Serious Marine Casualty - Chemical reaction within fertilizer load on the PURPLE BEACH, German Bight 25 May 2015

The following is taken from the German Federal Bureau of Maritime Casualty Investigation Report 198/15. It gives the findings from a fertiliser chemical reaction on board the vessel Purple Beach in 2015. Thankfully there were no fatalities, injuries or pollution. However, the vessel was eventually scrapped.

ICHCA is currently leading on a proposed amendment to the IMDG Code regarding safe carriage of Ammonium Nitrate, though it should be noted that this work relates to different types of AN product than those on Purple Beach.

Summary

Multi-purpose carrier Purple Beach was proceeding to Brake on 25 May 2015 with various types of fertilizer in lower cargo holds 2, 3, 4 and 5. Various general cargo was additionally stowed in hold 1 and in the tween decks of cargo holds 3 and 4.

The ship anchored in German Bight deep water. During the anchor manoeuvre, the master noticed smoke in the area of cargo hold 3, visible from the bridge. An initial survey was carried out. Later, an individual wearing breathing apparatus attempted to investigate cargo hold 3.

- ability to open tween deck hatches was an identified factor in this incident
- CO2 extinguishers not seen as a suitable control medium for this reaction
- copious amounts of water required to control the reaction
- potential risk to crew/ firefighting professionals attempting to respond could mean that access via hatches or remaining on the vessel at all is considered an unacceptable risk

LINK: https://www.bsu-bund.de/SharedDocs/pdf/EN/Investigation_Report/2018/Investigation_Report_198_15.pdf;jsessionid=1C899DE84A80CDFE4A77F7BB2342C4A7.live21303?__blob=publicationFile&v=2

This attempt was aborted due to the dense smoke rising from the cargo hold entrance booby hatch. Realising the smoke generation might be connected with the cargo of fertilizer in the lower hold of cargo hold 3, ship management was consulted and C02 extinguishing agent deployed.

Shore was notified 2.5 hours after C02 deployment. VTS Bremerhaven prohibited entry. Command passed to German Central Command for Maritime Emergencies at 0259 on 26 May. A fire service fact-finding team reached Purple Beach by helicopter at 0500.

The firefighters established that the smoke was a result of decomposition of ammonium nitrate-containing fertilizer on board. A significant outbreak of smoke subsequently developed; taken with earlier readings by the firefighters this was indicative of imminent explosion. Due to the risk of potential accelerated decomposition the vessel was no longer considered a safe platform and all firefighters and crew were evacuated safely. Crew and firefighters exposed to decomposition reaction residues were decontaminated, examined, and flown to various hospitals as a precaution.

Three response vessels ordered to the scene used hoses to cool the distressed vessel and suppress the smoke. The assumption was that an exothermal self-sustaining decomposition of ammonium nitrate based fertilizer had occurred in hold 3 and was ongoing. Cargo hold 3 was flooded with water over the next few days, stopping the reaction. The ship was then towed to a place of refuge in Wilhelmshaven, where the BSU investigation began.

Unloading operations and disposal of contaminated water competed in July 2016. Towing to Turkey for scrapping began in March 2017. There were no fatalities, serious injuries or water pollution from the incident.

The volume of cargo to volume of the lower hold implies that the cargo hold was completely filled.

Summary of German Federal Bureau of Maritime Casualty Investigation recommendations

- ship's management alter its ISM system with regard to sensitive cargo to avoid future violations of the requirements of the IMSBC Code for stowing over hatch covers that should be kept accessible, for welding in the vicinity of substances listed therein and for the acceptance of fuel while certain cargoes are being loaded or unloaded.

- ship's management inspect cargo hold lights installed on its ships, so as to ensure they comply with the specifications set out in the Annex to the List of Equipment of the Document of Compliance for the Carriage of Solid Bulk Cargoes.

- IMO to classify ammonium nitrate based fertilizers (non-hazardous) under Group B, to highlight the hazards associated with them more clearly.

- IMO to ensure that in addition to the manufacturer's product description, ammonium nitrate based fertilizers also be clearly described with regard to dangerous components, such as chloride and phosphate, to provide for better identification.

- IMO to ensure that the result of a current trough test (UN Manual of Tests and Criteria, part III, subsection 38.2) be provided to masters or their representative before loading.

- IMO to ensure that the solid bulk cargo definition suffix 'non-hazardous' be deleted because it fails to account for the hazards actually posed during loading and carriage sufficiently.

- IMO to ensure that unpowered tween deck hatch covers always be open to ensure maximum ventilation and heat dissipation even under adverse conditions.

The MSDS for the AN product that chemically reacted in cargo hold 3's lower hold states that it does not constitute dangerous goods and is not flammable. However, it must be kept clear of heat and ignition sources. Contact with organic materials should be avoided during storage. When heated above 130C , dangerous gases may develop due to the onset of decomposition. These gases include nitrogen monoxide, nitrogen dioxide and nitrous oxide. The MSDS states that sand, foam, C02 and chemicals are not suitable for firefighting (respectively the termination of a thermic decomposition). Water in larger quantities was a suitable media to stop thermic decomposition.

Current ICHCA work on carriage of Ammonium Nitrate

ICHCA is leading a proposed amendment to the IMDG Code regarding safe carriage of Ammonium Nitrate. This specifically relates to the need to be able to open upper and tween deck hatches in the event of a fire involving AN stored in a lower hold.

In this instance, ICHCA's proposal relates to carriage of technical grade AN under UN1942 and UN2067 in reefer vessels, not the material carried in the Purple Beach which was a multi-purpose carrier and not a reefer vessel.

Despite the difference in material and vessel type, the following points are of interest in relation to the ICHCA work:

- the ability to open tween deck hatches was an identified factor in this incident

- BSU do not consider CO2 extinguishers to be a suitable control medium for this kind of reaction; copious amounts of water are required to control the reaction

- potential significant risk to crew and firefighting professionals attempting to evaluate and respond to the chemical reaction could mean - as was found in this instance - that access via personnel hatches or even remaining on the vessel at all is considered an unacceptable risk