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1 *Flame treater on a paper extrusion coating line.*



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2 *Flame treater on a BOPP extrusion line.*



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3 *Water drops on polymer films; bottom film activated.*

4 *Film converting machine at Fraunhofer IAP.*

FLAME TREATMENT 4.0

ADVANCED SURFACE FUNCTIONALIZATION OF POLYMER FILMS

Summary

EsseCI and Fraunhofer IAP joined forces to advance the application of flames for the surface treatment of plastic films by having signed a cooperation agreement. We invite partners to a joint project for advancing flame treatments in order to improve the durability of the treatments as well as the range of possible functionalizations and, in turn, boost the competitiveness of the users of this technique. For this purpose we intend to explore the possibilities of advanced flame treatments by addition of agents and post-treatments.

Flame treatment

Most polymers (plastics) require a surface activation before printing or adhesive joining. Flame treatment is one of the techniques used for activation on an industrial scale. It modifies the surface chemistry of various substrate materials in a way that

makes them polar and increases the surface energy. The materials turn wettable and they are ready for printing, coating, and laminating.

Flame treatment offers a number of advantages, when compared to other surface treatment techniques, such as more stable treatment results and a higher level of surface energy on many materials. While in the past corona treatments have been diversified by the use of gases other than air to meet special demands, flame treatments such as CCVD (combustion chemical vapour deposition) are largely limited to the deposition oxide coatings so far. It is up to new technological developments to extend the application range of flame treatments towards a wider range of functionalization in order to further improve the competitiveness of the technique.

We intend to start a joint project with the target of pushing current limits of technology and knowledge.

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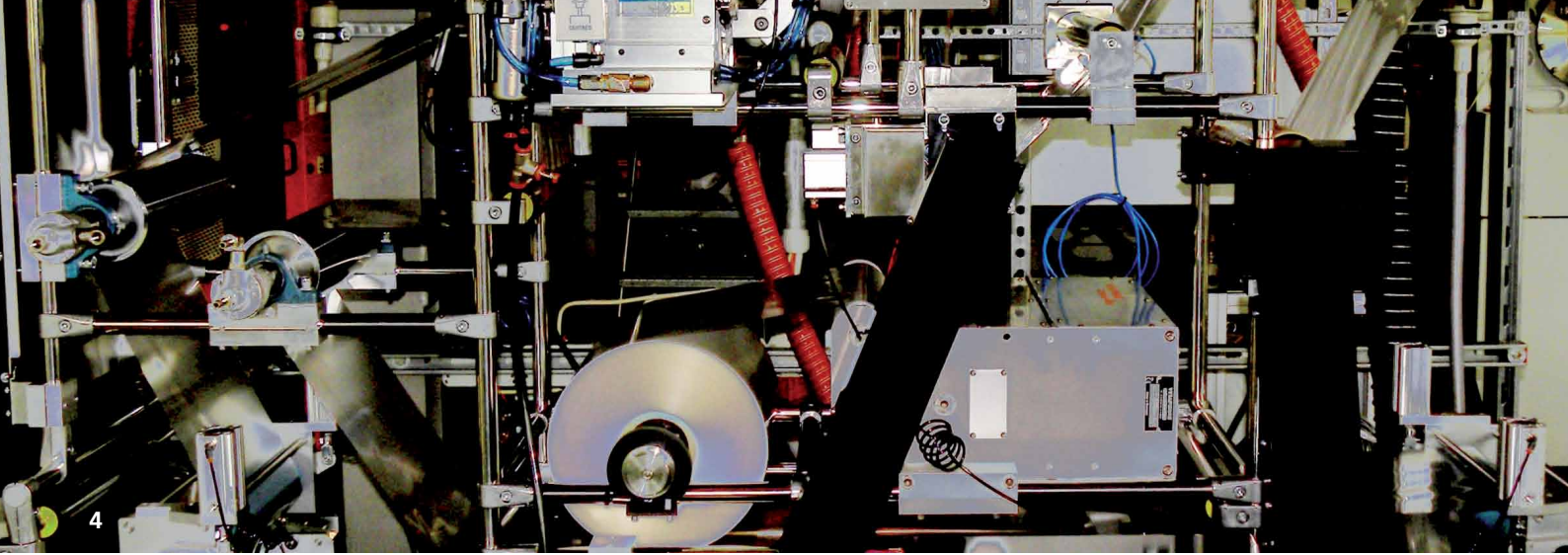
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Advanced Flame treatment

For the activation of polymers flames supply various kinds of oxygen based radicals which readily react to form an oxidized surface. These radical reactions are extremely fast and give rise to efficient processes. However, we believe that it is worth investigating how the surface properties can be improved by combining flame treatments with additives and post-treatments.

With the project we target this issue by modifying the flame treatment technology in order to achieve a greater range of surface properties compared to the state of the art. It is intended to use the flame for the actual surface activation and as an energy source for further reactions of additional agents with the surface. The additives will be supplied with a modified flame treater and can be non-hazardous chemicals or polymers. We will explore this approach in two directions:

1. to obtain a more durable surface activation and
2. to prepare a surface functionality based on other elements than oxygen.

In particular the latter investigations provide the opportunity to prepare surfaces with a good adhesion to e.g. metals, especially for printing applications.

The studies will be carried out on a R2R film converting machine in order to obtain information which is suitable for having a short way to an industrial application.

The project

Start: Spring 2017

Duration: 1 year

Costs: 6 000 € (min. 8 participants)

Your benefits

- influence on project detail planning (materials, parameters etc.)
- first-hand information about results including a report
- workshop for up to two participants about technology, equipment, and project results
- exchange of experiences
- fast industrialization of the process based on experimental results

esseCI srl.

esseCI srl. is an Italian company which has been working in the field of surface activation of polyolefins and other substrates since 1969. The company is world leader in flame treatment systems for BOPP extrusion lines (up to 10.5 m wide). It operates also in the field of converting material pre-treatment (aseptic packaging, extrusion coating, lamination, printing, adhesive coating), as paper, paperboard, aluminium, steel, PET, Tedlar®, and others.

Fraunhofer IAP

Fraunhofer is Europe's largest applied research organization and maintains 67 institutes all over Germany as well as a number of branches and offices in Europe and worldwide. The Fraunhofer Institute for Applied Polymer Research IAP develops materials, processes and products that are tailored to meet the special requirements of polymer applications. The surface technology group has profound experience in the surface functionalization of polymers for a wide variety of applications using various technologies.