ABSTRACT

Pulping of non-wood raw materials available in abundance by Kraft, soda and chemi-thermo-mechanical processes produces good quality pulp in short processing time. As these process involve less chemical doses hence the present research work was designed for the chemical recovery from the black liquors to make the waste environment friendly.

In the first step of the chemical recovery of the effluents, series of experiments were conducted to determine behavior and chemistry of this straw based black liquors. Chemical composition of the chemi-thermo-mechanical pulping black liquor was determined by fractional and composite sample analysis which showed extensively low dry solids and physical and chemical properties of the black liquor tend to vary with organic to inorganic ratio of the solid contents.

In the second step of the chemical recovery, desilication of the black and green liquors obtained from the chemi-thermo-mechanical pulping was conducted through the pH reduction by carbonation (80%) and sulphuric acid (85%). The green liquor sludge was found to be extremely high in COD, BOD with high reduction value. Sodium (95%) and sulphur (97%) were recovered from the sludge on dilution and addition of coagulating polymers.

Second part of this thesis discusses treatment of the black liquor by chemical and/or microbiological means. In the chemical treatment process some flocculating and coagulating chemicals were employed. Addition of 200ppm alum, Buflok polymer 5425 (Buckmans) and setting of two hours yielded 82% COD reduction and solids in the range of 292ppm. Increase of alum to 1,000ppm and polymer dose of only 1ppm yielded similar results. The treatment of black liquor with hydrogen peroxide, ferric chloride, polyaluminium chloride (PAC), other flocculating polymers like HMW 110, HMW 130 by GEBetz and 8086 by BALCO gave no appreciable results.

Activated sludge treatment was then employed to reduce the BOD of the black liquors in a series of experiments and the sludge yielded 50-60% reduction in COD, 60-65% reduction in BOD, 80-90% reduction in suspended solids and 58-60% reduction in total solid contents. Isolation and characterization of the micro-organisms from the activated sludge was also carried out. Results showed that the degradation activity of the activated sludge was high after 12 hours and was at peak after 24 hours of aeration because enzyme activity was maximum at this stage. Finally a combination of activated sludge and chemical treatment was designed which produced reducation of 90-95% in COD, 90-95% in BOD. Suspended solids and dissolved solids were within the National Environment Quality Standard (NEQ's) limits.