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The Sweep Dredge: High Accuracy Dredging Trials Continue

Introduction

To gather more knowledge on dredging thin layers in large lakes, dredging trials in the Ketelmeer, a highly contaminated lake in the north of The Netherlands, were initiated by the Netherlands Ministry of Transport, Public Works and Water Management (Rijkswaterstaat). The first two dredging trials were executed in 1995 and a report of the preliminary results was published (see *Terra et Aqua*, number 61, December 1995). The tested dredging techniques in 1995 were the modified auger dredger, owned by HAM-VOW and the environmental disc cutter from Boskalis.

Two additional trials were conducted at Ketelmeer during the summer of 1996. The new test involved the sweep dredger from Dredging International of Belgium (see following article, p. 19) and the modified bucket dredger from the dredging company de Boer.

SELECTION OF TECHNIQUES

The selection of techniques which were tested in the Ketelmeer was based on a multi-criteria analysis. This resulted in a list of ten possible techniques; from this list four techniques were chosen each representing a different approach for dredging thin layers of silt. A summary of the principles of the selected techniques is:

- *Modified Auger Dredger*: fully process controlled, large width excavation head, positioning by anchor wires, cutting and transport to suction head with large auger, pipeline transport to disposal site.
- *Environmental Disc Cutter*: fully process controlled, cutter swing, positioning by spuds, pipeline transport to disposal site.
- *Sweep Dredger*: fully process controlled, cutter swing, no rotating mechanical parts in excavation head, pipeline transport to disposal site.
- *Bucket Dredger*: traditional mechanical excavation technique, partly process controlled, transport to disposal site by means of barges.

Comparability

The following article on the sweep dredger contains the results which are related to the location where the tests were performed. An example is for instance the

results of the measured turbidity. Certain questions are relevant, such as, what are the erosion and sedimentation characteristics of the test area? what are the influences of currents, tides, waves, and depth of the test area? what are the disturbances by external causes like passing ships? and what method is used for the determination of the turbidity?

Answering such questions is not always easy even when there is a thorough description. For instance, what is the influence of the turbidity on the results, and how do they compare with other results. Similar questions can be asked about other criteria such as spillage and accuracy. The advantage of the trials in the Ketelmeer are clear: by performing the trials in the same location, a true comparison is possible between the obtained results.

Dredging Technique Assessment Criteria

The Ketelmeer trials were focussed on three main environmentally-related criteria. The first is the accuracy, which was split into several parts to be able to distinguish between dredging accuracy and positioning accuracy. The second was the spillage, which can directly influence the top layer quality of the dredged location. And third and last was the turbidity, because this is the main phenomenon for transporting contaminated particles outside the dredging area. The three mentioned criteria were closely monitored in relation to the achieved production and transport concentration.

RESULTS OF THE SWEEP DREDGER IN THE KETELMEER

In accordance with the other three trials, the sweep dredger was tested using several scenarios. A thin layer (20 cm) and a relatively thick layer (up to 60 cm) were dredged. The emphasis was set on the removal of the actual contaminated layer (average thickness of layer 40 cm). The major part of the acquired data is still under investigation, but the preliminary results show that the design of the sweep dredger is suitable for accurate removal of thin layers in the Ketelmeer.

A slight increase in measured accuracy, spillage, and

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