![The Swedish Club]

MONTHLY SAFETY SCENARIO

OCTOBER 2021

Indonesian coal self-ignited during discharge

A bulk carrier had loaded Indonesian coal to be discharged at another Asian port. After loading, all the hatch covers and openings were closed and sealed. During the voyage, the cargo holds were monitored by taking gas readings and temperatures. All values were within the parameters stated in the IMSBC Code.

The vessel arrived at the anchorage for the discharge port. After a short wait, discharging began, using the vessel's grab to transfer the cargo into barges. Initially, all went smoothly. However, after a few days of discharging, smoke was seen coming out of cargo hold 3. A fire team was assembled and as they approached the cargo hold, they could feel heat on the deck. The coal that remained in the cargo hold was piled by the bulkheads and was 6 metres high. More thick, dense black smoke then began to come out of the hold although no flames were visible. The atmosphere in the hold was tested by the fire team, showing a temperature of 66° C, methane gas levels at 120% LEL, and a carbon monoxide (CO) level of above 3,680 ppm.

At this point smoke then began coming out of cargo hold 4 which was almost empty. Again, the remaining cargo

in the hold was left in large piles by the bulkhead. The temperature showed 69° C, methane levels were at 144% LEL, and CO levels were in excess of 10,000 ppm. The Master informed the DPA and charterer that the coal had self-ignited and expert guidance was sought. There was now a risk of an explosion in cargo holds 3 and 4 and flames could be seen on the surface of the coal. An additional fire team was assembled, and in full firefighting gear they rigged the fire hoses and sprayed the coal with seawater. This action extinguished the fire.

The Master wanted the remaining coal from cargo holds 3 and 4 to be discharged, and so the following night the discharge from holds 3 and 4 continued onto different barges. The following day, and in conjunction with the expert's advice, the Master made the decision to flood holds 3 and 4.

There is nothing to indicate that the self-heating/combustion was in any way related to the actions of the Master and/or crew. The holds were not ventilated prior to the vessel's arrival at

the discharge port. The holds were only opened when discharging operations began. During discharge, oxygen will inevitably have entered the holds.

Indonesian coal is prone to self-heating/spontaneous combustion. This is related to oxygen combining with carbon in the coal (oxidation) and this reaction produces heat. When the heat produced cannot dissipate - in this case due to the insulation effect of the surrounding coal - the temperature of the coal increases. Carbon monoxide is produced as a result of the self-heating/combustion reaction. As the temperature of the coal increases, so does the rate of the oxidation reaction. This is why guidance is given in the IMSBC Code to close the ventilation after loading as soon as it is apparent that flammable gas is not accumulating.

Questions

When discussing this case please consider that the actions taken at the time made sense for all involved. Do not only judge but also ask why you think these actions were taken and could this happen on your vessel?

1. What were the immediate causes of this accident?

2. Is there a risk that this kind of accident could happen on our vessel?

3. How could this accident have been prevented?

4. Do we have a risk assessment for discharge operations?

5. If we do, could this risk assessment be improved?

6. If procedures were breached, why do you think this was the case?

7. Do our procedures make sense to the work we actually do?

8. Are our firefighting drills effective enough to address the problems in this case?

9. Do we have sufficient firefighting equipment to deal with a situation like this?

10. What sections of our SMS would have been breached if any?

11. Does our SMS address these risks?

12. How could we improve our SMS to address these issues?

13. Is there any kind of training that we should do that addresses these issues?