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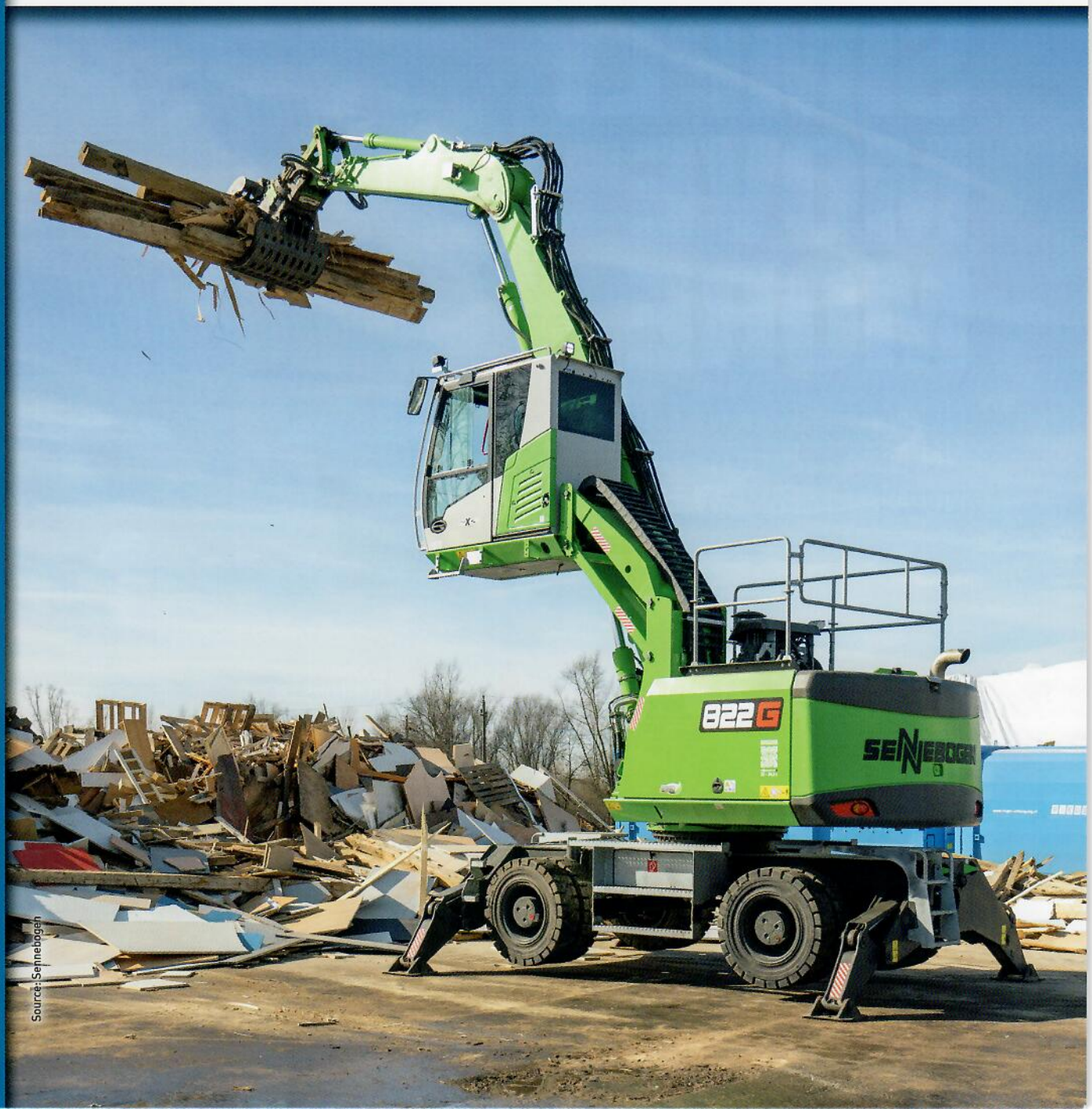

Source: Sennebogen

Digital additional content in the app!

A concept for a unique recycling and energy ship

The SeeElefant is a multi-award-winning concept by the environmental organisation One Earth - One Ocean e.V. (oeoo) for a 180-metre-long cargo ship that is to be converted into a processing vessel for the recycling of plastic waste in order to work stationarily off the coasts of Asian or African metropolitan regions. The capacity is designed for 60,000 tonnes per year.

By Frank Brodmerkel, One Earth - One Ocean e.V.

After the initial design was completed in March with partners from the industry and shipbuilding sectors and the classification society gave the go-ahead for the inspection of the leak stability in June, a shipyard is to be commissioned with the refit and conversion of a bulk carrier by the end of the year. From 2026, the first SeeElefant demonstrator is to strengthen the local disposal infrastructure in a metropolis in Southeast Asia and reduce marine litter there. In addition to plastic waste from the sea, large quantities of land-based waste will also be processed and brought on board via a container terminal.

A so-called bulk carrier, i.e. a cargo ship with loading hatches and cranes, is to be equipped with appropriate recycling technology in order to be able to recycle plastic waste as a mobile processing ship. In addition to plastic waste from the sea, large quantities of land-based waste will also be processed, which will be brought on board via a container terminal. On board, the plastic waste will be separated by type into PET, HDPE, LDPE, PP, PS, MPO via an LVP sorting plant integrated in the hold, compressed into plastic bales and fed into the recycling cycles on land. Other fractions are processed into oil or thermally.

A project team consisting of specialists in plant engineering, recycling and shipbuilding is steering the implementation. In addition to Günther Bonin, Dr Harald Frank, Senior Manager Finance & Business, is responsible for the business side of the project.

Prof. Dipl.-Ing. Andreas Meyer-Bohe, former project manager at the Sietas shipyard, head of the technical office at the Lindenau shipyard and director of the Institute for Shipbuilding at the Kiel University of Applied Sciences, is responsible as Senior Naval Architect for the ship design and project management for the conversion of the SeeElefant. Peter Berlekamp, long-time managing director of Tönsmeier Wertstoffe GmbH & Co KG and PreZero Recycling Deutschland GmbH & Co. KG/GreenCycle, is responsible for sorting and waste to energy as Senior Plant Engineer. Erich Groever, as an expert for plant and process engineering in the environmental sector, is in charge of implementing the „Plastic-to-Fuel Technology" (PtF) in the research centre on the SeeElefant.

Peter Berlekamp explains the planned material streams of the plastic waste: „From

the input bunker of the ship, the waste is fed to the LVP sorting plant, which can separate up to 10 different recycling fractions fully automatically and with assured quality with the help of shredders, infrared sorters, metal separators and air classifiers and will have a throughput of up to 10 t/h. PET and other readily marketable plastics are compacted with baling presses and sent for mechanical recycling. A mixture of polyolefins will go to the planned experimental oiling plant, other plastic mixtures will go to the cement industry as RDF substitute fuel or will be used with the non-mechanically recyclable residues in the on-site thermal recycling plant for energy generation."

The Waste to Energy (WtE) plant is designed to generate electrical energy from thermally recyclable residues in compliance with the highest emission standards, which can be used for onboard self-supply and/or fed into the respective onshore power grid. The plant consists of a combustion chamber with up to 12 MW thermal output, a steam turbine with generator (up to 4,000 kW electrical output) as well as a certified flue gas cleaning system with emission monitoring and is designed for a capacity of 18,000 t/y.

A science lab on the deck of the SeeElefant is used for process optimisation and research into new recycling techniques such as oiling by pyrolysis, e.g. with plastic-to-fuel technology (PtF). This is intended to recycle those plastic wastes that cannot be sorted and/or marketed well. Specifically, these are polyolefins, the largest group of plastics in terms of volume.

Erich Groever: „oeoo is working here with SEPCO Industries Co. Ltd. from Bangkok, Thailand. Their large-scale plant in SaKaeo, Thailand, is already running with two lines with 6,600 t/a throughput, reaching up to 15,000 litres of pyrolysis oil every day. The distillate produced from mixed liquid hydrocarbons is delivered weekly to a SHELL refinery in Singapore for further refining." In the future, the distillate produced on the SeeElefant can be used directly as a substitute for marine diesel or also delivered to a refinery. The PtF plant on the SeeElefant processes partial quantities provided by the integrated LVP sorting facility."

The use of the SeeElefant not only makes a positive contribution to decarbonisation, as around 84,000 t CO_2-equivalents (CO_2e) can be saved compared to landfilling the plastic waste. In addition, the ship leads to a significant improvement in regional plastic waste disposal at the point of use. The material recycling can close material cycles and increase resource efficiency by saving primary material.

Source background: Salvatore Monetti; pixabay.com
Source others: One Earth - One Ocean e.V.

The oeoo expert team of experienced shipbuilding, waste recycling and financing specialists is currently building up the necessary network for investment, financing, management and operation. Talks are being held with interested companies to gain an „anchor sponsor" from the industry, to be followed by other companies. At the same time, the market is being intensively monitored in order to be able to take over a suitable 2nd-hand ship in the short term. oeoo has already identified some suitable ships. A ship broker in the network supports the team in the search and purchase.

With NSB Niederelbe Schiffahrtsgesellschaft mbH & Co. KG, one of Germany's largest ship management companies, the project already has a well-known partner for the operation of ships.

The aim is to commission a German shipyard to convert the bulker by the end of 2023 in order to start trial operations at a mooring in Germany from mid-2025. Already during the trial operation in Germany, plastics are to be processed on the SeeElefant that would otherwise go abroad and end up at least partially back in the waters there.

The financial requirements amount to a total of 49.5 million euros, of which 7.2 million euros are expected to be covered by the shipyard funding programme „Innovative Shipbuilding Secures Jobs", and a further 42.3 million euros must be covered by sponsors or impact-oriented investors. The team needs binding commitments for this by autumn at the latest, so that the purchase of the ship can be pushed ahead and the shipyard process can be started.

Harald Frank, project developer in Kiel, comments: „With the SeeElefant we have finally succeeded in combining state-of-the-art technologies from the fields of shipbuilding and waste management with certifiable lowest emission values. Turnkey and usable worldwide. The mobility of this ship-based recycling factory has considerable advantages, because there is a lack of inner-city space in the mostly extremely dense metropolitan regions; offshore processing offers a technically excellent and also cost-efficient solution here. Our SeeElefent will thus make an important contribution to combating and recycling plastic waste".