knowledge base

Lab Project at **RWZI Garmerwolde**

Assessment of sludge thickening and dewatering performance using CIWI-Fe, compared with $FeCl_{2.5}$, to evaluate dry solids improvement, phosphate concentrations in the released water.

CIWI

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Lab project at **RWZI Garmerwolde**

Objective

Assessment of sludge thickening and dewatering performance using CIWI-Fe, compared with $FeCl_{2.5,}$ to evaluate dry solids improvement, phosphate concentrations in the released water, and whether similar results can be achieved with a lower chlorine content in the sludge.

Plant Overview

RWZI Garmerwolde is one of the largest municipal wastewater treatment plants in the north of the Netherlands, serving approximately 350,000 people. The plant treats around 30,000 m^3/day on average, with substantially higher hydraulic capacity during peak wet-weather conditions. The treatment train consists of pre-treatment followed by parallel biological treatment in the existing activated sludge plant and Nereda reactors.

Garmerwolde also has a central sludge-processing facility, i.e. dewatering location increasing the dry solid content (ds%) from ca. 3 to 18 - 25%. Iron-chloride (in this case $FeCl_{2.5}$) and polymers are extensively used for this process. The water released during dewatering is subsequently processed in a SHARON-reactor, for biological N-removal. As this process requires alkaline conditions, NaOH is used to increase the pH.

Sampling notes & limitations

Sludge from RWZI Garmerwolde was used in lab-scale dewatering tests. The objective was to compare CIWI-Fe with $FeCl_{2.5}$ under fixed conditions, using a constant polymer dose and a controlled mixing and centrifugation procedure.

The tests were performed at lab scale aiming to represent full-scale plant operation. Process conditions in the CIWI lab system, including pH and salt matrix, were fixed during product generation, and the polymer dose was kept constant during sludge treatment. In this lab setup, HCl was added externally to condition the CIWI-Fe to facilitate sludge dewatering and phosphate binding. In a full implementation, this acidification step would be integrated in the CIWI process itself rather than by separate HCl addition. In addition to the dry solids content, phosphate concentration in the released water and visual flock characteristics were assessed to compare product performance.

Custom-made dosing for sludge thickening

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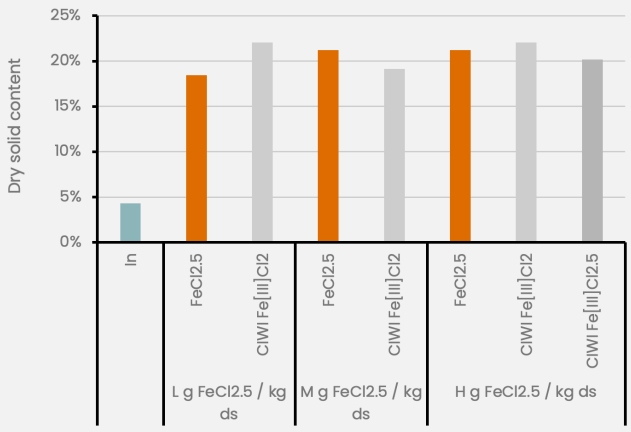
The **Procedure**

A fixed process condition was selected for CIWI's lab system; pH and salt matrix were fixed, and the formed product was tested for Fe content using HACH cuvette kits (LCK 321). The product was conditioned by external HCl addition to provide the desired H+/Fe-ratio. CIWI-Fe or $FeCl_{2.5}$ was dosed, together with a fixed amount of polymer, to sludge from RWZI Garmerwolde in a shaking setup intended to mimic mixing conditions in the existing process. After mixing, the sludge was dewatered using a centrifuge. The resulting sludge cake was then dried in an oven to determine dry solids content, while the water released by the centrifuge was analysed for phosphate concentration.

The **Result**

Results showed that CIWI-Fe achieved sludge thickening and dewatering performance comparable to $FeCl_{2.5}$. Dry solids content, determined on the dewatered sludge cake after oven drying, increased from approximately 4% in the influent sludge to 18–23% after polymer addition, coagulant dosing, and centrifugation. Although visual differences in flock size were observed during mixing, the final dry solids results were similar for both products. In addition, phosphate concentrations in the released water were slightly lower for CIWI-Fe, indicating no negative impact on phosphate release during sludge processing.

Data Dry solid content



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