HARBORS AND NAVIGATION

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Summary

Harbors are natural or artificial water basins with facilities a transition between ships and land. For the loading and unloading of goods harbors form the transition point between water-based transport and other transport carriers. Land-based transport networks include rail traffic, road traffic, inland shipping, air traffic, and transport in pipelines. Maritime transport and shipping vessels play vital roles in harbor operation. In addition, the demands placed on a seaport are in many ways related to the requirements of nature conservation and environmental protection. Harbor structures and wave protection must be investigated in detailed studies in order to minimize negative effects by appropriate engineering measures.

1. Introduction

Harbors are natural or artificial water basins with facilities to provide a transition between ships and land. For the loading and unloading of goods harbors form the transition point between water-based transport and other transport carriers. Land-based transport networks include rail traffic, road traffic, inland shipping, air traffic, and Transport in pipelines

Besides their loading and unloading function, harbors also provide protection to ships against the vagaries of the sea. Harbor shipyards serve as stations for repair purposes and the construction of new ships. Goods are intermediately stored in harbors. Harbors also increasingly serve as locations for further industrial processing of goods, the recycling of materials or similar industrial purposes.
Harbors are generally categorized according to

A. the geographical and natural conditions in seaports and inland harbors

B. the type of waterways into seaports, river harbors and/or canal harbors
C. the most important function such as shelter or safety harbors, cargo-handling harbors, ferry ports, marinas or naval harbors
D. the method of loading and unloading into package-freight harbors, container harbors, harbors for handling bulk cargo, bulk package freight or liquid cargo
E. the type of cargo flow into import or export harbors.

Seaports are further subdivided according to oceanographic sea conditions into “open” and “closed“ harbors (dock harbors) or tidal harbors and non-tidal harbors. The presence of ice may also be a distinguishing feature.

The fact that a harbor usually serves several functions means that a categorization according to the above-mentioned distinguishing criteria is not always clearly defined. For example, a seaport may also be linked to an inland waterway system, i.e. it may at the same time be a river harbor or a canal harbor.

As a rule, large seaports also have loading and unloading facilities for different types of goods. Harbors which specialize in a particular type of cargo are mainly to be found in the container handling sector, the loading and unloading of oil or chemical products, fisheries or ferry traffic.
In order to tackle the many complex problems relating to the design and construction of a seaport and its operating facilities many expert disciplines are involved.
The most important of these are:

A. Shipbuilding and ship machine engineering
B. Mechanical engineering and cargo-handling technology
C. Civil engineering, especially hydraulic engineering, geotechnics as well as structural and transport engineering
D. Operations management

Other disciplines include navigation, logistics, harbor operations technology and underwater dredging technology.

The requirements of a harbor on the seaward side are governed by the oceanographic conditions of the sea area concerned, i.e. sea state, tidal conditions, currents etc. These are also influenced in many ways by the development of shipping traffic. For instance, design criteria are specified by the type of shipping traffic concerned, marine engineering requirements in berth construction and cargo-handling equipment. Developments in the shipbuilding industry, i.e. an increase in the size of ships and the quantities of cargo to be handled, demand, against a background of competitive pressure between individual harbors, continuous adaptation of harbors to changing conditions on the world market as well as in relation to shipping fleets.

The fact that natural and sheltered estuarine locations for harbors cannot be adapted indefinitely to the ever-increasing size of vessels means that harbors nowadays must be constructed in exposed coastal areas, placing high demands especially on wave protection measures. A further problem from the oceanographic point of view is the maintenance of shipping-channel depths in harbor approach and entrance channels.

Flow and tidal effects give rise to sedimentation and siltation problems, which in turn lead to high dredging costs.

The demands placed on a seaport are in many ways related to the requirements of nature conservation and environmental protection. These must be investigated in detailed studies in order to minimize negative effects by appropriate engineering measures.

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Biographical Sketch

Sören Kohlhase was born in 1938 in Dessau, Germany. He has studied at Christian-Albrechts-University, Kiel and Technical University, Hanover. He got a Diploma in civil engineering in 1964 and Doctorate (Dr.-Ing.) 1971 in the field of hydraulics, from Technical University Hanover. In 1982 he completed habilitation in the field of harbor planning, as university lecturer, University of Hanover.

In 1987 he was appointed as a Professor of coastal hydraulics, University of Hanover. In 1994 he was appointed as the chair of hydraulic engineering, University of Rostock. In 1971, after some years as a research engineer,he was chief engineer at Franzius-Institute for hydraulics and coastal engineering. He coordinated various research projects. He was Scientific Coordinator of Special Research Institutions (SFB) on coastal waters and coastal engineering in Hanover respectively.

He is a chairman of working group on geotextiles and geomembranes and member of various working groups of German technical and scientific organizations. He had diverse engineering activities and functions as a consulting engineer both in Germany and abroad, e. g. in Pakistan, Bangladesh, Sri Lanka and different African countries. Priorities of work and interests: coast conservation, high water protection, harbor planning and harbor structures. Use of geosynthetics for civil engineering applications especially hydraulic engineering.