

## IS THERE AN EASY SOLUTION TO MOORING ACCIDENTS

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### ABSTRACT

The most dangerous tasks carried out onboard ships are mooring operations. Data collected by various parties of maritime industry such as Australian Maritime Safety Authority (AMSA), Protection and Indemnity Clubs (P&I Clubs). And Marine Accident Investigation Branch (MAIB) indicates that mooring accidents occur regularly and often result in deaths. These accidents may result in claims including severe injuries or fatalities to the crew. While there have been various innovations to reduce the hazard associated with traditional mooring systems. This paper reviews some of mooring accidents, to address some of the key factors and dangers associated with mooring operations and highlight areas where improvements could be made to find an easy solution to mooring accident.

**KEYWORDS:** Berthing, Crew, Mooring Accidents, P & I Clubs

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### Article History

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## 1. INTRODUCTION

Mooring is the term used to describe a vessel which is being tied to the quayside or moored to buoys [1]. Due to varied configurations for berthing operations; mooring patterns may range from being simple and repetitive to complex, innovative and often ‘one-off’ operations. Whilst the simple/repetitive mooring operations may appear less challenging, the risk of complacency, leading to reduced situational awareness among crewmembers at mooring station, may be enhanced and thereby increasing the possibility of an incident.

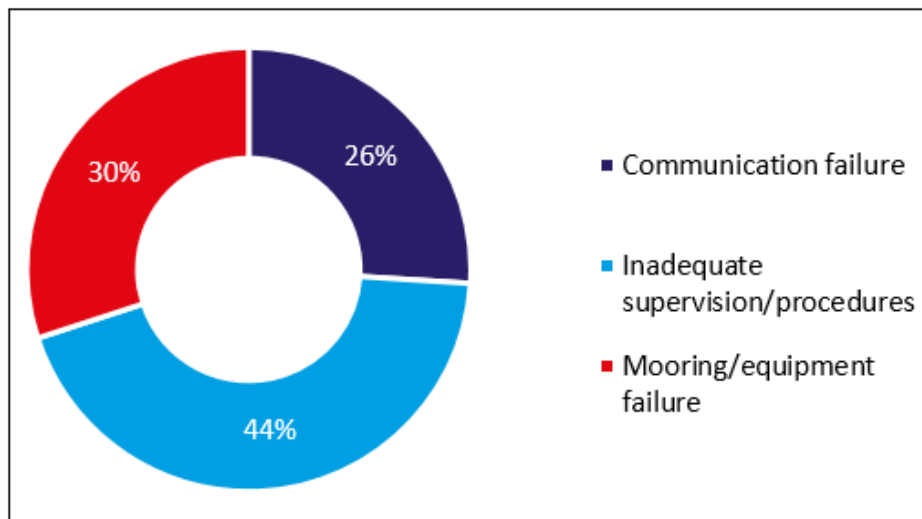
The mooring operations require three parties to work together at same time, the forward mooring team, the aft mooring team and the bridge team. Any actions taken by one of these teams will have a knock-on effect on every other party and so it is critical to the safe completion of the task that all parties work together closely [2-4]. The mooring operation should be conducted strictly according to an agreed plan, however if for any reason the plan is to be change, the officer in charge must be ensure that all members of his mooring team understand the new plan and are aware of any potential changes to the identified snap-back zones of ropes or wires. Throughout the mooring operation all crewmembers should ensure that the other members of the mooring team are not standing in dangerous areas. Mooring equipment inspections and maintenance should be included into the vessel's maintenance system in order that all equipment and fittings are inspected regularly on an ongoing basis and prior to every use.

## 2. PURPOSE AND METHODOLOGY OF THE STUDY

Most of the previous studies regarding mooring accidents analysis have been based on quantitative methods, such as mooring accidents and incidents reports of which the results have been analysed statistically. The number of mooring accidents is still increasing. Thus, we could consider that the results of the previous studies were more or less representative when providing the general picture. The purpose of this paper is to study, selected fatal mooring accidents to address some of the key factors and dangers associated with mooring operations and highlight areas where improvements could be made. In order to determine an entirely current picture of mooring accidents causes, more than 35 semi-structured interviews with experts working masters were undertaken. Also questionnaire items expressed were participants personal opinions based on extensive experience gained within their organizations and the shipping industry generally.

## 3. MOORING ACCIDENT CLAIMS

The Ship owners Club issued the latest in a series of risk assessment articles emphasizing on risk assessments from mooring and unmooring operations. In 2016, the Club has experienced a high volume of claims which arose from three main areas of causation [5]. Figure 1 demonstrate those areas as following:



**Figure 1: Distribution of Causation Analysis Claims in 2016.**

- Inadequate supervision/procedures, 44% of total claims, these include claims arising from a lack of supervision of the task, inadequate or non-existent procedures or a failure to comply with existing procedures.
- Mooring/equipment failure, 30% of total claims, these include claims which involved a failure of mooring equipment, mooring ropes and anchors used for mooring.
- Communication failure, 26% of total claims, these include claims arising from communication failures between the various teams involved in mooring operations such as, the bridge team, the pilot and the deck mooring team as well as the tugs/ shore mooring personnel.

## 4. FATAL MOORING ACCIDENT

It is not uncommon that mooring ropes part under different adverse circumstances such as strong winds, malfunctioning winches, strong currents and tides etc. Though the parting of the mooring rope was the determining accidental event, it is

not a sufficient explanation for understanding why the normal task of mooring the ship resulted in a fatality. A determining factor for the fatality was the fact that the crewmembers were challenged by the basic design of the mooring arrangement, i.e. lack of overview, small working area and exposure to ropes under tension. In that workplace environment with changing operational circumstances, the accident occurred.

Furthermore, it is inherently difficult to identify and assess the specific risk factors, while negotiating these risks with the goals of everyday work – e.g. working fast to get the ship alongside in ad-verse weather conditions.

Table 1 showing selected fatal mooring accident with different causes; mooring line may cause a catastrophic accident for nearby crewmember in many ways:

- Faulty or damaged equipment causing mooring lines to snap.
- Cinched cables or mooring lines that have been tied too tightly.
- Incidents caused by inexperienced or insufficient crew.
- Tripping over cables or mooring lines.
- Poor seamanship practices and did not function as an effective team.

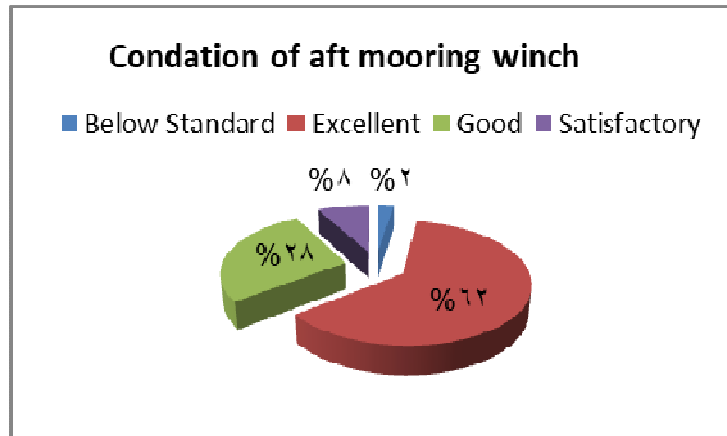
**Table 1: Fatal Mooring Accident**

Accident Date	Ship's Name/Location	Ship Status	Personnel Property Injure/Death	Comment
08/10/2019	Yalikoy Sagunto, Spain	mooring	yes	The Chief Officer of the Yalikoy was struck on the head by a snapped mooring line and was killed instantly. And another crew member was injured on one hand [6].
10/09/2019	Unison Medal Ilo Port, Peru	Alongside	yes	Master of bulk carrier Unison Medal was reportedly, hit by broken mooring line and died on the spot. While he went to assessing the mooring situations fore and aft in strong wind [7].
18/11/2017	Eleni M Porto Marghera	Unmooring	yes	Crew member got trapped between the mooring rope on the winch drum and the deck on the poop deck. the crew members had to engage physically with the ropes while the winch was rotating[8]
10/09/2015	Ocean Gold Calaca, Philippine	mooring	yes	An ordinary seaman's left side neck was hit by forward spring line bounced off from beneath the berth fender and ejected towards the OS [9].
02/03/2015	Zarga Milford Haven	mooring	yes	A deck officer suffered severe head injuries when he was struck by a parted HMPE mooring rope during a berthing operation[10].
03/10/2013	Atair J Aarhus	mooring	yes	The spring line parted shortly after having been secured to the quay bollard. It struck the bosun who was standing in the enclosed forecastle causing fatal injuries[11]
02/10/2012	Wah Shan Immingham	mooring	yes	The carpenter on board bulk carrier Wah Shan was struck by a messenger line while he was attempting to secure a tug's tow wire in preparation for the vessel berthing[12].

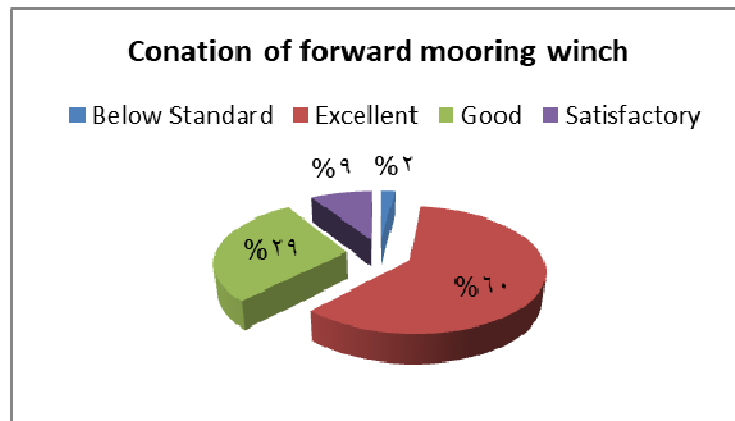
**5. DESIGN AND ANALYSIS OF QUESTIONNAIRE**

To identify the actual causes of mooring accident and area to be improved, questionnaire items selected through literature review of mooring accidents were revised and edited to fit the maritime crews. Meanwhile, considering the busy schedules of seafarers, a short questionnaire was required. The questionnaire was targeted at deck officers, including captains, chief mate and second officers. The survey was conducted from 21st October 2019 to 10th November at Maritime Examination Center and Upgrade Studies Institute in Alexandria, Egypt. Seafarers in active service were targeted, and 179 respondents replied. Excluding the unanswered questionnaires, the questionnaires of 125 respondents were utilized for the analysis.

**5.1. Winches, Ropes and Equipment**

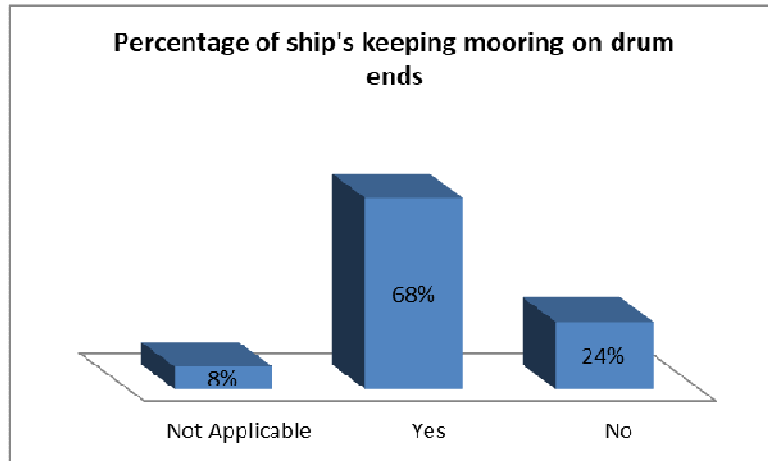


**Figure 2: Questionnaire Regarding of Aft Mooring Winch.**



**Figure 3: Questionnaire Regarding Condition of Forward Mooring Winch.**

Some of senior officers through the interview noted that, despite the overall good condition of the mooring winches, it was sometimes difficult to grease the equipment correctly. It is important that all greasing points are free, working correctly and have not been painted over. 48 % of the participants of the questionnaire carried out brake tests annually, 36% did not and 16% it was not applicable. Figure 4 explains the percentage of questionnaire regarding ship’s keeping mooring on drum ends.

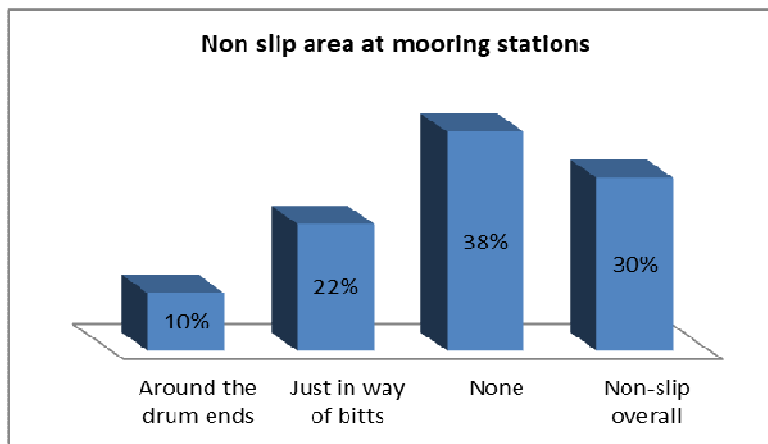


**Figure 4: Statistics of Mooring on Drum Ends.**

The Figure show that about 68% of the participants noted that last ship of their joining, vessels kept moorings on the drum ends instead of making them fast. Most of senior officers through the interview noted most of vessels had painted the drum ends. And all ropes, wires and Tonsberg links used for mooring have a certificate.

**5.2. Decks and Bitts**

With reference to the non-slip area at mooring stations; Figure 5 illustrates the types of deck area at mooring station.



**Figure 5: Questionnaire of Non-Slip Area at Mooring Stations.**

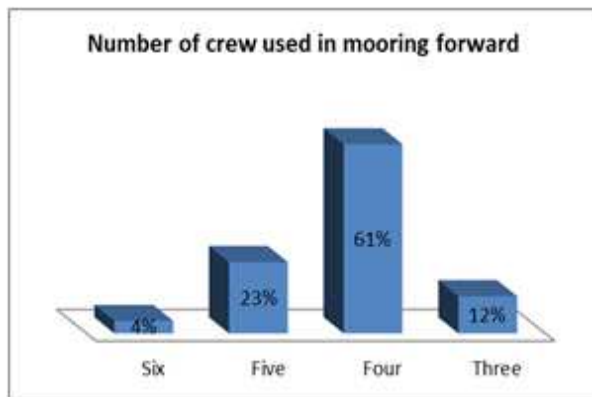
Despite 30% of last ships for the participants having fully non-slip decks and 38% had none at all. It is a fact that mixing sand, or an approved non-slip aggregate, into the paint prior to application can be a very effective measure in helping to reduce mooring accidents. Through the interview most of senior officers noted that bitts, rollers and fairleads were generally in good order.

**5.3. Practices and Procedures**

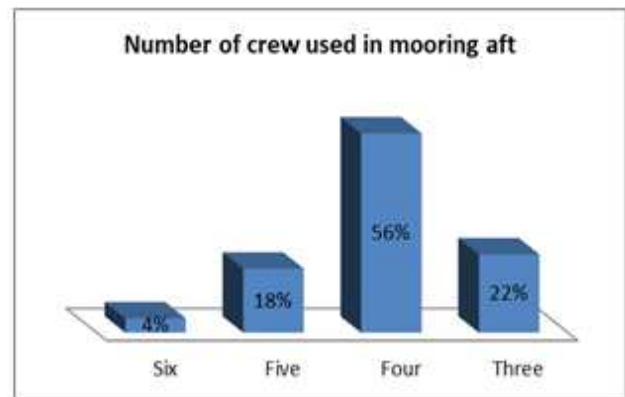
The first key factor that arose from the interview with senior officers related to the practices and procedures onboard last ship was mooring arrangements not satisfactory. Some of participants have seen an incident occur when non-deck crew are used during mooring operations. All crew should be trained and be familiar with bights, snap-back zones and the hazards associated with mooring operations. It is very important to have sufficient personnel forward and aft stations to be able to moor the vessel safely and effectively. The second key factor raised from the interviews and questionnaire was that 21% of

ships used mixed moorings and 14% of vessels did not use the correct stoppers, both of these points contribute to mooring accidents and should be rectified onboard, it is vital that the correct stoppers are used with the appropriate mooring ropes/wires. Stoppers should not be left around the mooring ropes once they have been made fast to the bits.

It is important to have sufficient personnel to be able to moor the vessel safely and effectively. Figure 6 and 7 illustrate the most common number for both forward and aft was 4 crew member with numbers ranging from as low as 3 (22% aft, 12% forward) and as high as six (4% forward and aft). The third key factor raised is predominantly related to procedures and practices, the use of insufficiently trained crew is still a significant issue.



**Figure 6: Number of Crew in Mooring Forward**



**Figure 7: Number of Crew in Mooring Aft**

## 6. CONCLUSIONS

The mooring operation is a challenging task for even the most skillful ship handler. The worst-case scenario is of course a crew member getting injured. Accidents always happen while you are unprepared, believing the operation to be going smoothly and efficiently. Although the causes of mooring accident are clear and explicit, however, it is still reoccurring. The questionnaire and interviews indicated that the standard of general equipment was relatively high. To reduce the risk of an accident the vessel and equipment must be maintained to a high standard, all personnel should be adequately trained with the correct personnel Protective Equipment, the correct procedures should be in place, work permits issued and all mooring operations should be supervised by a competent person. Training in mooring operations should be incorporated into the vessels regular training schedule and include all personnel who are to be involved.

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