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**Research area: Process aims**

Paper and paperboard production // Stock preparation

**Key words:**

Recovered paper, stock preparation, system analysis

**Subject:****Development of a system analysis for dirt particle control in paper production from deinked pulps****Background/Problem area**

Papers produced from deinked pulp (DIP) must meet high optical requirements. An important evaluation parameter in this context is the number of dirt specks. In recent years, the dirt speck numbers of DIP-based papers have increased significantly, which is mainly due to the following reasons:

- the steadily growing share of printed papers in the recovered papers used as raw material,
- increases in production capacity lead to treatment plants being operated close to their load limits, i.e. outside the optimum range. This results in an undesired comminution of dirt and ink particles, which renders their removal more difficult.

To counteract these trends, papermakers add more chemicals, put up with larger reject and flotage quantities at various treatment stages or implement complex process solutions, all of which raises the production costs.

PTS offers a system analysis methodology for the evaluation and optimisation of stock preparation plants. It is comprised of several modules focusing on different areas. For deinking analyses taking into account the above mentioned trends, a number of important tools and aids have yet to be developed or refined. This will be done within the framework of the present research project.

**Objective/Research results**

The project aimed at elaborating a systematic, comprehensive and standardised evaluation and optimisation procedure for the deinking performance of recycled pulp treatment plants.

The status-quo of the dirt specks removal was determined in three deinking plants. Based on the system analysis and the resulting evaluations the tools for planning, evaluation, assessment and simulation were gradually developed.

Innovative methods for sample preparation and new tools for the evaluation of the measurement results were developed. For the first time it is possible to measure the absolute loading of dirt speck particles in all pulp and water streams. New as well is the measurement of the loading across the whole size spectrum from 1 – 5000 µm. For the first time small and large dirt speck particles can be evaluated in a summarized way by joint characteristics, and used for process assessment.

For the first time the new method measuring the size distribution of ink particles could be used successfully in all process steps of deinking plants. The analysis method could be applied in undeinked and inked pulps, in flotates and filtrates.

The project data were used to develop and optimise many tools and characteristics for the presentation and evaluation of dirt particle removal by the various process steps. Especially the measurement of absolute ink particle amounts across the whole size spectrum led to a breakthrough in the assessment of ink particle removal and the determination of weak points.

For the first time ever ink particles sized between 1 – 5000 µm were balanced, modelled and used in simulations. The process simulation is now capable of modelling and simulating the different size classes of ink particles. The newly developed tools simulate the effects of changed raw material inputs, of process modifications and of variations in the reject rates of individual plant units or process stages.

The project has resulted in a systematic procedure to evaluate and optimize the dirt speck removal in recycled fibre treatment plants. It includes the following steps: on-site process analysis, analysis of the samples collected, presentation and evaluation of results, balancing of the plant as well as a proposal for the simulation of ink particles and resulting optical properties.

Based on this procedure, highly effective measures may be derived to minimize the dirt speck load and improve optical characteristics such as brightness, taking into account economic factors (yield).

The procedure was used for process analyses of the deinking plants of participating paper mills, and optimisation concepts were derived. Main optimization targets included the process design/circuitry and solids loss reduction, recovered paper use, and chemical additions.

**Application/Economic benefits**

Optimisations by means of the System Analysis Deinking can lead to reductions in raw material and disposal costs and in chemicals consumption. Based on the current averages of these three cost factors, the savings potential amounts to approx. 2,5 – 7,4 € per ton of paper produced. For a five-year period with an average paper production of 310,000 t/a, savings would amount to 3,600,000 – 10,500,000 €. Based on experience, investments for the necessary process modifications and the system analysis itself can be estimated at approx. 500,000 €/5a, which would allow net cost savings of 3,100,000 – 10,000,000 € within five years.

**Project period: 01.02.2005 – 31.12.2007**

**Remarks**

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