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Measurement and prediction of dewatering characteristics for mechanical pulps using optical fibre analysis

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ISSN 1652-8948, Mid Sweden University Licentiate Thesis 38; ISBN 978-91-86073-45-9

Abstract

On-line measurement of relevant fibre and pulp characteristics is necessary in order to increase productivity and to maintain uniform quality. The drainage properties within the wire and the press section are important factors since they affect the dry content after the press section. The higher the dry content, the less the steam consumption and thus less energy is consumed. In some cases the drier section has a limiting capacity and thus decreased web dryness will reduce the production. The runnability in the paper machine is also affected by the dry content after the press section, because web breaks might occur in the drier section or in the calendar.

The long term aim of this work was to obtain an on-line measurement of dewatering behaviour in paper machines based on optically measured fibre and fines characteristics. However, due to the difficulty in obtaining pulps with sufficient distribution in dewatering properties and the difficulty in varying the pulps characteristics on one single paper machine, a comparative study between four different laboratory dewatering methods were conducted as a first step. Optical measured fibre characteristics were used to attempt to predict the dewatering behaviour of the different laboratory equipments for different mechanical pulps. In addition, a designed experiment was conducted in order to further evaluate the quality of the optical fibre and fines measurement.

The results showed that there are rough correlations between the dewatering equipments; however they rank the pulps differently depending on the wood raw material used and whether the refining conditions are gentle or harsh. The prediction models formulated for the dewatering equipments based on optically measured fibre characteristics showed rather good correlation between the measured versus the calculated values; however, not sufficiently good for use in on-line applications. It was also found that the same measured fines amounts show different dewatering behaviour, depending on the quality of the fines used. The difference in fines quality was, however, not reflected in the optical measurement and it was thus concluded that there is a need for higher resolution of the measurement equipments in order to make it possible to measure the shape and the exact amount of the fines.

The results obtained from this work have provided an increase in both knowledge and understanding and can hopefully be utilized in characterizing paper machine dewatering with on-line measurements of fibre properties in the future.