

IUMI Position Paper

Firefighting systems on board container vessels

1. Current situation

Major fires on container vessels count among the worst hazards of the global shipping industry. Names such as the "Hanjin Pennsylvania" (4,000 TEU; fire on November 11, 2002, two fatalities, constructive total loss), the "Hyundai Fortune" (5,551 TEU; fire on March 21, 2006) and the "MSC Flaminia" (6,732 TEU; fire on July 14, 2012; three fatalities, two seriously injured, constructive total loss) are just a few of the best-known examples from the past.

Every ineffective attempt to put out such a major fire increases the damage to the cargo, the vessel and the environment. Moreover, the crew is in great danger when a fire breaks out on board. Crew members face considerable risks when fighting such fires with the equipment currently required by law. Some, as was most recently the case with the "MSC Flaminia", are unable to extinguish or contain the fire and ultimately pay with their lives.

In remote locations and on the open sea, it can often be hours or even days after a fire has broken out before external assistance arrives. As a rule, only seagoing tugs carry the necessary equipment for effective firefighting. Until they arrive, the crew has to rely on its own resources and the fire can spread extensively. As a result, as with the "MSC Flaminia", it can take weeks to bring the fire under control.

To increase the effectiveness of firefighting, Chapter II-2/10 of the International Convention for the Safety of Life at Sea (SOLAS) was amended in 2014 by MSC 92, applying to new ships constructed on or after 1 January 2016. Although these changes represent a first step in the right direction, and are expressly welcomed by IUMI, they do not go far enough. A concern remains with the firefighting arrangements on existing ships. Even with the new regulation, there is a risk that fires on board cannot efficiently be fought without putting members of the crew in immediate danger.

With the growing size of container vessels, the challenge of insufficient firefighting arrangements is becoming even greater.

2. Prevention matters

Containers often contain a wide range of hazardous and toxic substances and insufficient declaration of a container's content has, in IUMI's view, a significant impact. Although no reliable figures exist, it is IUMI's belief that a considerable amount of container content is declared wrongly which may lead to insufficient handling of the container as well as an incorrect firefighting strategy. This may increase the danger of combustion of the goods in the container.

3. Inadequate existing firefighting regulations

The legal requirements prescribed by SOLAS were originally developed for the situation on general cargo vessels. On this type of vessel, the cargo is stored openly in the holds and when fire breaks out, the air space within the hold immediately fills with smoke making a fire easy to detect. Once a fire is detected, the hold in question can be sealed off and CO² can be used directly on the fire.

However, this mode of firefighting is not suitable for container vessels:

- The fire detection systems specified in SOLAS do not enable effective detection of incipient fires in a container. To discover a fire, air from the hold, more or less directly below the deck, is usually extracted and passed in front of a photoelectric cell on the bridge. If the air contains smoke particles, the contact between the photoelectric cell and the opposite light source is interrupted and an alarm is triggered. For this to happen, however, the hold must already be full of smoke up to the level of the hatch cover. On a container vessel, the fire will already have spread by this point.
- The effectiveness of spraying CO² into the hatch is also doubtful for two reasons: First, with a closed container the CO² cannot act directly on the burning cargo as it will not penetrate through the container wall. Secondly, if the oxygen content of the container or the cargo is high, the CO² will be completely ineffective.
- If the fire develops further, it is inevitable that it will spread to the deck. In contrast to a general cargo vessel, fire spreading to the deck load on a container vessel will have even more catastrophic consequences. With the exception of the superstructure, there are no natural fire compartments on deck. Due to a lack of suitable equipment, it is practically impossible to cool the deck by using water.
- In addition, the detection of a fire on deck is left to chance. SOLAS does not stipulate that fire detectors must be fitted on deck. A fire is only discovered if a perceptible amount of smoke is produced, the fire results in sounds that drown out the ordinary noises of the ship, or if flame is discernible..

4. Best Practice

Attached to this IUMI Position Paper is a proposal from the German Insurance Association GDV which outlines an improved concept for firefighting facilities onboard container vessels. As an example of the work undertaken on this issue by classification societies, the ABS “Guide for Fire Fighting Systems for On-Deck cargo Areas of Container Carriers”¹ may be consulted.

¹ See https://ww2.eagle.org/en/rules-and-resources/rules-and-guides.html?utm_term=www.eagle.org&utm_campaign=TEST-ABS%20Expands%20Industry-leading%20Guidance%20for%20Fire%20Protection%20on%20Containerships&utm_content=email&utm_source=Act-On+Software&utm_medium=email&cm_mmc=Act-On%20Software- -email- -TEST-ABS%20Expands%20Industry-leading%20Guidance%20for%20Fire%20Protection%20on%20Containerships- -www.eagle.org#/content/dam/eagle/rules-and-guides/current/conventional_ocean_service/199_fire-



5. Recommendation

IUMI acknowledges and embraces all efforts undertaken by the leadership of the IMO to mitigate the risks for crew, vessel and cargo caused by a fire on a container vessel. However, bearing in mind the increasing size and complexity of modern container vessels and the inadequacies described above, IUMI believes that further steps are required to improve safety.

Accordingly, IUMI recommends that the responsible authorities, class and relevant industry stakeholders engage in discussions on how to further improve the fire detection, protection and firefighting capabilities on board container vessels.

Implementation of new and improved measures to fight fires on container vessels will not only protect the vessel and the cargo, but also the lives and wellbeing of the crew.

Hamburg, 18 September 2017

About IUMI:

The International Union of Marine Insurance (IUMI) represents 43 national and marine market insurance and reinsurance associations. Operating at the forefront of marine risk, it gives a unified voice to the global marine insurance market through effective representation and lobbying activities. As a forum for the exchange of ideas and best practice, IUMI works to raise standards across the industry and provides opportunities for education and the collection and publication of industry statistics. IUMI is headquartered in Hamburg and traces its roots back to 1874.

More information can be found at www.iumi.com

Firefighting systems on container vessels

A contribution to the discussion by German Insurance Association (GDV)

Proposal on technical improvements

Firefighting operations on container vessels are limited to allowing the containers to burn out in a controlled manner in such a way that the fire cannot spread further. This approach is still correct and reasonable but, in view of the rapid pace of development towards ever larger ships, new technical solutions are also required. It is impracticable to monitor each container separately and provide it with its own fire-detection and firefighting means. And even if it were technically possible, economic considerations are unlikely to make such a solution viable. This also applies to complete container stacks and bays.

To enable the controlled burning of a limited number of containers without losing sight of what is economically feasible; separating a ship into fire compartments offers an effective and efficient solution. It would be expedient to utilize the existing division of the ship below deck (hatches) for establishing fire compartments. A fire compartment can range over one or more hatches. Vertically, the fire compartments are demarcated by the hatch covers and the deck. Below deck, the fire compartments are demarcated by the bulkheads and the hull. By additionally cooling the ship's structure, the effectiveness of the fire compartment below deck is ensured. With fires below deck, the aim is to maintain the stability of the vessel's hull including the deck and the hatch covers, and to prevent the fire spreading to the deck and to the adjacent neighbouring holds.

On deck, the lashing structures to secure the container using rods and turnbuckles in the higher levels (5-7) can be used and extended for vertically separating the fire compartments. By providing additional sprinklers on the lashing structures, the fire is prevented from spreading to other fire compartments; monitors enable the fire to be attacked in a targeted way.

Fire compartments below deck:

To enable fires in the individual fire compartments below deck to be attacked effectively, in addition to the CO₂ firefighting system, a water-based firefighting system must be installed. This system should be suitable for cooling the vessel's structure including the hold walls, the bulkheads, the tank deck, the hatch covers, the deck and the cargo. Only this additional cooling will prevent the negative thermal influence of the fire on the structure of the vessel and thus avoid the fire spreading to other fire compartments.

The water supply should have ample capacity in order to be able to supply at least three fire compartments simultaneously. This enables firefighting even in the event of a fire spreading from one fire compartment to adjacent neighbouring ones. To provide a degree of redundancy, the water-based firefighting system must be able to operate entirely independently of the CO₂ firefighting system.

If it is not possible to ensure that the vessel has sufficient damage stability for every load situation, either the bilge pump system must be powerful enough and also have to be designed so there is clear, unrestricted flow of water out of the hold to safely cope with the water being used to fight the fire, or a water-saving firefighting system, e.g. fine water mist (hi-fog), must be used. In the latter case, the hatch cover could be flushed through with water as a "tank" in order to dissipate the heat. The "wastewater" would run off above deck. Nevertheless, firefighting with water is preferable. Past experience has shown that hatch fires can only be extinguished if the respective section is flooded with water.

Fire compartments on deck:

The boundary structures of the fire compartments on deck must be positioned vertically in such a way that they align with the water-cooled bulkheads below deck. Otherwise if a fire broke out below deck and spread to the deck, there would be a risk of it affecting two fire compartments on deck.

The boundary structures are to be constructed in such a way that they can accommodate a water-based firefighting system. This must ensure that deck cargo up to the maximum height and width can be cooled with water curtains, including the fore and aft sides of the fire compartment. At stack heights that permit only empty containers, it is sufficient if the fire compartment is protected by sprayed water, e.g. water shields. In addition, it must be possible to fit to the boundary structures with at least one monitor from which any position of the fire compartment (fore and aft) can be reached at wind speeds up to force 9. So that the monitors do not get in the way during loading and firefighting operations, and are also protected from damage by container crane movements, they should be telescopic. It must also be possible to control the monitors remotely so that they can be operated irrespective of fumes in the atmosphere on deck. Likewise, suitable cameras are required which give the crew a 180° view in the spray direction of the monitor.

The water supply for a fire compartment must be designed in such a way that their firefighting systems, including the monitors on the boundary structures, are able to cool the structural elements of the fire compartment boundary sufficiently on both sides so that their stability is never in danger and the flames and heat radiation from a fire are prevented from spreading to or penetrating other fire compartments.

Fire detection systems

To detect fires as early as possible, infrared cameras, thermal sensors or similar systems that detect any substantive warming of a container could be used. On deck it would be expedient to use infrared cameras which are mounted on the fire compartment boundary structures and are mechanically protected. There are no structural elements suitable for thermal sensors or similar systems on deck. However, the vessel's structure below deck offers good possibilities for deploying thermal sensors or similar systems.

The systems used must not trigger false alarms in the event of temperature fluctuations such as may occur in refrigerated containers for example.

Superstructures

All the ship's superstructures must be protected fore and aft against the effects of flames and heat by effective water curtains. The superstructures form a fire compartment boundary and provide a refuge for the crew. They also house the technical equipment for operating both the ship and the firefighting systems. In order to be able to attack or cool fires from a safe distance with large quantities of water, monitors must be installed on the fore and aft sides of the superstructures as on all the other fire compartment boundary structures.

Lifesaving equipment such as lifeboats and life rafts must also be protected by their own water curtains that can be activated on demand.

Conclusion

Implementation of all described measures would not only protect the lives and health of the crew members, the environment but also the vessels, their cargo and the environment. In the event of a fire, separation into fire compartments plus additional firefighting systems would enable the crew to more effectively attack and suppress fires and thus prevent them from spreading putting the hull, cargo and crew at risk.

By attacking and suppressing fires more quickly and more effectively, it is possible to reduce the amount of water used for extinguishing them and consequently minimize harm to the environment.

An adequately dimensioned firefighting system with partitioning into fire compartments

