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Research area: Process aims

Paper and paperboard production // Stock preparation

Key words:

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Title:
Development of an efficient, application-oriented description of the complex processes involved in removing contraries during flotation by reference to ink detachment and removal in recycled fibre stock preparation

Background/Problem area

The removal of contraries, in particular printing ink particles in the paper industry, is currently beset by the following problems: growing pollution of the starting substances with contraries, rising requirements on the end product, more stringent requirements of the removal process, continuing cost pressure and increasing complexity of the mechanisms involved in ink detachment and removal.

Contraries must be removed from the desired substances in numerous branches of industry. The flotation process is often suitable for this purpose in view of the size and physical properties of the contraries. Ever greater requirements are being placed on the processes designed to remove these contraries owing to the increasing contamination of the starting substances with contraries and the rising requirements being placed on the end product. Industrial processes in which flotation is used are normally standard procedures with high throughput rates and this in turn brings considerable cost pressure with it. It is possible to influence the costs both when developing the process and by optimising an existing facility. A complete quantitative description of these separation methods makes them accessible to computer-based optimisation, thus making the further development, design and operation of these separation methods more cost-effective. Research work has already made it possible to describe by mathematical means individual physical processes comprised in different separation methods including flotation. These descriptions, however, are unsuitable for the practical optimisation of the separation methods. What is still lacking is a complete, practical description of the separation method based on easily measurable parameters.

Objectives/Research results

The project objective was to develop an efficient, application-oriented description of the separation of contraries from a suspension by reference to the detachment and removal of printing ink in deinking plants at recovered paper processing paper mills. This also opens up to operators the possibility of enhanced control over their plants. The key to this is a practical and quantitative description of all effective mechanisms. The innovative core is to break down the process for separating contraries into three basic physical mechanisms within the scope of the project, thus making the process describable. These basic mechanisms include:

- removal or attachment of contraries to the material to be screened (e.g. fibres),
- comminution or agglomeration of contraries and
- discharge of the detached contraries now floating freely in the suspension.

The interactions of the basic mechanisms with one another and within the entire plant were described with the help of physical modelling. The individual basic mechanisms were described using trial results within the scope of a phenomenological approach. In so doing, the scientists fell back upon existing model approaches on the one hand and, on the other hand, upon the statistical evaluation of available data. The latter was evaluated in such a way that relationships between the contributing factors and the composition of the printing ink particles could be described. In view of the many process steps in the papermaking process, the research project was limited to the process stages of pulping and deinking flotation where the basic mechanisms of detachment, comminution and discharge were studied.

Application/Economic benefits

Manufacturers of the plant technology required for ink removal and the supplier industry (for measurement engineering, additives) can enhance the benefits of their products significantly by utilising the results of research and the descriptions to make the quantitative predictions of the effect of optimisation measures possible. The modelling approaches that are developed can be used by suppliers in the process measuring and control engineering sector to develop software-based optimisations. Putting these principles to work in practice was not part of the present project.

The optimisations that can be achieved in paper mills can contribute to reducing raw material costs, disposal costs and the amounts of chemicals required. Furthermore, more economical operating costs and investment costs are also attainable.

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Remarks

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