

Port of Emden, Germany reducing dredging costs by 90%

In many of the world's largest harbours, appropriate hydrographic survey is a necessary requirement in order to keep dredging costs low. The port of Emden succeeded in reducing the dredging costs by 90% with the help of a new dredging management and hydrographic survey using the density probe admodus[®] USP pro.

Until 1994, harbour maintenance dredging at the port of Emden was mainly based on the cost-intensive removal of suspended silt. This removal was done by a cutter suction dredger.

To prevent expensive shifts of this cutter suction dredger, a trailing suction hopper dredger (TSHD) was used to dump the dredged material right in front of the cutting head of the cutter suction dredger to provide a constant silt supply.

In 1994, after many years of research, the port authority managed to maintain the fluidity of suspended sediments, which were carried into the harbour basin by the river Ems. This so called "sediment conditioning" is mainly based on the prevention of the fluid mud's reconsolidation process by a regular treatment (recirculation). As a result, these sediments no longer have to be removed from the harbour basin and a lot of disposal costs can be saved.

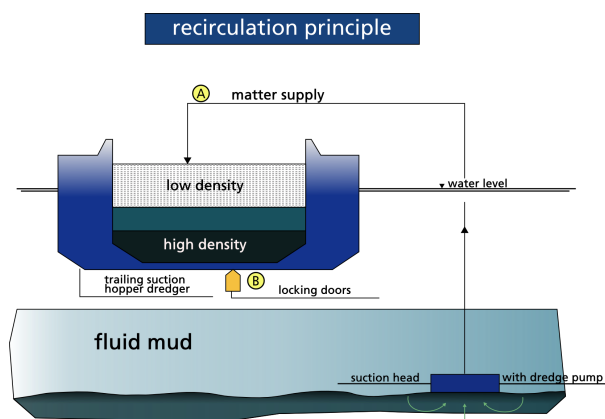


Figure 1: Recirculation principle

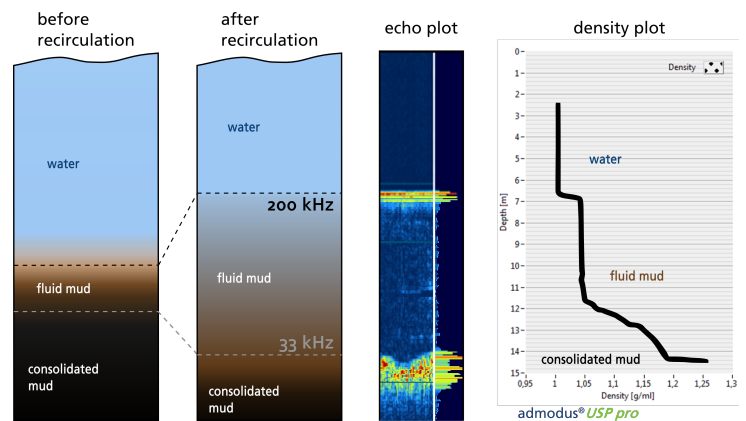


Figure 2: Fluid mud layer before and after recirculation.

Recirculation principle

A hopper dredger is sucking the consolidated sediment inward where it comes into contact with air. This is very important for gases (methane) to be released and new oxygen to be absorbed. The material at the bottom of the hopper will be dumped back into the harbour basin. This procedure results in big fluid mud layers.



The challenge:

How to monitor the density of this 'fluid mud' or measure the nautical depth in the harbour basin in a fast and reliable way, in order to guarantee navigability?

Taking mud samples with a van-Veen sampler and having them analysed in a laboratory was the first approach. But there are two major disadvantages: It is not possible to get an 'undisturbed mud sample' because on the way to the laboratory, the sample will be changed and it will take a few days before it can be analysed. Furthermore, using a van-Veen sampler is very time consuming. Thus, only a few points in the harbour can be measured.



admodus[®] *USP pro*

In 2003, the first version of the admodus[®] *USP* was developed. This was a real breakthrough in measuring the density online and in-situ. With the help of the admodus[®] *USP*, density measurement was easy, fast and reliable. A complete depth-dependant density-profile can be measured in a very short time. Thus, the number of measurement points in the harbour basin could easily be increased to 54.

After 10 years of experience and development, admodus[®] MARITIME DEVICES released the new admodus[®] *USP pro* in 2013, with improved precision, ruggedness, better software and easier handling like the one-man-automatic-mode. The port of Emden was the first customer who purchased and still uses this device with great success.

Conclusion

A lot of maintenance costs can be saved by an intelligent dredging management. Investigations in recent years have shown, that ships can navigate safely through fluid mud layers up to a density of 1.15kg/dm^3 at the port of Emden. This 1.15kg/dm^3 horizon is often much deeper than the 200kHz horizon of an echo sounder. Thus, there is 'more water' under the keel with less dredging.