

Successful approach to ‘Keep the sediment navigable’ in Port of Delfzijl.

Jannes Kamphuis¹, Reinder Meinsma²

¹Groningen Seaports, Handelskade Oost 1, P.O.Box 20004, 9930 PA Delfzijl,
The Netherlands

²Wiertsema&Partners, Postbus 27, 9356 ZG Tolbert, The Netherlands

Phone: +31-(0)-596-6400414

E-mail: j.kamphuis@groningen-seaports.com

Introduction:

A successful introduction of ‘Keep the sediment navigable’ (KSN) in Port of Delfzijl resulted in a decline of under keel clearance (UKC) from 10% to – 7% and an expected 10% reduction in dredging activity.

The presence of a mud layer in the Port of Delfzijl implicates a major restriction to the nautical accessibility of the port. Daily injection dredging is carried out to maintain nautical depth. At present the maximum drafts for shipping traffic to Delfzijl are limited by a minimum UKC with respect to the top of the mud layer.

Methods:

In 2011 a four phase study started to investigate the possibilities of the introduction of the KSN-method in Delfzijl.

1. Feasibility KSN methodology.

Based on the present rheologic mud conditions and discussions with portmaster and pilots it is realistic to implement the KSN method in Port of Delfzijl.

2. Simulation of sailing through the mud layer.

The ship-handling simulator study revealed the possibility to work with a nautical bottom which is at a lower level than the top of the mud layer. In order to perform the simulations as realistically as possible, local pilots experienced with the port of Delfzijl, participated in the study.

3. Full scale field test.

In order to validate the conclusions from the simulator study, full scale testing will be organized in autumn 2012.

4. New dredging strategy based on rheology of the mud.

After the transition from dredging strategy based on acoustic data to a strategy based on a combination of rheology and acoustic data a 10% reduction of dredging activity is expected.

Conclusions and recommendations

This study has proven that the harbour bed of Delfzijl consists partly of navigable mud. Partly due to the willingness of the pilots to participate in this study, a mode has been found to determine a safe negative under-keel clearance. The simulations and their validation with a practical pilot test have given all the stakeholders the confidence that the optimum draught for the harbour of Delfzijl has been obtained in the correct manner.

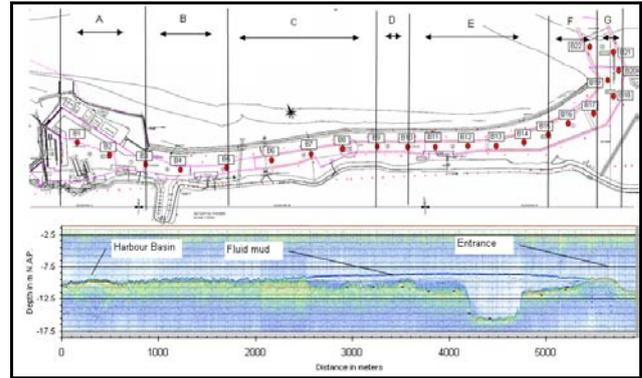


Fig. 1: parametric echo profile including harbour showing the fluid mud body

It has been ascertained that a negative under-keel clearance of 7% can be applied with an unchanged dredging effort

For Delfzijl, an unchanged bar height and a negative under-keel clearance of 7% means a 10% reduction of the dredging effort

The mud layer can be made navigable with different methods. The dredging industry faces the challenge of developing efficient methods that make and keep mud navigable.

For smaller ports in particular, acoustic measurements continue to be most efficient. This method is also preferable in terms of data density. However, acoustics is not sufficient to determine the navigability of mud, and additional measurements are required.

In Delfzijl a study into the effects of optimising the layout of the harbour mouth is essential if the draught of vessels is increased. The effects on current and silting in particular require further investigation.

References:

- [1] Vantorre, M, 2010: A novel methodology for revision of the Nautical bottom. Ghent.
- [2] Vantorre, M, 2010: Revision of the nautical bottom concept in Zeebrugge. Ghent.
- [3] Greiser, N, 2001: Pseudoplasticity of cohesive sediments Emden.
- [4] Greiser, N, 2009: Konditionierung konsolidierter Sedimente in der Ems. Emden.
- [5] Vantorre, M, 2006, : A Novel Methodology for revision of the Nautical bottom, FHI.
- [6] Delefortrie, G, 2007: Promotieonderzoek manoeuvrability of ships in muddy areas Ghent.