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**Research area: General aims**

Resource saving // Others

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**Key words:**

Recovery of minerals, efficient use of raw material, deinking sludge, reject up-grading

**Title:****Selective Recovery of Calcium Carbonate in paper making effluents (SERECARB)****Background/Problem area**

In the current situation, the paper industry is confronted with huge amounts of sludge, millions of tonnes world wide, which has to be eliminated, one way or one other. The sludge contains a high amount of water, up to 40% and a fair proportion of minerals, round two thirds of dry content, half of it being calcium carbonate. In many cases, this sludge is dumped or land-filled for soil improvement, but this solution is costly (estimated cost in Western Europe: Euro million 28) and limited by legal restrictions. Other solutions, aiming at partial or total recovery of minerals or conversion to valuable products, require transportation of sludge over long distances and complex thermal or chemical treatments. In thermal treatments, energy may be gained by oxidation of organic material in sludge, but an important share is lost in drying the substance prior to incineration.

Main sources of sludge are deinking mills and mills using calcium carbonate as filler. Deinking mills must on the one hand eliminate sludge containing high amounts of calcium carbonate and on the other hand purchase pure calcium carbonate as filler for paper production. The highest quality and most expansive grade on the market is precipitated calcium carbonate (PCC).

A selective recovery of calcium carbonate and conversion to PCC permitting on-site reuse would have several advantages:

- To reduce the amount of sludge to transport and dispose of,
- To save purchasing fresh carbonate and avoid corresponding expenditure and transport,
- To up-grade carbonate present in sludge to high value-added PCC

**Objectives/Research results**

The concept of the project is based on the following chemical reaction:  $\text{CaCO}_3 + \text{H}_2\text{O} + \text{CO}_2 \rightleftharpoons \text{Ca}(\text{HCO}_3)_2$

Calcium carbonate  $\text{CaCO}_3$  which is water insoluble, reacts with carbon dioxide to yield calcium hydrogen carbonate  $\text{Ca}(\text{HCO}_3)_2$  which is soluble. The reaction is reversible, which means that a solution of calcium hydrogen carbonate can be "stripped": carbon dioxide is then eliminated and calcium carbonate precipitates. The end product, precipitated calcium carbonate, or PCC, is a valuable inorganic pigment already used by the paper industry.

The project aims at:

- Demonstrating the technical feasibility a new low temperature process for selective recovery of calcium carbonate in deinking sludge or primary sludge of paper mills using this filler – The aimed end-product is high value-added precipitated calcium carbonate, PCC,
- Assessing process conditions controlling the end-product quality – The PCC can either be used on site or sold,
- Assessing the paper making potential on-site of the produced PCC,
- Assessing the economical interest and environmental benefit by Life Cycle Analysis, technico-economic and market surveys

At the moment of writing of this report the trials are still ongoing and the evaluation was not yet completed.

**Application/Economic benefits**

The paper industry is globally confronted with huge amounts of deinking sludge, one third of it being calcium carbonate:

- worldwide about 25 million tonnes and in Europe, about 8 million tonnes
- in Austria, about 400.000 tonnes / in Germany, about 1.200.000 tonnes / in the Netherlands, about 230.000 tonnes

Based on the tonnages of sludge exposed above, the potential production of PCC is:

- worldwide about 8 million tonnes and in Europe, about 2.7 million tonnes
- in Austria, about 130.000 tonnes / in Germany, about 400.000 tonnes / in the Netherlands, about 76.000 tonnes

The total production of graphic papers through is 50 million tonnes. All mills involved are confronted with the problem of elimination of sludge containing calcium carbonate.

The process will allow conversion of any quality of calcium carbonate in sludge to high value added PCC, i.e. a significant up-grading of a material which has been purchased and would have been dumped.

**Project period: 01.02.2008 – 31.01.2010**

**Remarks**

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