USE OF CATION EXCHANGE MEMBRANE IN THE ELECTRIDIALYSIS TREATMENT OF BLACK LIQUOR

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The liquid effluent from the Embillipitiya pulp mill, known as black liquor, is an extremely complex substance containing chemicals such as residual sodium hydroxide, sodium carbonate, sodium silicate, sodium lignite, phenolic compounds, and some organic acids. Its black color is due to the presence of lignate ions which are almost impossible to decompose by biodegradation. A continuous release of black liquor into a water body has the potential to kill all the aquatic life in the water body and eventually turn it into a dead one.

Black liquor has successfully been converted into a colorless liquor in an electrodialysis unit used to fractionate Embillipitiya black liquor into sodium hydroxide, lignin and organic acids cellophane was used as the anode and cathode side membranes in this electrodialyser.

As a further improvement to the system, the cathode-side cellophane membrane was replaced by a cation exchange membrane, and the performances by the two membranes was compared. The system with the cation exchange membrane yielded a considerably higher rate of separation than the cellophane one. It gained almost half of energy that used for the same separation in the system with cellophane.

When operating beyond limiting current densities, unlike cellophane membranes, the cation exchange membrane encourages the water splitting phenomenon. The side effects of water splitting, such as high-energy consumption and damage to membranes, were identified and quantified. Methods to minimize these effects were tested, and were found to be successful. For inctance using dilute NaOH solution, instead of distilled water in the cathode chamber, reduce water splitting.

Beside these, the durability of the membranes was also studied and the methods to preserve the membrane for the subsequent runs were also examined. After using the membrane, it was found out to store in 0.1M NaOH solution.