

A dynamic splash of teal-colored particles, resembling dust or fine powder, against a white background. The particles are concentrated in the center and spread outwards, creating a sense of motion and depth. The color transitions from a darker teal in the center to a lighter, almost white teal at the edges.

HaloSep

PURE SEPARATION

CONTENT

Introduction

The LIFE HaloSep Plant

Industrial use of fractions

HALOSEP FRACTIONS



Treated Fly Ash



Salt Product



Metal Product

LIFE HALOSEP – FINALIZATION

- LIFE Project Finalized and all documentation approved
- Closing seminar Summer 2023

After LIFE Finalization

- All HaloSep activates are now diverted from Stena Metall to the fully owned subsidiary HaloSep AB
- Vestforbrænding and HaloSep AB actively work together to ramp up capacity and performance
- Turning the Demonstration Plant “LIFE HaloSep” into a fully Commercially Operating HaloSep Plant at Vestforbrænding



VIRTUAL TOUR HALOSEP

PROGRESS AT LIFE HALOSEP PLANT

- Number of Shifts from 1 → 2 → 3
 - 5 days a week
- Improvements & Optimizations
 - Slurry pumps
 - pH-metering
 - Cycle time reduction
 - Agitation
 - Oven efficiency
- Results
 - Zinc content: 20% → 30%. Max 39%
 - Capacity moving towards full fly ash production:
 - Up to 75% of total daily fly ash production
 - Moisture content reduced in both treated fly ash and metal fraction



CLASSIFICATION OF HALOPUR

To use HaloPur in society it needs to be classified as non-hazardous waste

		Before HaloSep	After HaloSep
HP1	Explosive	N/A	N/A
HP2	Oxidizing	N/A	N/A
HP3	Flammable	No	No
HP4	Irritant	Yes	No
HP5	Specific Target Organ Toxicity (STOT)/Aspiration Toxicity	No	No
HP6	Acute Toxicity	No	No
HP7	Carcinogenic	Yes	No
HP8	Corrosive	Yes	No
HP9	Infectious	N/A	N/A
HP10	Toxic for reproduction	Yes	No
HP11	Mutagenic	No	No
HP12	Release of an acute toxic gas	N/A	N/A
HP13	Sensitising	No	No
HP14	Ecotoxic	Yes	No
HP15	Other*	N/A	N/A
POP	Persistent Organic Pollutants	No	No

Classification approved by Danish Authority with the European Waste Code 19 02 06 (Sludges from physico/ chemical treatment other than those mentioned in 19 02 05)

- Water soluble salts and reactive calcium is greatly reduced in the HaloSep process
 → No HP4 and HP8
- Advanced measurement methods show that toxic forms of heavy metals are removed in the HaloSep process
 → No HP7, HP10 and HP14
- HaloSep AB have our own Classification Tool to classify the treated fly ash as non-hazardous waste in accordance with European standards and thereby enable industrial use

LARGE SCALE TEST AT MANUFACTURER

- Discussions with several European manufacturers
- Larger trial performed with one partner
 - 24m² of pavement blocks
 - HaloSep ash from Vestforbrænding
- Next step a follow up full-scale test planned with recipe adjustment
- Aim: Fully replace a commercial filler material
- NB! Product was not put on the market
- Environmental impact over the product lifecycle needs to be evaluated



REACHING CIRCULARITY

- Facilitate usage
 - Wet filter cake → dry powder
 - Mixing
 - Dosage
 - Drying 70% → 85% dry substance, low value heat preferred
 - Powder for ease of transportation and customer infrastructure
 - Drying: Dry X-RGA
- Restproduktbekendtgørelsen
 - Only 4 wastes specified in BEK nr 1672
 - The treated fly ash from HaloSep meet the same criteria as specified for approved Category 3 materials in BEK nr 1672
 - IBA one of the approved wastes
 - HaloSep treated fly ash comparable to IBA
 - Include treated fly ash that meet the requirements specified in BEK nr 1672



SALT RECYCLING & WATER RECOVERY

- Salt as challenge → Salts as a value
- Water as abundant free resource → Water as a scarce and valued resource (as a condensate)


HaloSep's solution: Integrated Salt & Water Recovery Process as an add-on to the HaloSep ash treatment process

- Partnering with companies with extensive knowledge & experience in the field
- Established technology applied since the 1970's
- Preferred outputs NaCl, KCl and CaCO₃
 - Ca²⁺ as CaCO_{3(s)} not as CaCl_{2(l/s)}
 - CaCO₃ is a commodity in high demand
 - More robust process to take away polyvalent ions like Ca²⁺ before monovalent ions like Na⁺, K⁺ and Cl⁻
 - CaCO₃ requires input chemicals but significantly less energy than CaCl₂ production

CONCLUSIONS

- HaloSep
 - A complete on-site solution to allow full circularity
 - Avoiding excessive transportation
 - Future proofing plant to avoid landfilling
 - Utilizing available resources and waste heat

Hazardous fly ash



Treated fly ash

- Meets EU Landfill criteria
- Approved Waste Code in Denmark
- Meets technical & composition requirements of alternative virgin or recycled materials
- For future approval, application and use

Salts

- Replacing virgin materials

Metals

- Recovery through established smelters

THANK YOU FOR YOUR ATTENTION

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STATUS UPDATE OF HALOSEP PORT

HaloSep Development plant

- PORT, is now in running-in operation with fly ash and acid
 - All equipment installed and all material and consumables on site
 - Installation 100% finalized and tested
 - HAZOP performed and been approved
- Overall, the plant is performing as expected
- The plant is open for testing together with customers and R&D projects



A dynamic splash of teal powder or paint against a white background, creating a sense of movement and texture. The splash is centered and spreads outwards, with some particles appearing to be in motion.

HaloSep

PURE SEPARATION