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## Lakehead University Research Chair in Membrane Biotechnology

Chemical Engineering

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### **Research relevance (importance of the research and how it will benefit Canadians)**

The proposed study focuses on the development of the next generation of treatment technologies for pulp and paper mill wastewater and sludge treatment for energy recovery. Highly qualified personnel will be trained in areas that are important to Canada.

### **Key Words Describing Areas of Research**

Environmental biotechnology, membrane bioreactors, wastewater treatment, particle science and technology, colloidal and surface chemistry, separations.

### **Membrane Biotechnology for Biorefinery of Pulp and Paper Wastes for Energy Recovery**

Organic constituents in pulp and paper wastewaters are usually considered as waste and need the input of a significant amount of energy (aeration) for aerobic biological treatment. However, the organic constituents in wastewaters have potential energy that can be recovered. Instead of being energy sinks, wastewater treatment plants should be resource recovery centres. New treatment processes are required to maximize the recovery of renewable energy from the organic constituents in wastewaters.

The long-term goal of this study is to develop the next generation of technologies for energy recovery from pulp and paper wastewaters and sludge. More specifically, submerged anaerobic membrane bioreactor (SAnMBR) technology, which is a combination of membrane separation and conventional anaerobic digestion technology, will be developed for energy recovery, subsequent reuse of treated effluent, and ultimately system closure.

The feasibility of SAnMBR technology for the treatment of various wastewater streams and sludge will be tested. Optimal conditions for maximum energy recovery will be

obtained through process optimization. Economic analysis of this technology will be conducted. More importantly, membrane fouling characterization and control will be a main focus of this study. A better understanding of the nature of the foulants and the strategies for membrane fouling control is crucial for the application of the SAnMBR technology for energy recovery from pulp and paper wastewaters and sludge treatments.