

THE EFFECT OF A MUDDY BOTTOM ON SHIP CONTROL

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The available space underneath a ship's keel or the under keel clearance has an important effect on the manoeuvring behaviour. Minimal values of the under keel clearance are needed in order to avoid bottom touching or an unacceptable manoeuvring behaviour.

However in some cases it is hard to tell which space is still available underneath the keel, e.g. when the bottom is covered by a soft fluid mud layer. In this case the nautical bottom concept as introduced by PIANC should be used. This nautical bottom is located somewhere within the mud where the characteristics of the mud reach a critical limit or where the manoeuvring behaviour of the ship is unacceptable when the keel touches the nautical bottom. As a consequence not only the critical limits of the mud layer have to be monitored, but also knowledge on ship manoeuvring behaviour in muddy areas is needed.

To predict this manoeuvring behaviour an extensive experimental research program was carried out in 2001-2004 at Flanders Hydraulics Research, which consisted of captive manoeuvring tests with scale models of significant ships. Based on the measured data a mathematical model was built that takes account of the characteristics of any realistic mud layer on the ship behaviour. With this mathematical model built into a ship manoeuvring simulator, pilots can assess the manoeuvring behaviour and set acceptable manoeuvring levels in muddy navigation areas. This has successfully been done for the harbour of Zeebrugge, Belgium.

References

Approach channels – A guide for design, Final report of the joint Working Group PIANC and IAPH, in cooperation with IMPA and IALA. 1997. Supplement to PIANC Bulletin, No. 95, 108pp.

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