

# EVALUATION OF INDUSTRIAL BLACK LIQUOR EVAPORATION USING A NEW SAMPLING TECHNIQUE



## Background

For a chemical pulp mill, the black liquor evaporation plant is the largest energy consumer at the mill. In pulp mills, fouling (unwanted deposits that disturb the process) can be a significant problem in the black liquor evaporation plant. Fouling will reduce the energy efficiency, decrease evaporation capacity and can also result in production loss or shutdowns of the whole pulp mill. In the black liquor evaporators, the fouling mainly consists of crystallized sodium carbonate and sodium sulphate (called sodium salt scaling) and knowledge on how to control this crystallization is very valuable.

Due to a strong need to improve the operation of the black liquor evaporators, research about sodium salt scaling has been carried out for a long time which has improved the fundamental understanding. However, little of this knowledge has been implemented in industry to improve the situation. **Chalmers, Valmet, Södra** and **Stora Enso** are therefore working together in a project to implement available knowledge and develop new strategies to decrease the problem with scaling in industry. The work is conducted in close collaboration with a few Swedish mills, for

example **Södra Cell Värö** and **Stora Enso Skoghall**, to test the strategies in full scale.

One of the most important reasons for the slow implementation of the new knowledge about scaling is that the monitoring of the crystallization process is difficult, and there is therefore a lack of information about what is happening in the evaporators. In this master's thesis proposal, you will be a part of the work to improve the understanding of the crystallization process in full scale by using a new sampling equipment. The results will then be used to develop new operational strategies for the mill. There is also a sensor manufacturer, **Acosense**, involved in the project and they will use the results to further develop their sensor technology. The work will also be conducted in cooperation with **University of Toronto** which will do similar sampling and evaluation in North America.

**Objective:**

In this thesis project you will use a new sampling equipment, where the objective is to improve the understanding of the crystallization of sodium carbonate and sodium sulphate in industrial black liquor evaporators and help to develop new operational strategies to decrease the problem with scaling.

**Methodology:**

The work mainly consists of 4 parts:

- 1) Literature review and planning/preparation of sampling series.
- 2) In cooperation with mill personnel conduct sampling and lab analyses at 1-2 Swedish mills.
- 3) Data analysis and interpretation of the results to suggest more efficient operational strategies.
- 4) Reporting and presentation of the results.

**Prerequisites:**

The master's thesis project should be performed by two students working together.

The applicants should preferably have a background in Chemical engineering or Chemical Engineering with Physics. To be able to communicate with the mill personnel, good knowledge of Swedish is required.

**Project start:**

January 2019 or according to agreement.

**Examiner:**

Hans Theliander

**Supervisors:**

Erik Karlsson, Chemical Engineering  
Mathias Gourdon, Valmet

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