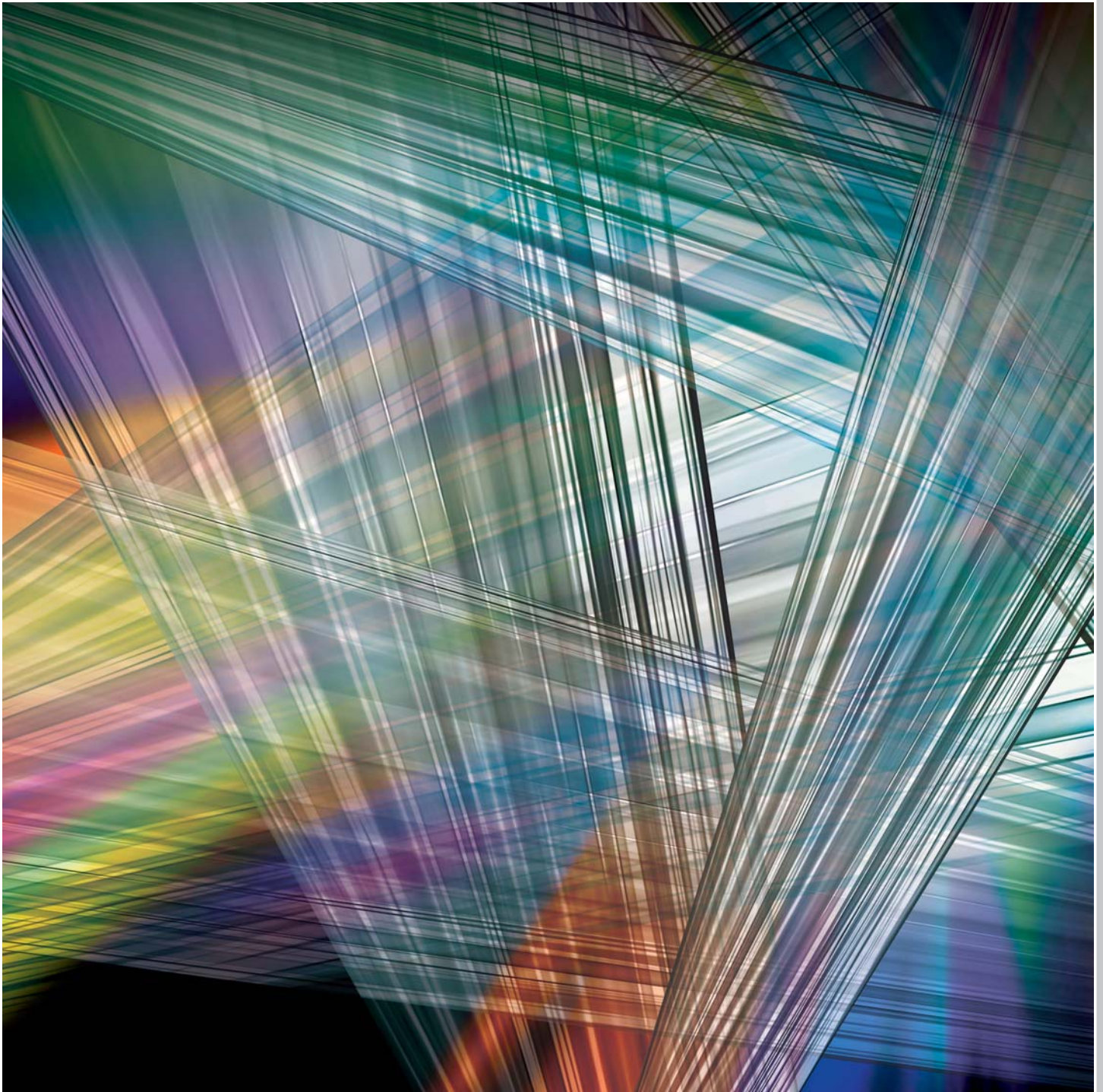


24863  
Volume 4 · January 2013

1-2013

# Packaging Films

Global Technical Magazine on Packaging  
Films and Laminates –  
Materials, Production and Converting



# Key technology for surface functionalisation

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Suppliers to the packaging market have the constant challenge to develop environmentally-friendly, economical and future-proof technology. The multiple combination of functions dictates the choice of compounds and layers to be used for the final film. The difficult part is finding the best materials for the purpose, staying in control of the manufacturing quality and keeping the price of the end product competitive in relation to the market. Here is where calvasol technology, which is patent pending in several countries, can play its part.

A key technology for surface functionalisation, *calvasol* relies on a combination of the atmospheric *calvatron* corona technology with a functional and water-based solution, which is converted to an aerosol and sprayed directly into the corona discharge.

The film is transferred through a system similar to that of a commonly-used corona treater, while the aerosol spray is applied on the surface with the help of the corona discharge. There is no need for low pressure chambers.

This process significantly improves on the previous, more lengthy procedure, which entails pre-treatment followed by coating. Combining the two steps into one saves both time and resources.

The layers applied are within a range of 3–150 nm and this is a further benefit of the *calvasol* method. Because the layer is so thin compared with usual coating methods, there is generally no need for additional drying processes, and consequently can save a tremendous amount of energy. And even if the chemistry does require additional curing processes, the complexity and energy consumption are relatively insignificant.

With the reactive chemistry fixed directly on the surface of the film, the effect is immediately activated and generally independent of environmental influences such as humidity and temperature.

All the important processes are controlled and necessary adjustments such as working width electrode gap and corona power are fully automatic and operated from a single touch-panel. Higher line speeds – dependent on functionalisation – reach up to 500 m/min (1640 fpm), and a working width up to 6000 mm (236") is possible.

## calvasol antifog

Among the current trends is the use of antifog on surfaces of packaging films. Although antifog is not new to the market, the challenge is to combine antifog with, for example,

a peel effect, a sealing layer or materials that offer a better oxygen barrier.

With the constantly increasing price pressure on resources, the packaging industry has to find cheaper and better materials to stay competitive. At the same time, materials must fulfil user expectations for state of the art functionality. These materials can be Polypropylene or other kinds of thermoplastics films.

There are currently two traditional ways to process antifog on film, namely batching and coating. However, batching with antifog additives is not easy to do and the results are far from perfect or – in case of coextruded films – very expensive.

When using a traditional coating it is necessary to process the film either in a special coating line, or in the printing unit of a printing press.

The antifog chemistry generally consists of solvent based solutions and the coating thickness is in a range from 1–3 micron. Although the antifog results after coating are acceptable in the market, this process comes with significant disadvantages, which include

- high consumption of antifog solution;
- solvent-based chemistry (up to 90%);
- high energy consumption for the necessary cross-linking process;
- additional coating step within a printing press or coater.

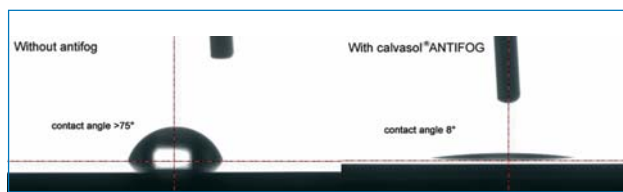
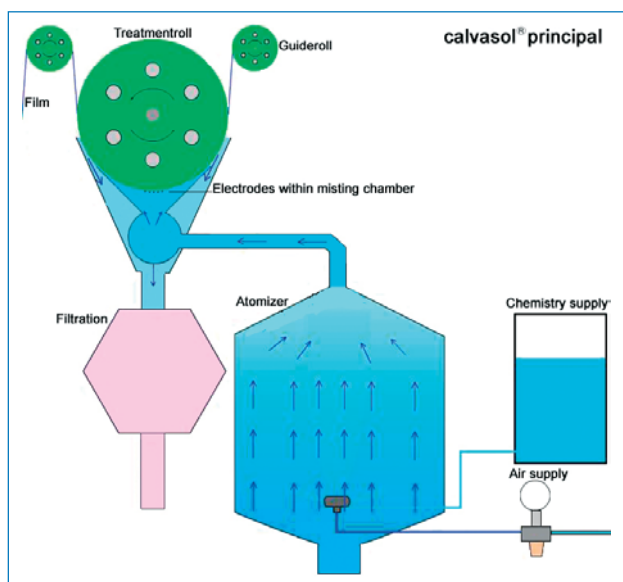
The integration of *calvasol* in laminating lines has proven the added value which comes with this process:

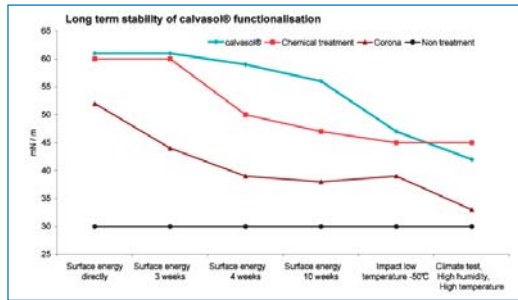
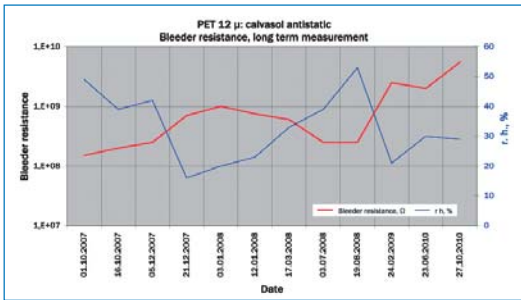
- Very good antifog results on Polyolefin and thermoplastic films (true for both cold- and hot-fog);
- Avoids additional processing of the film in a coating line or printing press;
- Avoids additional energy consumption due to cross-linking processes;
- Immediate supply of the films is possible due to the use of water-based and FDA approved chemistry;
- Low chemistry consumption of a nano-scaled, functional layer.

Managing Director of *Kalwar CIV Innovserv GmbH* and *Kalwar Group* Chief Sales Officer, Halle (Westf./D).

Above:  
Diagram to show the calvasol principal.

Below:  
Inline integrated calvasol unit at customer plant left: without antifog; right with calvasol antifog).





**Left:**  
Longterm effect of calvasol functionalised film in conjunction to humidity.

**Right:**  
Diagram shows the long term functionalisation.

**calvasol antistatic**

Another successful function which has been realised by *calvasol* is the reduction of the bleeder resistance of plastic films.

To avoid electrostatic discharge on films or other flexible materials it is possible to equip the surface of the film with an antistatic layer of around 10e8 to 10e9, even at 20% humidity. Measurement of long-term effects has proved the permanent stability of the *calvasol* equipped films.

**Multiple use**

*calvasol* not only sees the displacement of traditional production methods. The intelligent combination of *calvasol* and established processes can help to create completely new products and therefore opens the door to new markets.

Although antifog and antistatic are already high-end processes, *calvasol* is also suitable for an interesting variety of additional functionalisations. The system can be successfully used for longterm adhesion, silicone-free release, antiblock and UV primer effects. And *calvasol* is not only suitable for films. Benchmark tests have proved that its use with physical meshed foam shows a higher and more stable surface adhesion (>60 dyn) compared with traditional corona and gas chemical treated foams. In this case the inline or offline treatable material thickness can reach up to 12 mm (0.47”).

Nearly every kind of flexible material can be processed with *calvasol*: BOPP, OPP, CPP, PET, BOPET, PVC, TPO, Styrol, paper, non-wovens, textiles, physical and chemical meshed foam, and more. Not to forget that *calvasol* is also suitable as a traditional corona treater with all the benefits of the well

established *calvatron* corona technology.

**No chemistry supplier commitment**

The chemistry used for the *calvasol* process are generally standard products and readily available. However, if required, *Kalwar* can support the customer in the development and research of new products. Such a service is based on extensive database and partnership resources. Further to complement the di-

rect support of *calvasol* equipment on-site at the customer’s plant, *Kalwar* has recently extended its lab equipment at the plant in Halle, Westphalia/D.

The new integrated winder is equipped with a serial *calvasol* system and can process films and foams up to 1500 mm (59.1”) working width and 300 m/min (984 fpm) line speed.

All possible and imaginable functions can be processed on this equipment. ■

**Technology summary**

- *calvasol* is a multifunctional tool for a wide variety of materials and functionalisations.
- The reactive chemistry is immediately effective because active substances are fixed directly on the surface of Poleyolefin thermoplastic films or other flexible materials.
- The low chemistry consumption and thin surface layer (3–150 nm) saves resources.
- Environmentally friendly due to low energy consumption and use of water-based chemistry.
- Easy integration and inline and offline potential bring multiple benefits.
- No commitment to a specific chemical supplier or distributor.



**For the fast ability to test materials this equipment is to demonstrate the industrial road capability, which calvasol has already reached.**