CHAPTER 6
SUMMARY AND CONCLUSION

The present investigation as detailed in the previous chapters definitely meets its primary objectives. The objectives were analyzed in each chapter in the following way. The results were briefly discussed.

Chapter I. Introduction, deals with the need for recycling waste paper, the history of de-inking, present day status and problems of de-inking and an overlook of the main objectives with the program followed for present study.

Chapter II. Comparison of flotation cells deals different types of flotation cells, their ink removal efficiency and fiber carry over loss. Three types of flotation cells were employed in the study, they are single chamber cell, double chamber cell without bristles, and double chamber cell with bristle lined inner walls. Among these the double chamber with bristles was found to have better ink removal efficiency and less fiber carry over loss.

In addition to this, de-inked pulp evaluation was also done. For this physical properties of the pulp such as tensile, tear, burst, freeness and ash content etc. of the de-inked pulp were analysed. Optical properties like brightness, opacity, light scattering coefficient and light absorption coefficient etc. were also analysed. The pulp evaluation results of two blends of ONP/OMG in the ratio 70:30 and 80:20 were compared. It was found that the laboratory de-inked pulp from the present study had comparable properties and that a 10% OMG difference in the furnish did not affect the strength and optical properties appreciably.
The role played by sodium hydroxide, DTPA, sodium silicate, hydrogen peroxide and surfactants were described under the title "The role of different chemicals in de-inking" in chapter III. The de-inking response of newsprint and magazine furnish, pulping conditions and floatation were evaluated and presented in this chapter. The importance of these chemicals in de-inking was established. Sodium alginate was found to be a suitable replacement for sodium silicate. The evaluation of the effectiveness of commercially available surfactants in de-inking by flotation were compared. Screening of materials having surfactant properties, lead to the extraction of three plant products. Their de-inking properties were evaluated and compared with each other and also with commercially available surfactants. One of them was found to have better de-inking capability.

Bleaching of the de-inked pulp for higher brightness pulp grades is discussed in Chapter IV, Bleaching of the de-inked pulp. A comparative study of the oxidative and reductive bleaching was discussed. Bleaching by hydrogen peroxide, sodium hydrosulphite, sodium bisulphite and FAS was dealt with. The effect of bleaching on brightness of de-inked pulp was estimated.

Chapter V, Environmental effects of de-inking, is an attempt to generate data regarding the major environmental effects of de-inking operations. The solid and liquid effluents were analyzed and their components were identified and estimated. Analysis of the laboratory de-inked sludge, and its ash were also done. The heating value of the sludge was
estimated. X-ray diffraction data of the de-inked ash was generated to identify the mineral components. A discussion on environmental impacts of de-inking was made. The possibility of recovering the clay component as a paper filling material was also discussed.

**CONCLUSION**

- The present investigation has helped to gain a fundamental understanding of what is occurring in de-inking process.
- De-inking process requires careful balancing of physical and chemical conditions to produce the most effective ink removal and brightening of the de-inked fiber.
- Production of good quality de-inked pulp can be achieved by flotation de-inking.
- Under optimized conditions around 60% brightness could be obtained by flotation de-inking and a further gain of nearly 4 to 5% by an additional bleaching stage.
- The total rejects could be limited to around 5% under the experimental conditions.
- Sodium alginate and surfactants isolated from natural products could make the process environmentally favourable.
in India this figure is much low. Technical challenges involved in greater and better utilisation of waste paper is improving the quality of these fibers to the same level as that of virgin fibers. The difficulties for countries like India will be that they will be forced to deal with an ever-decreasing quality of waste paper in the future. Therefore, in view of future raw material shortage and environmental legislation to maintain ecological balance, there is an immediate need to develop a de-inking technology which could ensure uninterrupted supply of de-inked waste paper pulp suitable for making all type of light coloured paper grades including writing and printing papers. I believe that this study is one step forward in that direction. The major companies involved in paper making, in both public and private sector, may turn some of their profits to research in this field.