

Research Institute:

PTS Heidenau
Pirnaer Str. 37
01809 Heidenau

Head of the research institute:

Prof. Dr. Frank Miletzky

Project leader:

Sabine Pensold

Tel: 03529 / 551-610

Fax: 03529 / 551-889

E-Mail: sabine.pensold@ptspaper.de

Internet: www.ptspaper.de

Research area: Product aims

Paper, paperboard and board // graphic and packaging papers

Key words:

Paper curl, flatness deviation, fibre orientation, stiffness distribution, z-direction profile, TSO/TSI, sheet splitting

TITLE:**Paper curl and flatness deviation due to stiffness and fibre orientation distributions in paper thickness direction****Background/Problem area**

Two sidedness of paper structures is a well-known phenomenon mainly influenced by the sheet forming process. In particular the one-sided dewatering may result in an inhomogeneous structure in paper thickness direction affecting shares of fillers, fines, fibre types, fibre length, formation and fibre orientation within the different fibre network layers. The resulting structure profile leads to different properties of top and down side with regard to surface roughness, fluid penetration behaviour, optical and mechanical properties and especially also to flatness deviations e.g. curl. Quite a number of measures are available to control the two sidedness in the wet end and drying section or during sizing, coating or calendering. Nevertheless problems concerning flatness behaviour occur again and again and are assumed to be significantly influenced by the stiffness and fibre orientation distribution in thickness direction. Unfavourably the measuring devices that are available for paper mills and paper converters are only able to determine an integral value of parameters like stiffness and fibre orientation for the whole paper, thus a detailed analysis of quality profiles in thickness direction is not possible.

Objectives/Research results

The project aims at an improved ability to control the flatness behaviour of paper by means of an optimized stiffness and fibre orientation profile in paper thickness direction. For this purpose a new method involving sheet splitting is to be developed. Sheet splitting using a laminating foil can be easily performed and was already studied in several projects. Therefore the new method can be easily transferred to the paper mill labs later on. By applying an uncomplicated additional procedure the user would be able to determine not only integral values of stiffness and fibre orientation but also the distribution of these parameters in paper thickness direction using a commercial TSO/TSI tester. Based on a set of selected paper grades and samples the correlation of these characteristics to the observed flatness behaviour will be studied and demonstrated intensively also by the use of a finite-element model.

During the project three work packages are to be carried out

- Measuring method development
- Application on systematically selected paper products
- Model based assessment of flatness behaviour

Application/Economic benefits

Paper flatness behaviour and paper curl in particular are important characteristics of the paper product quality. It was confirmed by current literature articles and a survey of the ZELLCHEMING technical sub-committee for online sensor technology that this issue has high significance for manufacturers of graphic and packaging papers but also of some specialty paper grades. Flatness deviations appear when paper is cut into sheets, but also during the subsequent steps of folding, creasing, or die cutting internal stresses may be released and lead to paper curl if maybe fibre orientation and stiffness are not adjusted properly. Processes as printing and copying involve unequal moistening or drying of the top and down side and subsequent dimensional changes. In-depth knowledge on how to adjust two sidedness of paper properly may improve the runnability of paper products in these cases significantly. Thus economic effects are to be expected from better product quality, improved productivity during converting and less production wastage.

Period of time: 01.05.2015 – 31.12.2016

Remarks

The RTD Project INFOR 191 is being funded by the curatorship of research and technique of the pulp and paper industry within VDP e.V. and carried out jointly with the Chair of Paper Technology and Mechanical Process Engineering PMV at TU Darmstadt.