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Research area: Product aims aims

Paper, paperboard and board // Technical speciality papers

Key words:

overlay, melamine formaldehyde resin, penetration, transparency defects, pressing

TITLE:

Generation of transparent planar material grade cellulose fibre based via penetration with isorefractive fluids

Background / Problem area

The natural material grade paper comes across physical constraints in field of generation planar transparency. The transparency is important in two industrial areas: in flooring and in food packaging sector. In flooring, the product consists of at least 3 components: MDF plate, impregnated décor paper, and impregnated overlay, which will be pressed. The impregnated overlay should both be transparent and protect the décor paper from scratching. The current status is that after the pressing process it comes to defects in transparency, for example, white spots and a hazy optic of the product. To decrease the defects it is necessary to impregnate the fibre network with suitable fluids (transparent, refraction index like fibre, optimal penetration velocity, optimal viscosity and optimal surface tension) where the accurate wetting of the complete paper surface is given. Utilization of the interaction between microscopic wetting processes and product quality offers existing applications for transparent paper to improve and to open up new material grades. The challenge is to exclude air during impregnation and pressing of the paper in order to get a refractive index matching that leads to a complete transparent material. Using a fluid with a refractive index similar to the refractive index of cellulose fibre to impregnate paper will lead only to a transparent product if fluid connects to fibre. The aim of the project is to get better understanding and to control the interaction of fluid with paper as well as with fibre.

Objectives / Research results

The objective of the intended research project is to increase the competitive ability of paper towards synthetic materials in areas where the generation of transparency as a product property, like a surface film for laminate or a packaging material based on cellulose fibre, is an important quality factor. For this reason, the lack of knowledge in the correlation between properties of paper with low grammage and high porosity and transparency defects after impregnation and pressing has to be fulfilled.

A solid technical and scientific understanding of

- wetting process,
- chemical and physical properties of fluid,
- structure of the wetted fibre and fibre network,
- influence of paper production,
- influence of impregnation, and
- influence of further processing (pressing section)

are assumptions for projectable controlling of producing a transparent paper based product.

During impregnation of cellulosic papers with fluids void formation can be reduce through high pore volume and high surface tension of paper. High pore volume can be generated by the use of high drying temperature and surface tension can be increased significantly by the use of Polyethylenglycol (PEG) as a pore former.

Application / Economic benefits

The minimal target benefit of the innovative approaches to control / maximize transparency in cellulose fibre networks is the improvement of today's proceeding for producing overlay. Based on detailed understanding of penetration, pressing and drying processes, the growing overlay production shall be posed on a solid technical scientific fundament. Nowadays, existing problems and limitations should be minimized and the reject rate of the product should be decreased. Knowledge of the possibilities and boundaries for a complete penetration /absorption of fluids into paper are the basis for designing new innovative products in the packaging sector. The resulting transparent packaging foil based on cellulose fibre is a promising long-term alternative towards petrochemical based transparent packaging materials.

Period of time: 01.01.2013 – 31.12.2014

Remarks:

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