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Treatment and Chemical Recovery of
Embilipitiya Black Liquor by Electrodialysis

by

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ABSTRACT

A new type of electro dialyzer unit, proposed and experimented in this work, has been step-wise modified from the conventional electro dialyser, after conducting a series of experiments to minimize the problems associated with the conventional unit and hence successfully fractionate the Embilipitiya black liquor into NaOH, lignin and organic acids. Lignin deposition on, and the consequent damage to, the anode-side cellophane membrane that are generally associated with black liquor electro dialysis have been eliminated in the proposed unit. Pitting of the anode has been greatly minimized.

Investigations on the influence of operating parameters on the proposed modified unit have been studied. Also, bubbling of liquor in the anode compartment has completely been eliminated by manual control of the anode liquor temperature. Mathematical models that relate the anode-temperature to the current passing through the electro dialyser have been developed by conducting system identification experiments and using numerication optimization techniques.

Even with the use of an ordinary membrane, such as cellophane, the proposed unit yields NaOH solutions of about 0.1 N strength, which has a good market value. Lignin, which has a very high fuel value can be isolated from the end products by simple filtration. Most importantly the polluting black liquor, upon electro dialysis followed by filtration, yields a colourless liquor with a pH of 6 and a TDS of 0.2 g/l, which as far as the pH and the TDS are concerned could be discharged on land for irrigation purposes as per the environmental standards of Sri Lanka.

Key words: black liquor, electro dialysis, membrane, cellophane, straw, pulp, paper, pollutant, environment, sodium hydroxide, lignin.