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Research area: Process aims

Paper and paperboard production // Papermaking

Key words:

Flatness deviation, process control, process optimization, structural analytics, waviness

Title:**Avoidance of wavy flatness deviations during paper manufacturing process****Background/Problem area**

Flatness defects are a phenomenon every papermaker is dealing with. Those undesired effects occur, when the surface of a paper web deviates from a mathematical flat area, whereas the appearance of these defects can vary to a great extent. Besides curl, cockling and baggy webs, the specific defect wavy structures is causing problems over the last few decades, but still the main cause of this flatness deviations has not yet been clarified. It is unclear so far if, e.g., fluid mechanic phenomena in the headbox resulting in inhomogeneities in the paper structure cause wavy structures, or if the operational condition of the paper machine is responsible for this problem. Although it is possible to produce faultless paper with the machine-given setup, wavy structures still cause a significant amount of broke due to the fact that the defect is visible at the earliest when the paper web is wind up at the end of the paper machine. In order to get a better understanding of this major defect and its origin, it is necessary to investigate this topic scientifically.

Objectives/Research results

The overall objectives of this research project can be described as follows:

- Introduction of an definition of the flatness deviation wavy structures to be able to classify the defect and separate it from similar looking ones
- Development of machine, material and process parameters, which have a direct influence on the occurrence of wavy structures
- Introduction of a model that allows the production of paper on existing paper machines without the defect of wavy structures

In order to investigate the origin of wavy flatness deformations it is necessary to be able to quantify them. Therefore a novel method to quantify the dimension and appearance of the defect was developed using the raw data gained by a topographical measurement. Besides that an algorithm was introduced, which allows the user to differentiate between faultless and defective paper samples in an objective way. Those techniques are the basis of further investigations, which will help to clarify the root cause of wavy structures. Since the exact position and dimension of the defect are now accessible each pixel can be assigned to the results of different analyzing methods. Highly resolved measurements, e.g., fiber orientation, thickness and area related mass will now be used to execute correlation analysis and identify possible structural differences. In addition profiles over the entire width of a paper machine will be obtained and compared with different types of process data.

Application/Economic benefits

With the aid of the final developed model the manufacturing process in general and the quality of the final paper product can be optimized. Reducing/avoiding the appearance of wavy structures results in the following potential savings:

- Reduction of broke
- Savings in energy and raw materials
- Extra earnings by reducing the downtime of the paper machine
- Reduction of customer complaints
- Decrease of personnel expenses
- Higher availability of the equipment during further processing (e.g., cross and plan cutter)
- Lower storage costs

Period of time: 01.01.2017 – 31.12.2018

Remarks

The RTD project IK-MF 160068 is being funded by German Federal Ministry for Economic Affairs and Energy BMWi