INVESTIGATIONS ON POLLUTION PREVENTING INKS

by

Chandrakant S. Sarkar

Department of Chemical Engineering

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Dedicated to

My Parents

CERTIFICATE

This is to certify that the thesis entitled "**Investigations on Pollution Preventing Inks**", presented by **Mr. Chandrakant S. Sarkar,** is worthy of consideration for the award of the Doctor of Philosophy and is a record of the original and bona fide research work carried out by him under my guidance and supervision and that the results contained in it have not been submitted in part or in full to any other University or Institute for award of any degree or diploma.

(Ashok N. Bhaskarwar)
Associate Professor
Department of Chemical Engineering
Indian Institute of Technology, Delhi

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(Chandrakant S. Sarkar)

Abstract

Printing presses use aliphatic and aromatic solvents for cleaning various surfaces, which are coated with the ink. The conventional printing inks also contain volatile solvents. During printing and cleaning operations, volatile organic compounds (VOCs) present in the inks and cleaning solvents are lost to the atmosphere by evaporation and these losses are quantifiable and alarmingly high. A new type of ink based on castor oil, which completely eliminates emissions of VOCs, has been developed. Synthesis of resins and the kinetics of washing of the ink, similar to the recently announced pollution-preventing ink (Pennaz, 1994_b), with water at a slightly elevated pH are studied. A correlation between the mass-transfer coefficient, characterizing the washing of ink, and the experimental process variables (Bhaskarwar and Cussler, 1997) is examined. New data are also reported on flake-formation dynamics. A new empirical correlation between the mass-transfer coefficient and the process variables is sought based on the experimental data on washing of ink on a prototype roller drum. This correlation may be useful in deciding the optimum resin concentration in ink, the pH of wash solution, and speed of roller drum during cleaning of the presses. The mass-transfer coefficients obtained on the roller drum are very large as compared to those on a revolving watch glass in the low-shear experiments reported earlier (Bhaskarwar and Cussler, 1997; Nair and Bhaskarwar, 2000). The experimental data moderately support the theoretical expression for washing of inks under excess-base conditions. The washing of these inks under excess-resin conditions, however, appears to be only slightly dependent on the theoretically anticipated combination of process variables and instead seems to have an appreciable contribution of hydrodynamic factors. Printability of the new ink was tested on an actual off-set printer and found to be excellent.

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