SELLBERGS HÄSTÅKERI is founded in Stockholm.

YESTERDAY: LANDFILLS
TODAY: MATERIAL BANKS

RECYCLING IS IN OUR DNA

RESEARCH & DEVELOPMENT

HISTORY IS KEY TO UNLOCKING THE FUTURE

FUTURE PROOF FLY ASH TREATMENT AT HÖGBYTORP
RAGN-SELLS FOCUS – CLIMATE NEEDS CIRCULARITY

Sweden at COP27 (invitepeople.com)

Circularity, new focus from IPCC
OUR GUIDING PRINCIPLES FOR ACHIEVING CIRCULAR SOLUTIONS – RAGN-SELLS

When we develop sustainable solutions for a circular society, these three principles need to be considered.

- De facto: Reduce need for usage of virgin resources
- De-contaminate circular flows
- No debts or hindrances pushed to future generations
RAGN-SELLS CREATES SUSTAINABLE FOOD PRODUCTION FOR THE FUTURE

Ragn-Sells contributes to sustainable food production with a closed loop solution of detoxified nutrients that will be able to reduce the risk for several planetary boundaries.
RESOURCE PLANTS REPLACING WASTEWATER TREATMENT PLANTS IN THE FUTURE

- Summary: 69th Session of UNECE (ragnsells.com)
- From Wastewater Treatment Plants to Resource Plants (ragnsells.com) – UNECE 2021
- "We need international agreements based on the quality, not origin" (ragnsells.com) – WTO 18th of May 2022
**POTASSIUM FROM ASH2SALT**

*Media release, 15 April 2020*

**Extracting the Best from the Rest:**
Ragn-Sells and Hitachi Zosen Inova Build Facility for Processing Flue Gas Treatment Residues in Sweden

Swedish recycling company Ragn-Sells and Swiss cleantech company Hitachi Zosen Inova are to build a facility for processing flue gas treatment residues at Högbytorp, Sweden. The process enables salts to be extracted from the waste product which can then be reused in industrial and chemical processes.

The flue gas treatment residue processing facility being built at the Högbytorp site of the Swedish recycling company Ragn-Sells will collect and wash residues from industrial processes, enabling the recovery of various commercial salts. Following a joint project development phase, the client, Ragn-Sells Treatment & Detox AB, has commissioned the Swiss cleantech company Hitachi Zosen Inova (HZI) to supply and integrate the entire process technology.

"HZI is a well-known name in plant construction and has many years of process technology experience. These were crucial factors in our choice of partner for this project," says Ragn-Sells project head Ulfrik Amsten.

**Making a Sustainable Circular Economy Reality**

With the objective of creating a sustainable circular solution, once commissioned the installation will extract useful materials such as various salts such as potassium chloride, sodium chloride and calcium chloride as well as ammonium sulphate from the residue. These materials can then be reused for industrial or chemical purposes.

For HZI this project marks a return to familiar territory: in the past the company has successfully developed and installed diverse fly ash washing systems at thermal waste treatment plants. "Given the various interpretations of the European legislation on treatment and landfiling fly ash and residues in different countries, the Ragn-Sells facility marks the way forward," says Ruedi Frey, Senior Engineer at HZI. "We're proud to be able to contribute our know-how and experience to this prestigious project."

Read more: Ash2Salt (easymining.se)
LICENSE AGREEMENT WITH HITACHI ZOSEN INOVA

- Ash2Salt-plants in 12 countries outside the Nordics
- Signing in Tokyo 20 October, in the presence of vice Minister of Environment from Japan
UN, JULY 2018
PHOSPHORUS IN FOCUS

WE NEED TO MOVE QUICKLY TOWARDS A CIRCULAR ECONOMY, BECAUSE WE JUST DON'T HAVE ENOUGH RESOURCES TO USE THEM ONLY ONCE.'
LARS LINDEN, CEO, RAGN-SELLS
From sewage sludge to clean phosphorus products
ASH2®PHOS – PRODUCTS FROM THE PROCESS

Ash2®Phos results in clean, well known products where the input chemicals become part of the final product. Products are effective in their applications.

Products from the process = 99% can be used

- Phosphorus
  - Ammonium phosphate – Fertilizer
  - Calcium phosphate – Feed phosphates
- Precipitation chemicals – Iron chloride and aluminium hydroxide and/or sodium aluminate
- Silica sand – Foundry sand, fill, proppant etc.

Recovery of heavy metals

- Heavy metals that should be recovered (Cu etc)
- Heavy metals that should be taken care of (Cd)
GERMANY FIRST MARKET IN FOCUS

Important partnership to recover phosphorus from sewage sludge ash

Swedish environmental company Ragn-Sells and German utilities company Gelsenwasser have agreed to expand their cooperation with the primary goal to construct a major new facility for extracting phosphorus from incinerated sewage sludge. The plant will be the first in Germany to utilise EasyMining’s Ash2Phos technology for recovering this valuable resource, and is the first of several such facilities planned.
RECOVERED PHOSPHORUS FOR ANIMAL FEED

- Utilising the Ash2®Phos process to recover phosphorus from incinerated sludge ash

- PCP as feed phosphate:
  - same solubility in citric acid as MCP
  - low in fluorine

- Activities
  - Digestibility tests on pigs and poultry
  - Legal discussion together with European Phosphorus Platform (ESPP) and European Food Safety Authority (EFSA)
  - Next step: criteria to get ash accepted as safe raw material. Incineration criteria key.
**LEGISLATION STATUS**

**Conventional farming**
- Legislation opens in 2022 for recovered P from sewage sludge ash

**Organic farming**
- Legislation closed; first step is that conventional farming legislation opens.
- Lobbying with ESPP to add PCP as an accepted material
- Need certification bodies to approve and certify our products.
- Ongoing discussions with organic certification bodies (KRAV in Sweden and Bioland in Germany)
- Coop; a potential partner in Brussels to open the organic market

**Feed**
- PCP fulfills all quality demands in the feed legislation
- Webinarium planned to present the positive digestibility results and discussion the legislation hindrance (3 feb)
- Goal; present in Brussels and try to get exception to sell in key countries.
- Several potential customers for PCP2Feed; Lantmännen have First Right of Refusal, Vilofoss, Vilomix, Seges.
A CIRCULAR RESOURCE IS NOT WASTE

There is a need to shift from today’s ORIGIN perspective to a QUALITY perspective by our policymakers when dealing with resources to enable a circular transition in society.
Project Nitrogen

From ammonium (NH$_4$) to climate neutral fertilizers
Inaugurated on the 8$^{th}$ of December
In the LIFE RE-Fertilize project, co-financed by the EU LIFE Programme, the process is being currently demonstrated and product evaluated.

- Capacity of demonstration plant: 4 m³/h
- Applications:
  - Leachate water at Ragn-Sells’ landfill Dec-21 to Mar-22
  - Reject water at BIOFOS’ WWTP Apr-22 to Sept-22
- Nitrogen product will be evaluated by Lantmännen, a Swedish agriculture cooperation

LIFE RE-Fertilize-project finished in end of 2022, thereafter the technology is to be commercialised.
THE NITROGEN CHALLENGE

Examples on direct effect to the climate and environment

- Laughing gas – 6% of the total CO$_2$e emissions in the world
- Needs 2% of the world’s energy to produce today (natural gas)
- Needs huge amounts of energy with current solution to release into the atmosphere
- If not removed from wastewater, it will risk causing eutrophication – leading to dead seabed’s
1. Havbrugsindustri (NO)
   a. Fiskegylle/-slam
   b. K2 ensilage

2. Kylling/Æg/Gris/Mælkeindustri (Nordjylland)
   a. Gødning

3. Hjørring (DK)
   a. Havn
   b. Biogas
   c. Forbrænding

4. Helsingborg (SE)
   a. EasyMining

5. Fredericia (DK)
   a. DLG (handelsgødning)
   b. Vilomix (foderminerale)
A NEW LIFE FOR OIL SHALE ASH WITH CARBON CAPTURE UTILISATION
400 MILLION TON OF TOTAL CO2e POTENTIAL
Estonian ash piles turned into carbon negative raw material for flooring: Tarkett and Ragn-Sells partner to fight climate change

Paris, France, 12 October 2021 - Tarkett, a worldwide leader in innovative and sustainable flooring and sports surface solutions, and the Swedish environmental company Ragn-Sells, have announced today a collaboration aiming at developing carbon negative mineral fillers for vinyl flooring by 2025. The calcium is extracted from ash piles in Estonia and the calcium carbonate is produced using carbon capture technology.