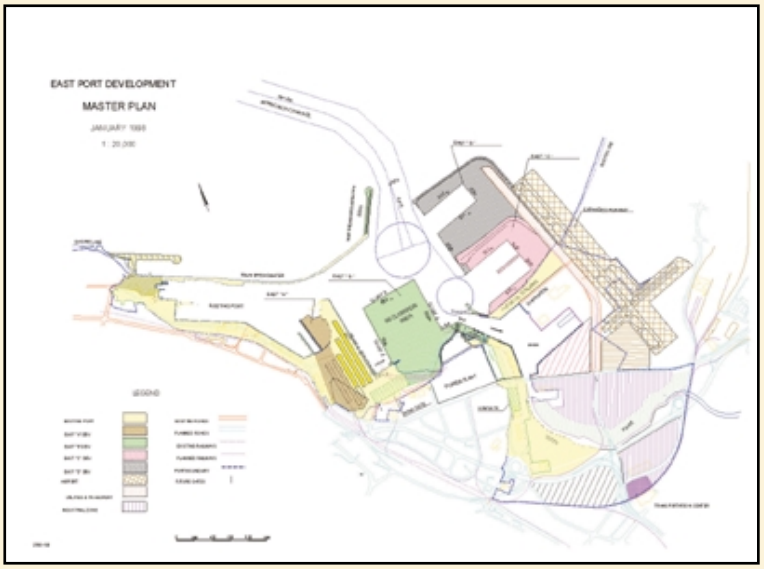
Next to the safety of day-to-day nautical operations, port authorities need to keep the total levels of risk in their ports as low as reasonably possible. The maritime (nautical) operations determine an essential part of that risk. Here, recent safety and risk assessment initiatives are examined.

Safety versus Risk -



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Three questions need to be addressed: What is the actual risk level? Is it below a reasonable level and what actions are most cost effective to reduce the risk level? To answer these questions a framework of safety assessment is needed. Recent developments in the UK (the Port Marine Safety Code) suggest the application of the Formal Safety Assessment methodology. This requires the identification and analysis of risks and the assessment of those risks against an appropriate standard of acceptability, as well as a cost-benefit assessment of risk-reducing measures where appropriate.

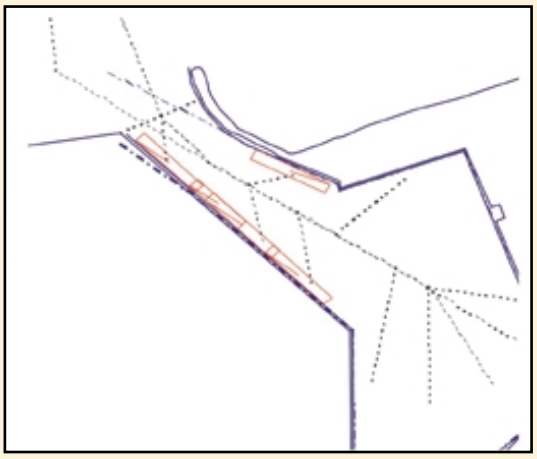
Traditionally, expert opinion - more recently added to with simulation studies (see in this issue) - helped to evaluate the different design or existing port lay-outs and the operational measures, within a given environment and a given traffic distribution. This is still a viable option for the basic assessment of the feasibility of a design on the operational level but fails to predict accurately the total levels of risk and possible consequences.

Evaluating risks

Over the last two decades, quantitative safety management assessment tools have been developed taking into account the total vessel traffic image and its related risks in the whole physical port environment. These tools are capable of evaluating the consequences of measures on a strategic level. The flow diagram shows the total Maritime Traffic System used to define the relationship between ship traffic, accidents, the environment and measures to be taken in order to assess the accident probabilities and risk consequences (impacts). To this model (SAMSON), further risk models are added. These could include oil spills, LNG leakage, cloud dispersion, explosion risk, coastal pollution etc. Obviously, human safety as expressed in the individual and societal risk is still the most important outcome of this quantitative risk model.

A recent risk study

On behalf of a port authority a risk assessment study has been performed concerning an extension of the port. A special harbour basin is planned for chemical, LPG and oil products under the future



Safety assessed

A safety assessment study examines the number of collisions that can be expected each year. Two types of collision risk are considered - the drifting and the ramming risk. The drifting risk covers cases where the moored ship, a quay, or breakwater, is hit by a ship that drifts after an engine / rudder failure.

in ports and at sea

port extension. The added Masterplan shows the different phases of the project. However, at the present there is an immediate need for two chemical / gas tanker berths. On practical grounds the only available location is along the existing harbour entrance channel, in the middle of the planned port. (see detailed picture)

Objectives

The objectives of the study are (1) to provide a professional opinion on the suitability and effectiveness of the proposed layout and (2) to establish for present and future traffic, whether the layout has an acceptable degree of safety with regard to the channel width and manoeuvring requirements. In addition, (3) the study has to determine the influence of passing ships on the ships moored along the quays facing the channel (mooring safety), (4) the risk of possible accidents which could occur in the entrance to the harbour, (taking into account the ship sizes and type of cargo) and (5) formulate recommendations regarding operational guidance and restriction measures and if necessary, to avoid or contain such accidents (e.g. limiting size of passing ships, limiting environmental conditions, day / night manoeuvres, special aids to navigation, removal of moored vessels in case of a passage of a very large ship etc.) In order to meet these objectives a real-time simulator study (1, 3, 5), a desk study (3) and a safety assessment study (1, 2, 3, 4) have been carried out.

The ramming risk covers cases where a moored ship collides after a navigational error. In the Kishon study both the ramming and drifting models were applied. The figure shows the layout of the harbour with the present and future berth locations (in red). The distribution in collision energy is assessed for each berth location. The general conclusion was that the collision level in the harbour remains acceptable when a number of conditions are fulfilled. A number of recommendations have been formulated that will further reduce the risk level in this port. MARIN