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Neural network modelling and prediction of the flotation deinking behaviour of industrial paper recycling processes

SUMMARY

The removal of ink from recovered papers by flotation deinking is considered to be the "heart" of the paper recycling process. Attempts to model the deinking flotation process from first principles has resulted in complex and not readily usable models. Artificial neural networks are adept at modelling complex and poorly understood phenomena. Based on data generated in a laboratory, artificial neural network models were developed for the flotation deinking process. Representative samples of recycled newsprint, magazines and fine papers were pulped and deinked by flotation in the laboratory, under a wide variety of practical conditions. The brightness, residual ink concentration and the yield were measured and used to train artificial neural networks. Regressions of approximately 0.95, 0.85 and 0.79 respectively were obtained. These models were validated using actual plant data from three different deinking plants manufacturing seven different grades of recycled pulp. It was found that the brightness and residual ink concentration could be predicted with correlations in excess of 0.9. Lower correlations of ca. 0.43 were obtained for the flotation yield. It is intended to use the data to develop predictive models to facilitate the management and optimization of commercial flotation deinking processes with respect to recycled paper inputs and process conditions.