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Research area: Product aims

Paper, paperboard and board // Technical specialty paper

Key words:

Silicone, curtain coater, separating layer, multilayer

TITLE:

Siliconization by means of the multilayer curtain coater

Background/Problem area

A total of 30.5bn m^2 release papers, 50% thereof for labels, were consumed in 2006. The worldwide growth rate amounts to 9.9%, whereas an increase of about 4 to 6% is estimated in Europe.

Silicone coating has been state of the art in release paper production since the 1950s. A thin silicone layer is applied as separating layer on a substrate and then cured or rather cross-linked.

High-quality raw materials and complex production processes are responsible for about 20-30% of the cost of label laminates. Additionally the labels are usually not recycled and are disposable products.

75% of all silicone coatings are created by means of poly addition, where two silicone compounds are cross-linked under the influence of a Pt catalyst. The Pt catalyst is of high chemical activity and prone to inhibition by contamination through amines, phosphoric, sulphuric, or heavy metal compounds. These compounds can be present in the paper, paper coating or in the environment. They can migrate through the substrate to reach the surface, or can be transferred via contact areas between felt and wire sides in the paper roll. For this reason only high-quality paper or films are used as basic substrates. They are intended to provide a sealed surface in order to save silicone, but cannot ensure a chemically inert surface.

Objectives/Research results

Project objective is the simultaneous application of silicone coating together with a chemically inert barrier layer in a single curtain coating step leading to reliable release properties.

Curtain coating technology is the only coating technique capable of applying multiple layers wet-in-wet and in one run on a substrate. The ideal contour coating enables an excellent coverage in spite of low coat weights.

Analysis of the chemical compatibility between silicone coating and barrier layer is required to avoid damage to the silicone coating. This has not been investigated so far. Process-technological compatibility between the two layers is of major importance to ensure good converting properties. The advantage of a barrier layer may result in a significant reduction of the silicone layer including a reduced Pt catalyst consumption. The suitability of different chemicals and compounds for use in the barrier layer and in the curtain coater is to be investigated. Apart from being chemically inert, the liquid barrier layer should have a high hold-out, and its surface should provide enough anchoring points for the silicone.

Besides improving the siliconization result, this will primarily save operating and production costs in the entire value chain.

Suitable silicone coatings and barrier chemicals have been chosen in initial laboratory trials and are now being tested for applicability in the curtain coater. Aspects of chemical compatibility and inertness of the barrier chemistry against the silicone coating are of major importance. Paper sheets have been produced in the laboratory. Tests of various paper properties, e.g. surface properties but also release forces, have been finished and led to selected silicone coating compounds and barrier chemicals. While the barrier layer forms a good curtain on the curtain coater, the silicone does not show curtain formation without surfactants. Especially silicon tensids added to the barrier formulation allowed a simultaneous curtain coating of barrier and silicone release layer. Finally curtain coating on the VESTRA were performed with appropriate mixtures of barrier coating and silicon release layer simultaneously with success.

Application/Economic benefits

Up to now, the curtain coating technology has not yet become established in the field of silicone release papers and siliconization. The project is to help establishing the technique in these production areas.

The envisaged research results are mainly related to the field of materials. Further applications are seen in the fields of chemistry, process engineering and production, but also in the paper-, publishing and printing industries.

Period of time: 01 March 2010 – 29 February 2012

Remarks

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