

PALM-BASED PRODUCTS IN DEINKING OF WASTE PAPERS

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INTRODUCTION

Recycling of paper has been increasingly important primarily due to a number of factors such as (i) diminishing wood supply coupled with social concerns over deforestation (ii) environmental pollution, and (iii) greater global demand for paper.

Basically, method for recycling waste paper can be classified into two types (1) to reuse waste paper after pulping them by a machine called pulper and (2) to reuse waste paper after pulping followed by removal of printing inks, a treatment specifically called 'deinking'. The process of 'deinking' often involves a number of steps to produce a clean pulp from waste paper through removal of printing inks and contaminants from the fibre substrate. A wide variety of chemical additives is used in the deinking process and this includes surfactants or deinking agents. The type of chemicals or process used depends very much on the type of ink, contaminants and papers to be processed.

USES OF RECYCLED PAPER

About 80% of all waste paper comes from three main sources, *i.e.* newspapers, corrugated boxes and office papers. Most of the deinked paper is used in paper boards, chipboard and roofing materials where colour is not important. However, the waste papers which are deinked and used in newsprint, tissue or other bright grades are less than 20%.

DEINKING PROCESSES

Generally, there are two basic methods currently in use for deinking newspaper, *viz.*

- (i) flotation and (ii) washing



Deinking of waste papers.

In the flotation method, the first step is pulping where deinking agents are usually added. The function of the deinking agent is to assist the mechanical separation of printing inks from cellulose. The next step is flotation where the ink particles separated from cellulose is adsorbed on air bubbles to facilitate their removal from the system constantly. For effective adsorption on an air bubble, the ink particles must grow into homogeneous aggregates of 10–30 μm in diameter before contacting with air bubbles. Therefore, the main function of deinking agent is to ensure complete separation of ink from printed waste paper in the pulping step and ink aggregation in the flotation step. *Figure 1* shows the schematic drawing of the flotation method. In the washing method, the pulp slurry is diluted with excess water which is then subjected to repeated filtration and dewatering to remove ink particles from the system.

Nowadays, flotation method is more commonly practised because of the advantages such as a higher pulp yield, less waste water treating load, less use of water, less installation area and less total reagent cost. The flotation method is commonly practised in Europe, Asia and in North America.

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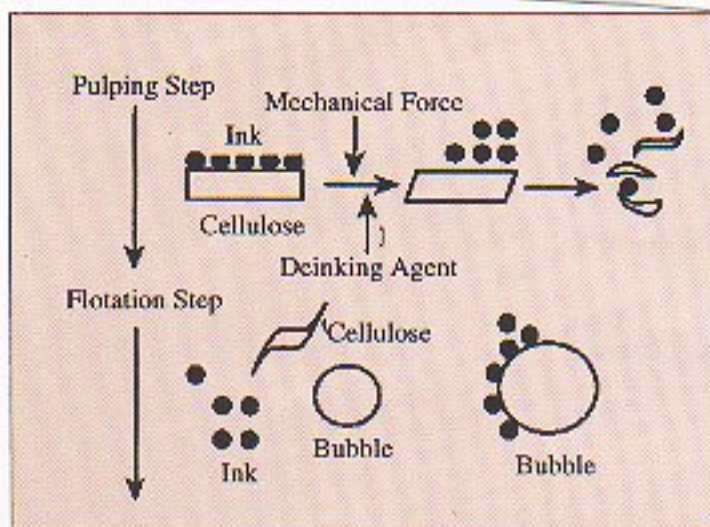


Figure 1. Schematic drawing of flotation.

The most important characteristics of deinked pulp are paper brightness and the number of ink specks on a sheet surface. Paper mechanical properties such as tear strength also need to be determined in order to minimise the adverse effects of the recycling processes on the properties of the deinked paper.

DEINKING STUDIES OF NEWSPAPERS PRINTED WITH PALM OIL-BASED AND PETROLEUM-BASED INKS

Some preliminary deinking studies were carried out on paper printed with palm oil-based inks and compared with those from mineral oil-based inks since the deinking chemistry of these two types of inks may be different. A simulated laboratory flotation cell was used for all the deinking studies. Several palm-based surfactants were used for the studies and these included palm-based alpha-SME, palm-based soap, fatty alcohol ethoxylates of different ethylene oxide mole ratio, sodium lauryl sulphate, sodium lauryl ether sulphate and linear alkyl benzene sulphonate (LAS). The brightness of deinked newspaper was measured thereafter. From Table 1 it was revealed that several palm-based surfactants are not only effective in deinking the newspaper printed with petroleum-based ink but also those printed with palm-based ink to achieve

TABLE 1. PERFORMANCE OF VARIOUS DEINKING AGENTS

DEINKING AGENT	Brightness, %	
	Newspaper printed with palm oil-based ink	Newspaper printed with mineral oil-based ink
Control (No deinking agent used)	42.2	42.2
α -sulphonated methyl ester (palm stearin based)	43.8	43.5
Fatty acid	47.6	46.5
Fatty alcohol ethoxylate $C_{12} - C_{18}$, EO : 2 mol	47.3	46.3
Fatty alcohol ethoxylate $C_{12} - C_{18}$, EO : 3 mol	47.4	45.3
Fatty alcohol ethoxylate $C_{12} - C_{18}$, EO : 5 mol	48.2	45.8
Linear alkyl benzene sulphate	44.8	47.1
*Sodium lauryl sulphate $C_{12} - C_{15}$	43.0	43.1
*Sodium lauryl ether sulphate $C_{12} - C_{15}$	42.5	42.7

* A lot of paper, ink did not float well.

satisfactory brightness of deinked paper. It seems that generally palm-based soap was found more efficient in removing ink from paper printed with palm-based ink. However, in a number of cases, the deinked paper of palm oil-based ink was slightly greenish when only fatty alcohol ethoxylate (FAE) was used as the deinking agent even though high brightness was obtained.

CONCLUSION

The laboratory studies revealed that several palm-based surfactants could be used to deink paper printed with both palm oil-based ink and mineral oil-based ink in order to achieve satisfactory brightness of the deinked paper. However, pilot plant studies in using these palm-based surfactants as deinking agents for paper recycling are necessary for feasibility evaluation.

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