Institute of Paper Science and Technology

Technology Transfer Fact Sheet

Froth Flotation Deinking

SAVE UP TO 5% MORE FIBER DURING FLOTATION DEINKING

An innovative flotation deinking process has been developed for improved capital effectiveness and minimized manufacturing impact for the recycling of mixed office waste, old newsprint, old magazine paper, and old corrugated containers. This retrofit process uses a surfactant spray to deliver frothing agent at the top of a flotation unit rather than adding it to the pulp suspension prior to the flotation unit (Figure 1). The result is increased deinking efficiency leading to decreased fiber losses.

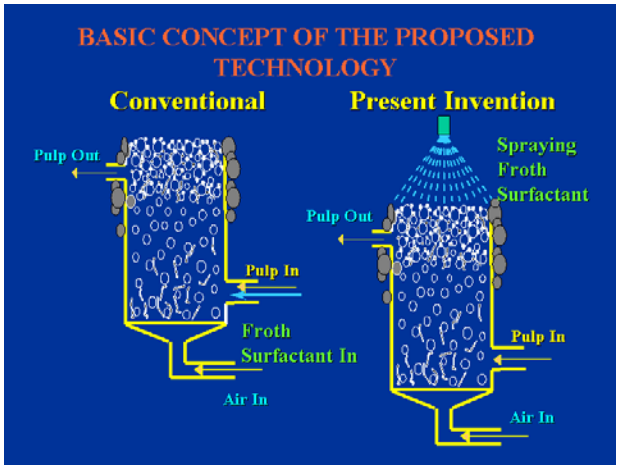

Figure 1. Basic Concept of Froth Flotation Deinking

Background

Flotation deinking has been used in paper recycling since the 1980's to remove contaminants such as waxes, stickies, and inks. Surfactants play three roles in flotation deinking:

1. As a dispersant to separate the ink particles from the fiber surface and prevent the redeposition of separated particles on fibers

2. As a collector to agglomerate small particles to large ones and change the particle surface from hydrophilic to hydrophobic

3. As a frother to generate a foam layer at the top of the flotation cell for ink removal

Normally, the deinking chemicals including dispersant, collector, and frothing agent are added directly to the pulp suspension prior to air flotation. However, this can cause adverse effects, including (a) contamination of fibers by froth, (b) decrease in surface hydrophobicity and removal efficiency of the ink particles, and (c) poorer control of froth stability.

Process Description

Froth flotation deinking is based on use of one simple mechanical device, an atomizer, to spray frother at the top of the flotation column (Figure 1). This allows control of several key process variables – froth consumption, concentration, and distribution; froth structure and stability; and fluid dynamics within the froth. The frother is sprayed to the top layer, not into the bulk pulp suspension, creating a stronger frother concentration gradient in the region of the froth:pulp suspension interface. Therefore, the contamination of the fibers by frother can be avoided and the hydrophobicity of the ink particles is not affected – leading to increased ink removal efficiency.

Benefits

Based on fundamental laboratory work and scaled-up pilot investigations, the following results have been confirmed:

- Increased deinking efficiency
  - Higher recycle fiber quality with brightness gain of 10% (or about 1 brightness unit)
  - Improved paper machine runnability
- Reduced air flotation fiber losses by up to 50% (relative), compared with conventional technology (Figure 2)
- Higher capital effectiveness
- Minimized environmental impact through reduced water and deinking chemical use

Applications

In general, the technique can be used to enhance air flotation deinking of any waste papers. For small and highly charged ink particles, a combination of this technique with chemicals may be applied. Current non-pressurized flotation cells can be retrofit for this application.

This retrofit technology utilizes a simple mechanical atomizer to deliver the froth to the top of the air flotation unit. Feedback control could be used to minimize froth usage and optimize the process. Individual atomizers can be placed on each of several cells in series to allow overall system optimization.

Fiber Loss Versus Ink Removal for Different Flotation Methods

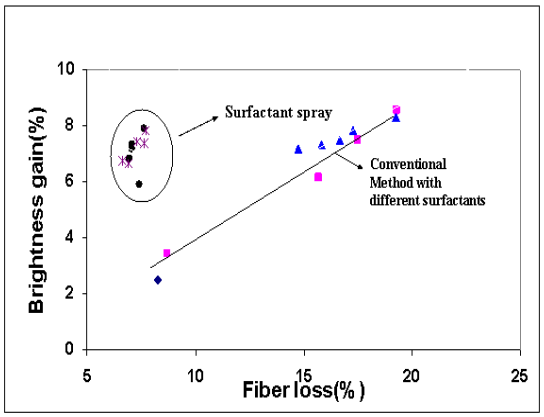

Figure 2. Floth Air Flotation – Brightness Gain (Ink Removal) Versus Fiber Loss

Patents

U. S. Patent 5,876,558, "Froth Flotation Deinking Process for Paper Recycling", issued to Deng, Y., and Zhu, J. Y., Dec. 17, 1997.

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