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Misdeclared container caused fire

It was early morning and from the bridge the Master saw a large cloud of smoke issuing from the forward part of the vessel. At the same time the fire detection system for cargo hold 2 sounded on the bridge. The Master described the smoke as being white at first and then greyish. The Chief Officer, however, described the smoke as being "dark grey, almost black".

The ventilation fans for the cargo holds were stopped. The fans for cargo hold 2 were not operating at that time but natural ventilation was being provided for the holds as the covers for the vents were open. Crew members closed the covers of the vents for cargo hold 2 and no crew member entered the cargo hold.

Discharge of CO₂

Meanwhile the Master navigated the ship to a nearby anchorage. After various checks had been performed, the Chief Engineer released the contents of 197 CO₂ cylinders into cargo hold 2. This discharge was the designated full complement of CO₂ required for the hold, and appeared to extinguish the fire. A couple of hours later smoke began to issue from the hold and a further 57 CO₂ cylinders were released into cargo hold 2. About six hours later smoke was observed issuing from cargo hold 2 and the Chief Engineer released a further 57 CO₂ cylinders.

Salvors boarded the vessel the following morning. Shortly before midnight, temperature checks were completed by the vessel's crew indicating that the temperature in cargo hold 2 was rising so five more CO₂ cylinders were released. In the morning another 15 CO₂ cylinders were released. The salvors entered cargo hold 1 and measured the temperature for the bulkhead to cargo hold 2 - it was 83°C. It was decided that cargo hold 2 should be filled with water from the fire hydrants. The water filled three container tiers up and after a couple of hours the salvors considered the fire to be extinguished.

Dangerous cargo

The container where the fire started was not declared as dangerous cargo but was actually loaded with calcium hypochlorite and had been misdeclared by the shipper. The charterer had loaded the container as per the rules of the IMDG code. As per the manifest, the container was allowed to be loaded in the cargo hold, but as the cargo was calcium hypochlorite it should not have been loaded below deck or in the position it was stowed in.

What can we learn?

Cargoes that fall into this category include calcium hypochlorite and other oxidising solids. They are often used for swimming pool sterilisation and fabric treatment (bleaching or washing). These materials do not oxidise but they can be relatively unstable chemicals that decompose slowly over time, evolving oxygen. This self-decomposition can evolve heat. A self-heating process can therefore happen in which the material towards the middle of a body of cargo becomes hotter, so the rate of decomposition and heating increases. This can lead to 'thermal runaway' with very rapid self-decomposition and evolution of heat and gases, sometimes including further oxygen. The effects of this in a hold can be similar to an explosion. The heat and oxygen produced can lead to fire spreading.

Potential causes of self-decomposition incidents include:

- Exposure to heat e.g. solar radiation (before or after loading), cargo lights and heated fuel tanks.
- Cargo formulation.
- Contamination of cargo at manufacture.
- Spillage and thus reaction between cargo and combustibles e.g. timber.
- Excess quantity of cargo in containers giving insufficient dissipation of heat.
- Inadequate separation of packages in containers, also giving insufficient dissipation of heat.