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Curtains on Board Tanker for Preventing Spilt Oil Diffusion

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ABSTRACT

Oil pollution caused by tanker accidents is increasingly becoming a serious public issue. Even if a large quantity of oil spills from the tanker, there are no effective countermeasures that seamen can take by themselves. Most oil spills occur at the early stage after the accident. In addition, no other support can be expected just after the accident because rough weather conditions often continue for several days, preventing spill control operations. Therefore, some effective devices which can be operated by seamen themselves should be boarded. In this paper, the authors propose a new device to prevent tanker-spilt oil diffusion. It encloses a hull with curtains whose depth is nearly equal to the full load draft of the ship, and sinkers are mounted on the foot of the curtain to be stabilized in water. Through some two-dimensional model experiments, it is shown that the device performs better than an oil boom in preventing or reducing tanker-spilt oil diffusion. Furthermore, it becomes clear on the basis of a full-scale performance of a curtain that one of the most practical setting method of the device is to handle the curtain rolled in the shape of a rope.

INTRODUCTION

Conservation of the oceanic environment is one of the most important obligations for seamen. Thus, they should endeavor to prevent oil from spilling out of their ship and should always prepare effective countermeasures to be taken during the accident. In the past, for designs of oil-containment devices and their effective operations, spilt oil behavior (e.g., Chung, 1977) and performance of the devices (e.g. Ueda et al., 1985) have been researched. In addition, although many kinds of devices have been developed to prevent oil pollution, not only are there no effective countermeasures to be taken by seamen when a large quantity of oil spills, but also almost all of the devices have needed some other support for their operation. For example, an oil boom, which is one of the most typical devices to prevent spilt oil from diffusion, cannot be set on the sea surface without support of jolly boats.

To take an effective countermeasure for preventing oil pollution, it is important to prevent spilt oil from diffusion as early as possible. However there exist no devices that can be operated effectively just after an accident.

In this paper, first, the authors propose a new device (Kubo et al., 1991) designed so that a seaman can operate it effectively to prevent spilt oil diffusion in several minutes just after an accident. Second, the effects of the device are discussed on the basis of some results (Kubo et al., 1994) of two-dimensional model experiments. Finally, a practical operational method of the device is presented as the result (Kubo et al., 1995) of a full-scale experiment carried out on an actual ship.

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KEY WORDS: Tanker accident, oil spill, oil pollution, device for preventing spilt oil diffusion, oil curtain, oil boom.

NEW DEVICE TO PREVENT SPILT OIL DIFFUSION

Fig. 1 shows wind velocity and wave heights in Niigata offing of the Japan Sea, where the *Juriana* accident occurred in 1971. Wave heights are 3 m or more for a quarter of a month, and 2 m or more for a half month. Wind velocity is 15 m/s or more for one-fifth of a month, and 10 m/s or more for a half month.

An existing typical device to prevent spilt oil diffusion is an oil boom, which needs some other support such as a jolly boat to be deployed on the sea surface. Even if a device has sufficient performance to prevent spilt oil from diffusion, if the device needs some other support to be set, it is impossible to use the device under the rough weather condition as shown above, because the support can not be expected.

Fig. 2 shows the quantity of oil remaining in a ship's tank at the beginning stage of an oil spill, which is calculated by the simple Bernoulli's theorem. It can be seen from this figure that most oil

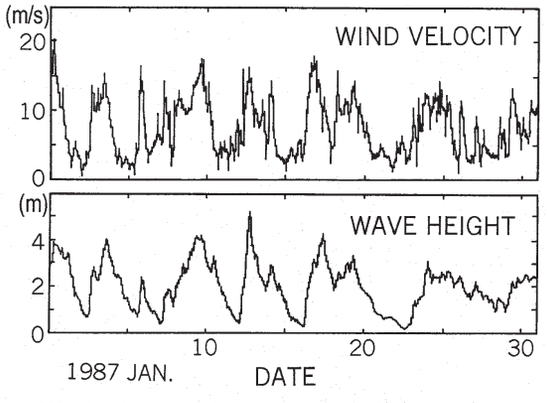

Fig. 1 Wind velocity and wave height in Niigata offing of Japan Sea