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**Research area: Process aims**

Pulp production // Recovered paper treatment

**Key words:**

Cleaner, Hydro Cyclone, Stickies, Minerals

**Title:****Enhancing the efficiency and quality of recovered paper treatment plants by targeted mineral adsorbent use in cleaners****Background/Problem area**

Sticky contaminants introduced by recovered papers continue to be the most disturbing non-paper components in paper-making. Intense research has led to considerable progress in the combat of screenable macrostickies. But paper mills are now focusing more and more on the control of higher fragmented stickies – small macrostickies and microstickies. These stickies are not completely removed during stock preparation and are still present in the final stock.

But there is almost no practicable solution in sight. The very few methods (flotation, washing/thickening, process water cleaning) currently available have considerable drawbacks. Model calculations of targeted stickies modifications through adsorption of mineral (e.g. talc) adsorbents predict a significant increase in stickies density. Density increase is a prerequisite for the efficient removal of stickies in cleaners (hydrocyclones), which makes the cleaner a process stage offering new possibilities for the efficient removal of stickies from recycled fibre suspensions.

In former studies an improved stickies removal in cleaners was reported. But in these trials the work was done at very low stock consistencies (0.5 - 0.7 %) and with small sized cleaners, which had a big particle acceleration. The modified specific weight of the adhesives used in these studies was provided by the adhesive suppliers.

Some fundamental questions must yet be clarified within this project: How to ensure the complete wrapping of stickies in minerals in the stock preparation plants of paper mills? Which are the most important influences? How to measure the wrapping result or density increase? Which removal rates can actually be achieved by the cleaner?

**Objectives/Research results**

The research project aimed at enhancing the efficiency of recovered paper treatment plants and the quality of recycled fibre pulps through the adequate removal of higher fragmented stickies. To achieve these objectives, the removal efficiency of cleaners (hydrocyclones) for stickies should be significantly increased. For this purpose, mineral adsorbents were added to considerably increase their specific weight. Minerals basically suitable for adsorption on stickies were identified together with the technical processes and conditions required for optimum adsorption. The achievable removal rates were studied and quantified in pilot plant trials by comparing the load of the studied stock flows with those of flows containing unmodified stickies. The trials were performed at 1.1 % stock consistency in medium sized heavy weight cleaners.

Basic conditions for selective particle separation in hydro cyclones are sufficient density difference, stock consistency, particle acceleration and particle size. With mechanical adsorption of minerals to the stickies surface and volume a significant increase in specific weight of stickies from 1.0 up to 1.33 g/cm<sup>3</sup> was achieved. Best adsorption results were seen by increased stock consistency, temperature and mixing time. Suitable devices for strong fixing of minerals to the stickies were the pulper and hot disperger in stock preparation.

For significant stickies removal in hydro cyclones a minimum stickies density of 1.20 g/cm<sup>3</sup> was needed within this project. In this way a stickies removal rate between 20 and 90 % was possible. The best results were achieved for stickies with particle sizes from 1,000 to 2,000 µm (measured by INGEDE-method No. 4). The stickies separation rate decreased generally when lowering the particle size. Finely dispersed stickies (microstickies) could not be removed significantly.

Calculations have shown that the total macrostickies removal rate can be increased from 49 to 63 - 67 % in the paper machine loop. In situations with big amounts of stickies the use of an advanced cleaner process is more economical in relation to long time use.

**Application/Economic benefits**

The annual cost of production and quality losses due to stickies amounts to several million € in the German paper industry. A one-hour standstill of a modern newsprint machine costs up to 10,000 €, the resulting turnover losses can quickly run up to more than 4 million € per year in medium-sized paper mills. The solution to be elaborated in this research project can considerably lower these extra costs. In papers produced from virgin fibres, manufacturing costs make up approx. 42% of the selling price. This share is almost twice as high (approx. 83%) in recycled-fibre based papers, which means that process optimisations can produce enormous cost savings in recycled-fibre based papermaking. These optimisations require no further investment in plant technology, which is particularly advantageous to SME.

**Project period: 01.04.2005 - 31.03.2007**

**Remarks**

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