

A dynamic splash of teal-colored powder or fine particles against a white background. The splash originates from the right side and spreads towards the left, creating a sense of movement and energy. The particles are most concentrated in the center and right, fading out towards the left.

HaloSep

PURE SEPARATION

CONTENT

HaloSep projects update

LIFE Halosep Vestforbrænding - Status

Classification of treated fly ash

Industrial use of fractions from HaloSep

New Baseline



This project has received funding from European Union's
LIFE Program under Grant Agreement
LIFE15 ENV/SE/000265-HALOSEP



STENA



VESTFORBRÆNDING

HaloSep

HALOSEP PLANTS

LIFE HaloSep

Operational since Jan 2021



HaloSep PORT

Start-up Jan 2023



AVR HaloSep Feasibility

Study Sept 2022



The new HaloSep baseline process is ready for the market



HaloSep

Det første anlæg i verden men ikke det sidste



VESTFORBRÆNDING



STENA

Det startede i 2005:

Kim Crillesen og Erik Rasmussen fik en virkelig god idé



Det første anlæg af sin art i verden

Fuldskala-anlæg opført 2019 - 2021

Tests og indkøring siden 2021
forventes færdig ultimo april 2022

Skabt i tæt samarbejde med
Stena Recycling A/S og EU-Life



Om HaloSep - kort fortalt

- HaloSep - oprensning af flyveaske hvor man fjerner salte og tungmetaller, som er bundet i asken
- Tungmetaller separeres med henblik på genanvendelse – særligt Zink
- Saltvandet har potentiale til at blive genanvendt som vejsalt
- Dele af restproduktet har potentiale til at kunne indgå i produktion af bygge- og konstruktionsmaterialer
- Det endelige restprodukt kan herefter deponeres som affald, der ikke er miljø- eller klimaskadeligt





Vestforbrændings Læring

- ✓ Samarbejdet mellem private, kommercielle aktører og offentligt ejede selskaber skaber nye muligheder – det fortsætter vi med
- ✓ Set i stort perspektiv: Vestforbrænding er ikke verdens største anlæg men vi kan bidrage til at skabe løsninger til resten af verden
- ✓ Udvikling af nye teknologier og innovation er vejen frem – og det kan lade sig gøre
- ✓ Der skal afsættes administrative ressourcer, når der arbejdes med tilskudsmidler





Opnåede resultater til idag

- HaloSep-anlæg står fuldt integreret og operationelt på Vestforbrænding i Glostrup
- HaloSep-proces er valideret med succes - herunder en omfattende kemisk analyse
- Nu gælder det om at finde flaskehalse for at nå den fulde mængde af flyvaske.



Kørestil: Fra Fiat 127 ...til Bentley



CLASSIFICATION OF TREATED FLY ASH (X-RGA)

- Classification based on chemical characterization and column leaching results from samples taken over LIFE HALOSEP project
 - Classification to be approved by “Glostrup Kommune”
- Reference substances are employed for all elements except zinc, copper and lead
 - Concentrations of zinc, copper and lead close to limits for hazardous waste (HP10 and HP14)
 - Updated structural information was requested by Glostrup Kommune to finalize classification as “non-hazardous”



CLASSIFICATION OF TREATED FLY ASH

- MAX IV, X-Ray Absorption Spectroscopy (XAS) (University of Lund)
 - Viktor Sveding (Stena Recycling)
 - Kim Crillesen (Vestforbrænding)
- XANES (X-Ray Absorption Near Edge Structure)
- It is important that oxide and chloride forms of zinc are removed.
H410 Very toxic to aquatic life with long lasting effects
- Supported by leaching and MAX IV results that the HaloSep process reduces the zinc oxide and chloride concentration to below hazardous waste limit
- Can only be achieved with a pH controlled process like HaloSep



CLASSIFICATION OF X-FGW

To use X-RGA in society it needs to be a 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 will provide data to classify the treated fly ash as non-hazardous waste in accordance with European standards and thereby enable industrial use

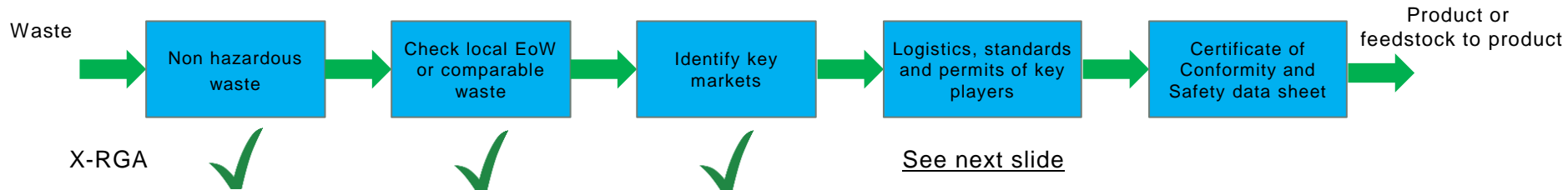
END-OF-WASTE (EoW)-> INDUSTRIAL USE

Re-classification through item four below is completed

End of waste according to the Waste Framework Directive

1. the substance or object is commonly used for specific purposes
2. there is an existing market or demand for the substance or object
3. the use is lawful (substance or object fulfils the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products)
4. the use will not lead to overall adverse environmental or human health impacts

Generic Waste-to-product Road Map



DEVELOPMENT ACTIVITIES ON X-RGA



- Manufacturing of concrete block with treated fly ash as limestone replacement, meets applicable standards (successfully completed tests at Teknologisk Institut)
 - Ongoing dialog with prefabricated concrete pavement block producer
- Using X-RGA in Barrier Material showed promising results (tests done by bentonite barrier material producer)
- Ongoing projects with use of X-RGA in soil stabilization

NEW BASELINE



The industrialized HaloSep baseline process is ready for the market

- Based on the experiences from LIFE HaloSep at Vestforbrænding
- All equipment, process design and control systems are designed for performance guarantee
- Process structure and building are co-designed
- Key process parameters verified in development plant (PORT)

Fully PLC automated process with remote surveillance and control capability

Key parameter control automated and with redundancy

30+ frequency converters on pumps and agitators for full process control

Advanced pH control system for performance guarantee

Reaction in tank 1 and 2 is mildly exothermic, temperature increase up to 15 degrees Celsius

THANK YOU FOR YOUR ATTENTION!

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