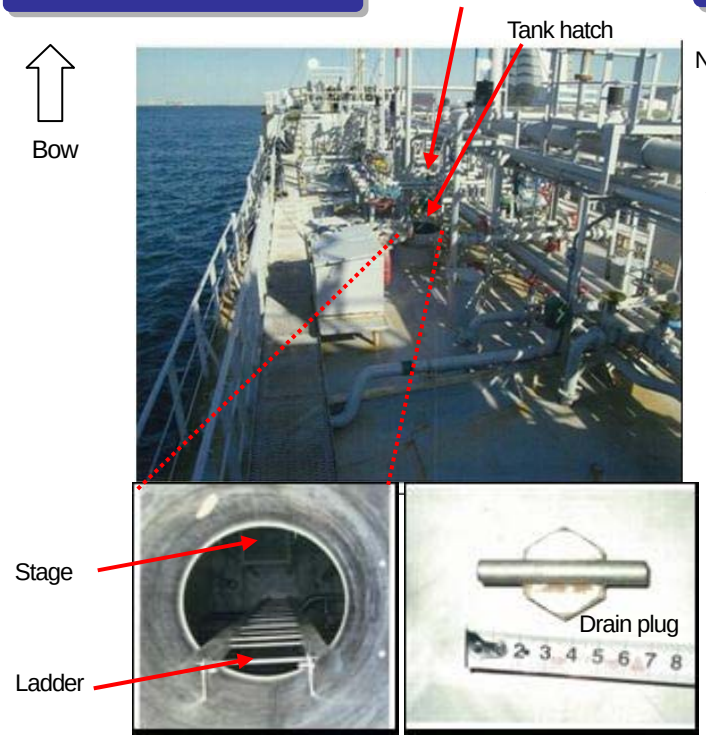
Case 2

A crew member who was engaged in cargo unloading entered a cargo tank and died of suffocation caused by oxygen deficiency

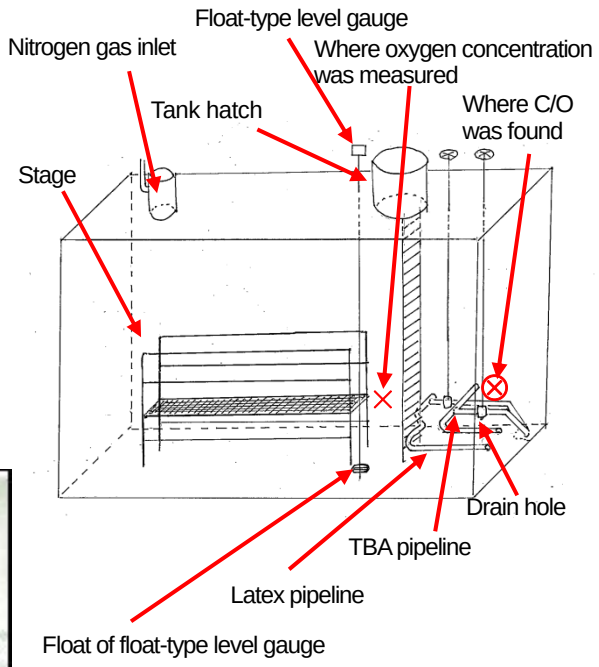
Outline: At around 13:55, March 10, 2010, while the Vessel (same as the vessel in Case 1) was unloading about 380 tons of chemical liquid cargo containing tert-butyl alcohol (TBA) at the consignee's No. 2 pier (the Pier) in Kawasaki Section of Keihin Port, the chief officer who was engaged in cargo unloading entered portside No.2 cargo tank (the Tank), and died of suffocation caused by oxygen deficiency.

The crew of the Vessel: Master, chief engineer, chief officer (C/O), first engineer (1/E) and second officer (2/O)
Workers of the stevedoring contractor: Worker A1, Worker A2 and Worker A3

State of the Vessel



Inside the Tank



Events Leading to the Accident

While undergoing a pre-loading inspection of the cargo tank cleaning by a relevant organization's inspectors at the shipper's exclusive pier in Kawasaki Section of Keihin Port, the Vessel took in TBA without restoring the drain plug of the Tank which had been removed, and sailed toward the Pier in Kawasaki Section of the port.

Around 12:00

After arriving at the Pier and having C/O confirm the stevedoring checklist and the checklist for accepting TBA carriers with Worker A1, the Vessel started unloading TBA.

Upon checking inside the Tank from the upper surface of the opened hatch to see why it became unable to unload TBA inside the Tank, C/O found that a drain plug was placed on the stage of the Tank, and was not restored in the proper position.

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Causal Factors of the Accident

It is considered probable that crew members other than C/O and 1/E were unaware that nitrogen gas was injected, although nitrogen gas was injected into the Tank and other cargo tanks as return gas (*1) for preventing explosion and negative pressure when the Vessel started unloading.

*1: Gas which is to be sent back in the direction opposite to the direction of cargo which moves from land to a vessel or vice versa, while loading or unloading work goes on.

According to the findings that the drain plug was not restored in the drain hole of the cargo pipe inside the Tank, it is considered probable that air was absorbed through the drain hole while unloading, and it became unable to transfer TBA.

Drain plug: Although once removed for undergoing a pre-loading inspection, the drain plug should have been restored in the drain hole to prevent air from being absorbed while unloading.

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In order to restore the drain plug, C/O ran for getting a gas mask without measuring oxygen concentration inside the Tank, and entered the Tank after wearing the gas mask.

C/O entered the Tank wearing the gas mask without measuring oxygen concentration.

According to the findings that C/O tried to restore the drain plug in a hurry upon finding it placed at a wrong location, it is considered somewhat likely that having forgotten nitrogen gas was injected into the Tank, C/O entered the Tank to restore the drain plug.

Around 13:55

Soon after fixing the drain plug in the drain hole by screwing it about three times, C/O stopped moving.

Worker A3 restrained a group of about three crew members of the Vessel from entering the Tank, saying that doing so would cause a secondary accident, and waited for an ambulance to arrive.

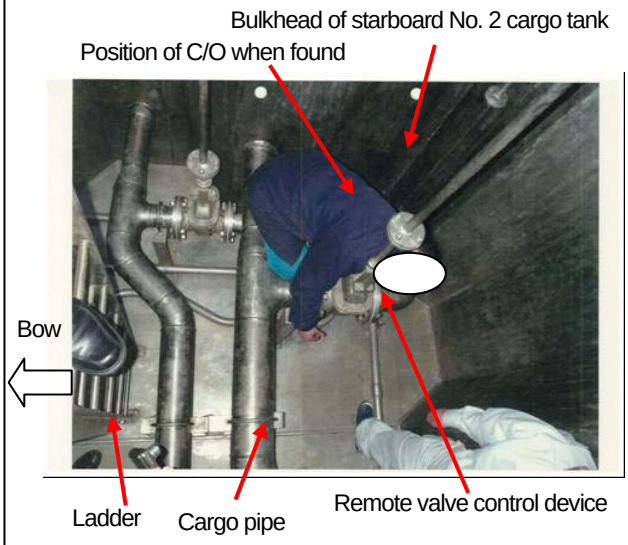
It is considered probable that being aware of accident cases caused by oxygen deficiency, Worker A3 was able to prevent a secondary accident from occurring by restraining the crew members wearing only a gas mask from entering the cargo tank.

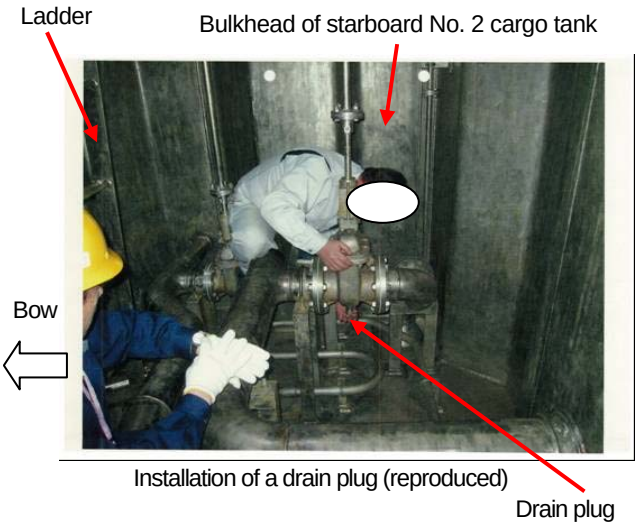
Around 14:44

It is considered probable that C/O was confirmed dead, although he was rescued from the Tank and hospitalized by a rescue team.
C/O's cause of death was suffocation caused by oxygen deficiency.

According to the findings that although the gas concentration inside the Tank was 16% at around 14:23, C/O stopped moving at around 13:55 soon after picking up the drain plug and fixing it in the drain hole by screwing it three times, it is considered somewhat likely that the gas concentration near the drain hole was not so high as to cause instant death, but to the extent of causing the loss of consciousness in a short time (10% or less).

Reproduction of the Accident Site





Installation of a drain plug (reproduced)

In Order to Prevent Recurrence

It is considered probable that this accident occurred because a crew member on board a chemical tanker entered a cargo tank without measuring oxygen concentration inside the tank, and died of suffocation caused by oxygen deficiency, although nitrogen gas was injected into the tank while unloading TBA.
Accordingly, vessel owners are required to provide the crew of chemical tankers with safety education about the possibility that a state of oxygen deficiency will be caused depending on the nature of cargo to handle, as well as the method of cargo handling, and further to instruct them never to fail to measure oxygen concentration before entering a cargo tank which is feared to turn into a state of oxygen deficiency.
Furthermore, considering that crew members other than C/O and 1/E were unaware when the accident occurred that nitrogen gas was injected into the cargo tank while unloading work was going on, and even C/O may have forgotten it, it is earnestly recommended that stevedores working on the shore side should notify the crew of a chemical tanker properly before injecting gas into a cargo tank to lower oxygen concentration.

The investigation report of this accident case is published on the Board's website (issued on July 29, 2011).
http://www.mlit.go.jp/jtsb/ship/rep-acci/2011/MA2011-7-11_2010yh0032.pdf