

## 4. Summary

Based on our investigation reports on fatal and injury accidents related to on-board works including the three serious accident investigation cases mentioned in this digest, we summarized how these accidents occurred, and what the lessons which will help prevent recurrence are as follows.

### How “Fatal and injury accidents related to on-board works” occurred

- ◆ By the type of accidents and by the type of works  
By the type of accidents, there were 38 cases of fatal accidents (40 % of the total), while works such as mooring and anchoring, stevedoring and working inside tanks and holds accounted for 70% of the total, by the type of works when the accidents occurred.
- ◆ The breakdown of fatalities and the injured  
The number of fatalities was 41 (35.3%), while the seriously injured and the slightly injured were 43(37.1%) and 32(27.6%), respectively. The breakdown of the fatalities and the injured by the occupational category was, crew 84 (72.4%), workers 30 (25.9%) and others 2 (1.7%).
- ◆ By the type and tonnage of vessels  
The number of cargo ships was 43 (45.3%), the largest among all, while, by the tonnage, vessels in the range of 100 to 1,600 tons accounted for about 50% of the total.
- ◆ By the type of deaths and injuries  
The number of contacts and heavy blows was 26 (27.4%), fall and man overboard 24(25.3%) and crush 23 (24.2%).

#### Accidents during mooring and anchoring

- By the type of deaths and injuries, contacts and heavy blows accounted for 35.5% (11 cases) while crush 25.5% (8 cases).

#### Accidents during stevedoring

- By the type of deaths and injuries, fall and man overboard accounted for 39.1% (9 cases) while crush 34.8% (8 cases).
- The number of fatalities and the injured in this category was 35, the largest among all.

#### Accidents during working inside tanks and holds

- By the type of deaths and injuries, anoxia and toxic gas inhalation accounted for 46.1% (6 cases).
- The number of fatalities accounted for 82.3% (14 persons).

### Lessons from serious accident investigation cases

- ◆ During discharge of copper sulfide concentrate, anoxia was developed (Serious Accident Case 1)
  - Lesson ① Before entering enclosed space, O<sub>2</sub> and gas concentration should be measured properly, and should carry out forced draft when the concentration is found dangerously high, and wait until it becomes within a safety level.
  - Lesson ② Should get fully familiar with appropriate measures to deal with cases of a fatal accident which may occur in cargo holds loaded with copper sulfide concentrate.
  - Lesson ③ Should understand the properties and risks of copper sulfide concentrate and floatation reagents adhering to it.
- ◆ A mooring rope was broken and snapped back, hitting mooring workers, and took their lives. (Serious Accident Case 2)
  - Lesson ④ Should recognize the hazardous zone caused by the snap-back of broken ropes, and when it is necessary to work at a place near ropes put under tension, should complete the work swiftly and leave the zone as promptly as possible.
  - Lesson ⑤ Should carry out a routine inspection of any degradation of fiber mooring ropes which are partially in touch with the bend point of a sheer strake, since it is hard to identify degradation

### A word from Director for Analysis, Recommendation and Opinion

The accidents presented in this digest are not associated with vessel navigation, but mooring, stevedoring and working in tanks and holds.

These type of accident may not happen frequently compared to collision and capsizing of vessels, but they suggests that factors easily overlooked in normal situations can lead serious accidents.

To prevent recurrence of similar accidents, it is important for the crew members and workers to understand the properties and risks pertaining to the loaded cargo, the facilities and instruments on the vessel. And I believe that this will accomplished only by taking appropriate initiatives in the industry, such as providing safety education and training regularly.

**Your comments are most welcome**

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