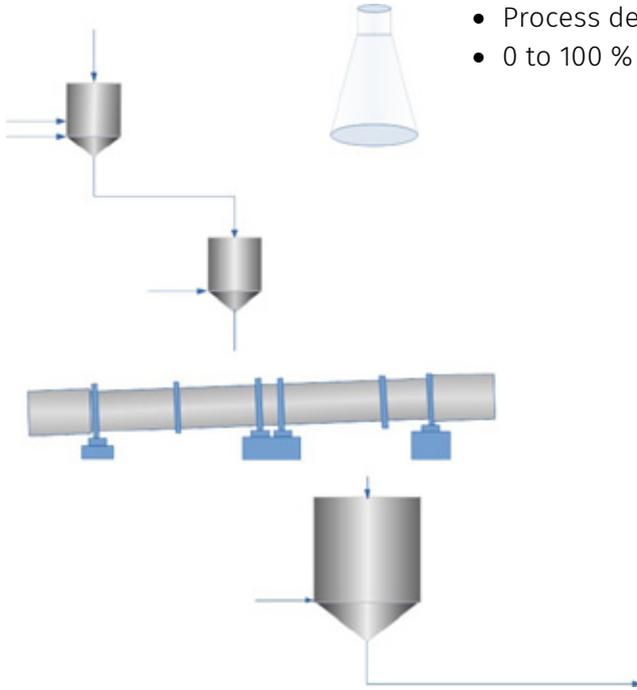


## RENOTECH PROCESS CHEMISTRY SOLUTIONS



- Process development and problem solving for the need of the client
- 0 to 100 % Circular Raw Materials

## RENOTECH PROCESS CHEMISTRY RESEARCH, DEVELOPMENT AND PRODUCT DEVELOPMENT

Renotech has made research, development and product development in the field of process chemistry for decades, having roots in cement industry and its side streams. Some of the staff has made research on metal ion equilibria and balances in kraft pulp mills, and on recovery and recycling of chelating agents from process solutions, as well as on characterization of kraft pulp as ion exchanger, its ion exchange reaction stoichiometry, solubilities and solubility products of chelating agents in the 1990's, and thereafter in continued with hydrometallurgical process development and development of several testing and analysis methods.

## WE OFFER

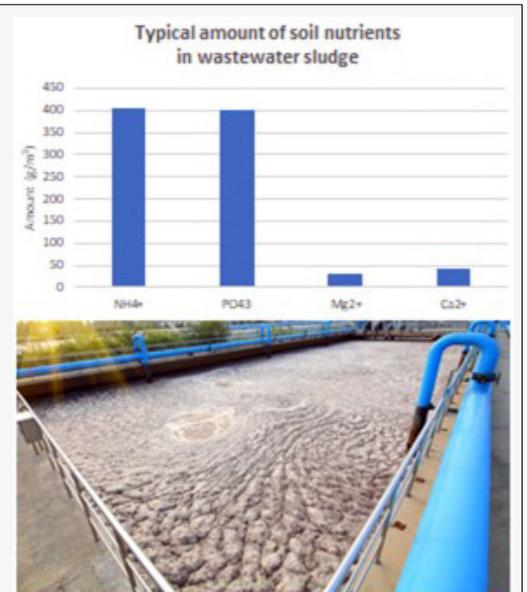
### 1) Process concepts

We have made development for a raw material change in a chemical plant (magnesium chemical processing). The process is used successfully in full-scale production. We have also made development for a new product in that plant. It has been used in successfully in some full-scale runs, and the production start of the new production line in Autumn 2020 is another notable achievement of the Renotech co-operation with an industrial partner. We can start making process concepts on paper, make calculations/modelling and continue with experiments in our laboratory. We can also find companies for a production chain, e.g. in circular economy production.

### Process Chemistry Services

Nutrients Recovery within a circular economy N, P, Mg, Ca are recovered from wastewater and other waste sources by crystallization into struvite. This can be used as slow-release fertilizers; bi-ammonium sulfate crystals and phosphorous rich solids are other products which aid soil nourishment that can be produced. Renotech participated in the R3 Water project sponsored by EU. The project focused on 3 'R's, Resource efficient treatment in wastewater treatment; saving and Reuse of water and increased Recovery of substances from wastewater.

*We have the professional competence and experience required to design and manage a sustainable materials. recovery plan from any kind of waste.*



## 2) Finding new uses/processes for unused resources

Renotech has very much to offer in the field of cement chemistry, processing, and applications. We also provide ash to slag applications. Furthermore, Renotech has, with an industrial partner, developed a process for utilizing unused mining waste (patent pending). We are active in nutrient recovery, too – research and development in phosphorus and nitrogen recovery from waste solution (or sludge). We participated European R3 Water Consortium in 2014-2016.

Typically, the above-mentioned applications do not only produce a desired product, but also reduce waste and waste related costs. An important effect is also that they reduce other negative consequences such as carbon footprint, eutrophication, and depletion of scarce mineral resources, even with the EU classification critical.

Circular economy processing requires often processing routes that involve several companies. Renotech has an outstanding network to Finnish and foreign companies, operators, universities and research institutions. This network enables us to find partners to new projects. We also know if there are funding opportunities.

## 3) Process evaluation

We have not only analyzed process samples, but also made plant elemental balance and performance evaluations in a chemical plant. Our staff has also experience from making elemental balances in other industries. Performance evaluation can include e.g. liquid - solid separation, yield and losses, product or residue characterization, and suggestions for process improvements.

We can also calculate chemical equilibria (modelling) and make verification experiments (mainly in atmospheric pressure). We can also provide heat values and reaction heats, reactivity (e.g. neutralization speed or heat production) and LOI up to 1500°C. We have also determined calcination performance.

## 4) Processing issue solving

We have helped the client in their processing issues, e.g. by contributing to their mill trials, other test runs, and actively supporting them in their process development needs. We are in close co-operation with the client, remotely or on the site. We serve most often in Finnish, Swedish and English, but our staff knows also other languages (Hindi, Bangla, Yoruba, some German etc.)

Examples on processing issues: raw material change, new products (e.g. of magnesium), chemical balances in a chemical plant, evaluation of the effect of process changes, raw material, product and residue analyses, calculation of chemical equilibria (modelling), chemical and physical separation methods, new process technologies.

Also, circular economy production chain, technological and economical assessment.

### Client case 1

A client has a chemical industry plant that uses solid raw material and an acid, for producing a liquid and a solid product. The overall elemental balance and losses were determined for this production line.

### Client case 2

The effect of a potential change or fine-tuning in solid-liquid separation was evaluated.

