Safety Criteria for Approach Channels

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Abstract

For more than twelve years the port of Rotterdam has operated a probabilistic admittance policy for tidal-bound vessels. When introducing this method, no decrease in safety was allowed. The chance of touching the channel bottom is therefore limited by safety criteria. The risk taken during the channel trip includes not only the chance of touching the bottom but also the outcome of this event. This resulted in politically and scientifically acceptable criteria.

Keywords


1. Introduction

The port of Rotterdam is one of the biggest in the world. Both the amount of iron ore and the number of containers transshipped increased again last year. Vessels with a draught of up to 22.55m are able to use the approach channel. 350 channel-bound vessels (draught more than 17.40m) arrive at Rotterdam each year. Looking at these figures, one can understand that the Port of Rotterdam has a very high economical value for the Netherlands.

To safeguard the port’s position, many investigations are carried out to increase accessibility. Vessels with a draught of over 20.00m are tidal-bound. For these vessels (250 each year), the water level is not sufficient. Only at high tide can they reach the port. This results in a restricted period of time during which tidal-bound vessels can transit the approach channel. Specially developed calculation methods have optimised the usage of the restricted time for entering the channel. Another way to increase accessibility is more dredging. However this is extremely expensive.

The economic reason for increasing the accessibility of the port of Rotterdam without dredging is however contrary to a safe channel transit. The number of vessels can be increased. Also, the required keel clearance can be lowered. However, both will result in a higher chance of touching the channel bottom, or worse, an accident. The final design is always a compromise between safety and accessibility.

To guarantee a safe channel trip, safety criteria are used to limit the chance of touching the bottom of the channel. A probabilistic calculation method is currently used to determine the chance of touching the bottom. Both the risk during a single transit as well as the combined risks of all the tidal-bound vessels using the channel is limited by safety criteria.

Choosing a safety criterion for an approach channel, is as complicated as choosing a safety criterion for designing dikes, cars or buildings. It is difficult to strike balance between accidents on one hand, and a less economically efficient system on the other hand.

1.1 Contents

This paper explains the use of safety criteria for designing approach channels, especially for the port of Rotterdam. The first section briefly explains the probabilistic admittance policy which is used for the Euro-Maas channel, the approach channel of the port of Rotterdam. By introducing this method, the port’s accessibility has been increased without additional dredging. The next sections looks at the definitions of safety criteria and the policy of the Dutch authorities. In the fourth section the safety criteria are calculated and compared with other accepted safety criteria. At section five, a sensitivity analysis is performed to examine the effects on the port’s accessibility. Finally a brief introduction of the implementation is given at the last section.

2. Probabilistic admittance policy

The design of the admittance policy of the Euro-Maas channel at Rotterdam (Figure 1) and the Western Scheldt is based on a probabilistic method. Using this method, a substantial improvement of