



Oxide large scale testing

Executive Summary

The main focus of the Oxide related work in WP4 was to scale-up the previously designed lab-scale cell, to do onshore pilot tests on seawater, as well as to increase the specific hydrogen peroxide production rate of the Oxide reactor. The latter was necessary to make the Oxide method feasible for the onboard treatment of ballast water.

The newly designed generation-2 and generation-3 electrochemical cells show an important increase of the hydrogen peroxide production rate in relation to the cell used in work package 3. In WP3 the highest output of the Oxide system was 14 grams per square metre of cell membrane per hour. In WP4, a continuous and stable peroxide production of up to 60 g/m²h was measured in the pilot, i.e. an increase by at least a factor four.

Due to this substantial gain in specific production rate the size of an Oxide system onboard of a ship can be reduced a factor of 4 compared to the design in WP3. Also, this reduces the cost prize of the system and the costs per cubic metre ballast water. The economical aspects of the improved Oxide system are evaluated in more detail in task 4.8.

Several problems had to be overcome during the work in WP4. Due to a delay in the delivery of the pilot installation, the pilot tests started 6 weeks later than planned. In August 2003 the concentrations of the phytoplankton in the North Sea were very low, which is attributed to a long period of extreme warm weather. The biological efficiency of the system could therefore not be studied during the onshore testing period. Instead, the H₂O₂ production rate of the pilot was continuously monitored. A very low production rate with the generation 3 cell was observed during the first onshore trials in August. The origin of this low output was not found, despite serious efforts to find it. Later, these problems with the production rate were not observed anymore.

During the on large scale on shore tests in October and November the Oxide pilot was functioning very well. An endurance test of 4 days revealed that the specific production rate remained stable at approx. 60g/m²h for two cells in parallel and at a flow rate of 400 l/h.

It is expected that the specific production rate and the current efficiency can be further improved, since rather low values have been found for the current efficiency. This requires fundamental research to improve the characteristics of the cell.