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Research area: Product aims

Paper, paperboard and board // corrugated papers and board

Key words:

Corrugated board, flatness, moisture, temperature, model, simulation

TITLE:

Productivity improvement in corrugated board manufacture while simultaneously enhancing flatness

Background/Problem area

Optimisation processes in corrugated board manufacture aim at improving the productivity and the quality of the corrugated board. For a corrugating machine, this means greater quantitative output, but also improved production quality, especially the production of less broke.

For this reasons, a reduction in broke production is the most effective measurement for improving productivity in the manufacture of corrugated board, in particular for already existing corrugating machines. This planned research project focuses on avoiding deviations in flatness (warp).

The approach taken by this research project is the systematic analysis of primary and secondary factors on the deviation in flatness (warp) of corrugated board. Control systems hitherto available in the corrugating machines only prevented flatness deviations (warp) unsatisfactorily. The reason for this was probably that the physical relationships between moisture content and paper properties such as penetration properties, hygroexpansivity/dry shrinkage behaviour and drying kinetics have not yet been sufficiently identified and taken into account. The project builds on the previous state of modelling.

In order to systematically analyse the factors that contribute to warp, it is necessary to identify all essential physical processes that act on the paper plies. Using advanced algorithms, models can then be derived from this information which then calculate on the basis of physical laws both the penetration process (the penetration of starch size into the liner and the layer of fluted paper) as well as the flatness deviations of the entire corrugated board that are due primarily to the influence of moisture and irregularities in drying.

Objectives/Research results

The objective of the research project is to increase the productivity of corrugating machines by simulation-assisted process optimisation of corrugated board production by reducing deviations in flatness. The simulation-assisted optimisation measures are intended to reduce corrugated boards that are not flat and thus bring about a quality improvement of the corrugating machine.

In addition, productivity losses in the downstream converting processes – printing, punching, gluing – are reduced, thus achieving significant productivity gains here as well.

Systematic analysis of corrugating machines and corrugated base paper were done to establish a relationship between the penetration behaviour, moisture and hygroexpansivity/dry shrinkage behaviour. A first model-based calculation was built to reduce the occurrence of deviations in flatness.

In this process, findings could be gleaned about the penetration behaviour of the corrugated board adhesive and its share of water in the paper for corrugated board. In particular, findings concerning the moisture status of the paper for corrugated board and the semi-finished corrugated board products were obtained in the individual process steps from the corrugating machine. These findings were included in different developed simulation models. After a prolongation of the project additional required special data for the simulation calculations are determined and simulation calculations will be done in order to predict the flatness behaviour of the finished corrugated board downstream of the corrugating machine and for any subsequent converting processes.

Application/Economic benefits

The planned research project will make it possible due to the improved flatness of corrugated boards to achieve greater productivity of corrugating machines as well as of subsequent converting processes. This brings with it many significant advantages for manufacturers of corrugated board, i.e.:

- More sales success for folding boxboard manufacturers due to the higher-quality products,
- Decline in the complaints rate,
- Potential cost savings due to improved material and raw materials selection,
- Potential cost savings due to reduced production of broke.

Period of time: 01.08.2012 – 31.10.2014

Remarks

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