LIFE Project Number

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Deliverable

After-LIFE Plan

Action D1

LIFE PROJECT Acronym

HALOSEP

Data Beneficiary

Name Beneficiary:	Stena Recycling International AB
Contact person:	Mr Fredrik Overgaard
Postal address:	Box 4088, 40040 Göteborg, Sweden
Telephone:	+46-10-445-2495
E-mail:	Fredrik.Overgaard@stenarecycling.com
Project Website:	www.lifehalosep.eu

1 CONTENTS

2 INTRODUCTION

The aim of the LIFE HaloSep project is to evaluate the goals for the project established in the Grant Agreement. The After-LIFE Plan outlines the plans for continued technical, commercial and dissemination efforts planned for after the end of the LIFE HaloSep project, as well as to describe the fate of the demonstration plant which has been established at the LIFE HaloSep project site. It was concluded during the project that the HaloSep process are after the LIFE HaloSep project in a position where it is ready for commercialization. The beneficiary HaloSep AB will be responsible for all aspects of the continued work on the HaloSep process. As a start, the beneficiary HaloSep AB made a SWOT-analysis to outline, possible ways forward and how weaknesses can be mitigated. The After LIFE plan also includes an action plan with respect the continued work on the technical, commercial and dissemination aspects of the HaloSep process.

2.1 SWOT ANALYSIS

A SWOT-analysis has been made by the beneficiary HaloSep AB. This SWOT analysis forms the basis for future objectives to utilize our strengths and mitigate weaknesses. Our strength at the moment is that we are part of and have the full support from one of the largest privately held companies in Sweden, the Stena Metal Company. The HaloSep process is the fly ash treatment process that offers the most sustainable solution in the Market, placing HaloSep as the first mover. However, for this to be valid some prerequisites must be fulfilled. Finding the “perfect match” customer is identified as one of the major challenges going forward. One of the identified key success factors is to maneuver approvals for industrial uses of all fractions produced in the HaloSep process. One threat that was identified is that the EU and national legislation changes to support circular solutions for the re-classified hazardous wastes is slow and ineffective.

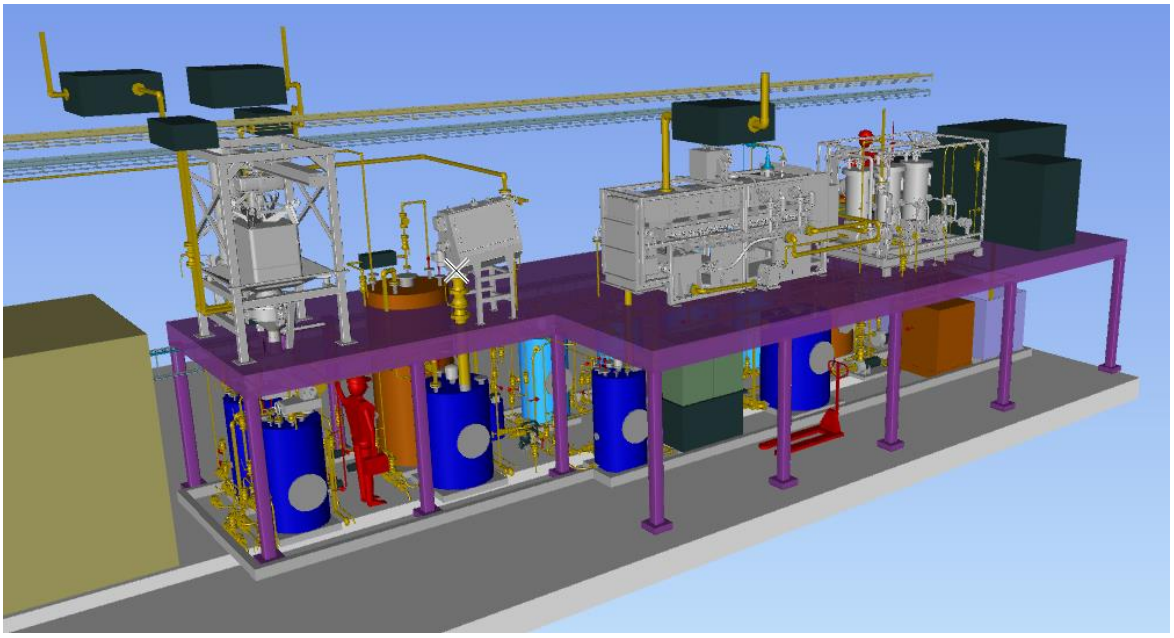
3 THE LIFE HALOSEP PROJECT SITE

The demonstration plant established at the beneficiary Vestforbrænding´s waste to energy plant will now after the finalized 4 test periods, be retrofitted from demonstration operation to commercial operation. The LIFE HaloSep plant will be fully incorporated in the Vestforbrænding operation with dedicated staff and maintenance plan. Examples of alterations are that one agitator in tank BB007 will have an increased capacity and a new cloth for filter AK001 will be installed. Henceforth, beneficiary Vestforbrænding will be responsible for the operation of the LIFE HaloSep plant. HaloSep AB and Stena Recycling AS will support the operation through a new collaboration agreement and use the site for demonstration purposes for stakeholders and potential customers.

4 TECHNICAL DEVELOPMENT OF THE HALOSEP PROCESS

All further technical development of the HaloSep process will be undertaken by the company HaloSep AB with the support from the Stena Metall AB. Since the project site LIFE HaloSep will go into commercial operation, there will be little to no opportunity for further test periods with other ashes, testing of other operational conditions or evaluating new equipment. This is why the HaloSep PORT (Plant for Optimization, Research and Technology development) facility in Gothenburg, Sweden is being established. It is a down-scaling of the LIFE HaloSep plant with about a factor of 50. The HaloSep PORT plant will replicate the developed baseline design of the HaloSep process. The purpose of the facility is to establish and validate process parameters for our potential customers specific operational

conditions. Another purpose is to run test campaigns for process- and technology development purposes. The equipment for the HaloSep PORT facility has been purchased and the building preparations is completed. Figure 1 shows a 3D model (a) of the HaloSep PORT facility and a picture from construction site (b). The HaloSep PORT is situated at one of Stena Recycling´s hazardous waste treatment facilities in the Gothenburg harbour area (Skarvikshamnen), which supports the name HaloSep PORT. The estimated investment for the HaloSep PORT plant is 3M€ and commissioning is planned for Nov 2022.



a)

b)

Figure 1 A 3D rendition of the HaloSep PORT facility (a) and the inside (b) the construction site.

5 COMMERCIALIZATION OF THE HALOSEP PROCESS

All commercialization aspects of the HaloSep process will naturally be fully diverted to the HaloSep AB company. HaloSep AB has the full support of the mother company Stena Metall AB, in the commercializing phase.

The delivery of a HaloSep plant is to take place in five levels, as presented in Figure 2. Level zero is a free of charge Pre-study where the feasibility of a HaloSep plant is roughly evaluated based on fly ash volumes, type of flue gas treatment, location and some initial lab tests of the fly ash. Level one, the feasibility study, is the subsequent first commercial agreement between the parties where the true feasibility of a HaloSep plant is evaluated from an environmental, financial and technical point of view. A 3D model of the plant is designed and integrated into the existing waste to energy plant. All necessary data for the environmental permit is also provided.

The second level is the Project design, where the final design of the plant is established. The third level is a complete project delivery of a full HaloSep plant including procurement of equipment, erection of building and structure, commissioning of the main components and hand over of a fully functional plant. The fourth level is to provide functionality support, maintenance planning and technology development over the first 10 years of operation.

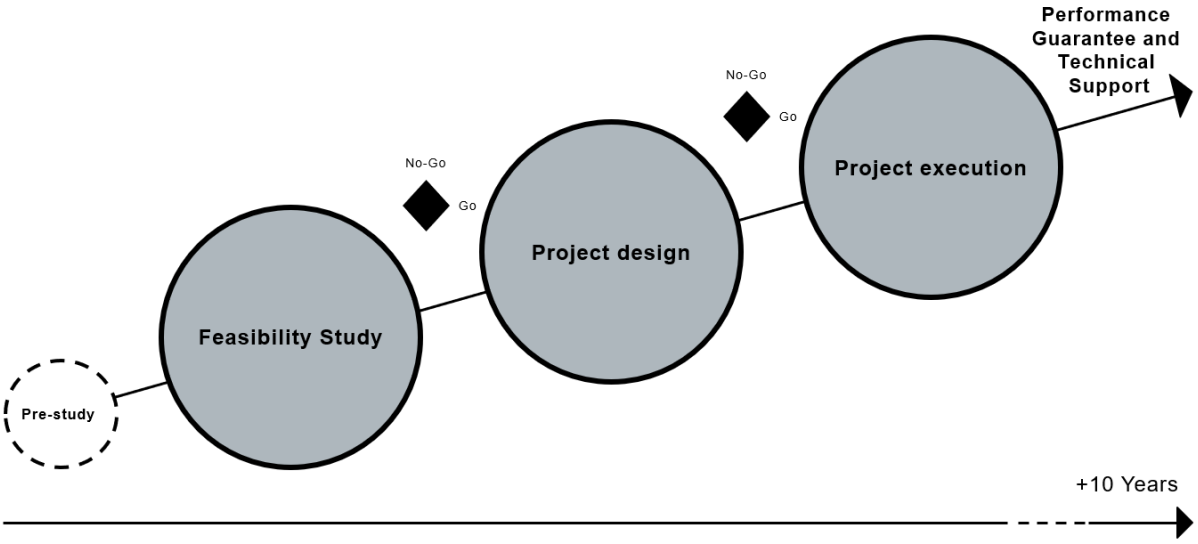


Figure 2 The delivery plan of a HaloSep plant employed by the HaloSep AB company.

5.1 FUTURE FUNDING

The commercialization and industrialization of the HaloSep process will primarily be funded by the Stena Metall company. But, both HaloSep AB and Stena Recycling AS are and will continue to be involved in publicly funded research projects both on a national and EU level. As the HaloSep process has a clear environmental benefit profile, further use of public funding for investment and project support is expected.

5.2 TARGET GROUP

A ranking system has been established for all WtE plants where about 50 plants have been identified are near perfect fits for a HaloSep process. The main customer so far for HaloSep AB have been AVR in Rotterdam, the Netherlands, for which HaloSep AB did a feasibility study during the summer of 2022. Other potential future customers (that also has agreed to be mentioned here) of HaloSep AB are ARC in Copenhagen, Denmark, Halmstad Energi och Miljö, Halmstad, Sweden and SYSAV, Malmö, Sweden.

6 DISSEMINATION OF RESULTS FROM THE LIFE HALOSEP PROJECT

The responsibility of disseminating the results of the LIFE HaloSep project will to a high degree also fall upon the company HaloSep AB with support from all beneficiaries of the project. The communication department of Stena Metall AB has helped HaloSep AB extensively with marketing and communication and will continue to do so also after the LIFE project. Vestforbrænding will continue to present findings and operational experience from the HaloSep plant locally and in waste to energy interest organizations.

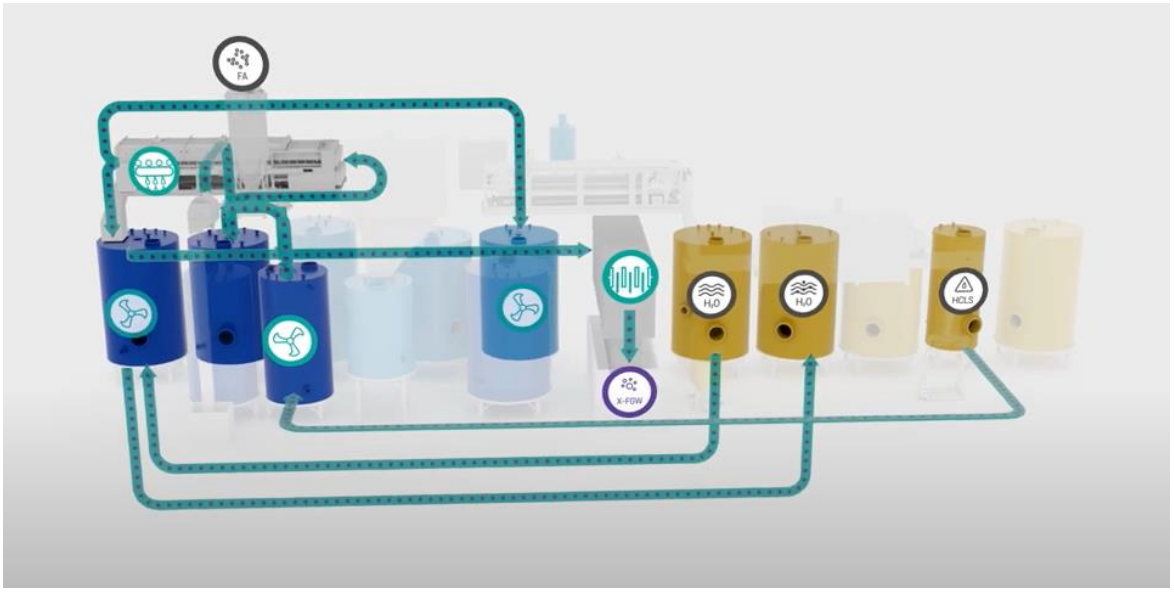
For the commercialization of HaloSep process, a professional marketing and information film was produced by the company Luminate. The film features an introduction to the environmental issues with handling of fly ash and scrubber liquid. Operation from the LIFE HaloSep plant (Figure 3a) is included as well as a pedagogic 3D model and animation (Figure 3b) describing the HaloSep process.

The founder and project manager of the LIFE HaloSep project Erik Rasmussen is interviewed in the film. Along with this film, other materials have also been produced to facilitate marketing at industry shows and seminars, such as roll-ups, pamphlets, clothes, and giveaways with the HaloSep logo.

Seminars and conferences that are important for the outreach of results from the LIFE Halosep project are the commercialisation of the HaloSep process trough HaloSep AB are WtE stakeholder conferences, such as the “Svenska Energiaskor” in Sweden (April 2023) or any conference organized by CEWEP, which is the European stakeholder organisation for WtE plants.

Parts from the After LIFE plan and other conclusions from the project was presented at a seminar the 29th of Nov 2022, held by Dansk Restprodukthantering (DRH), an organisation formed by the Danish WtE plants to coordinate handling and R&D activities on wastes from WtE plants. The attendants where representatives for many of the Danish WtE plants, consultants and other stakeholders within the WtE field. Special attention was placed on the non-hazardous waste classification of the HaloSep treated fly ash, which is a significant milestone achieved by the LIFE HaloSep project. The HaloSep seminar was held by Viktor Sveding from Stena Recycling A/S and Kent Unolt from VESTFOR.

a)



b)

Figure 3 Screen shots from the marketing film from the LIFE HaloSep project site (a) and the 3D animation (b).

7 STRATEGIC ACTION PLAN

HaloSep AB has developed a strategic action plan (Table 1) to ensure that experience and results from the LIFE HaloSep project is retained and utilized. The aim is to ensure a strategic industrialization and commercialization of the HaloSep process. One of the clearly defined goals is to have the capacity to deliver four HaloSep plants per year.

Table 1 Strategic action plan for HaloSep AB following the closure of the LIFE HaloSep project with detailed activities redacted.

Strategic area	Strategic initiative	Activity
Market Growth	Deliver four HaloSep plants per year	Establish design baseline
		Sales capabilities in strategies countries in Europe
		Establish and maintain marketing and sales plan, “yearly activity wheel”
	Established plan for staffing and marketing	Recruit sales and commercial manager
		Execute marketing campaign on social media
		Establish strategic partnership with design supplier
Business model, Process and System alignment	Established Strategic business structure	Maintain and develop Business model, ref Figure 2
		Establish a Business Development Team
	Established process & industrialization structure	Establish documentation structure adaptable to new projects
		Establish quick dimensioning model capability
		Establish quick CapEx and OpEx model capability
	Secure stable suppliers that can deliver worldwide and with favorable agreements & short delivery times	Sign partnerships with at least 5 equipment suppliers and one contractor
Circular economy	Ensure circularity	Ensure at least 3 different stakeholders that can use the treated fly ash
		Partnership with zinc smelter
		Evaluate 3 suppliers for salt recycling
		Achieve non-hazardous waste classification in at least 3 countries
Effectiveness and technical development	Sustainable digitalization, remote control & system support	Establish protocol for remote access with IT
	Established development facility for parameter validation and process development	Development Plant, PORT, in full operation