

Notifiable incident

Incident ID [5475](#)

Duty holder: Shell Australia Pty Ltd
Facility/Activity: Prelude FLNG
Facility type: Floating liquefied natural gas facility

Incident details	
Division	Occupational Health and Safety
Notification type	Incident
Incident date	01/07/2018 02:30 PM (WST)
Notification date	01/07/2018 03:52 PM (WST)
NOPSEMA response date	01/07/2018 04:09 PM (WST)
Received by	[REDACTED]
Nearest state	WA
Initial category type <i>(based on notification)</i>	Dangerous Occurrence
Initial category <i>(based on notification)</i>	Other kind needing immediate investigation
3 Day report received	03/07/2018
Final report received	31/08/2018
All required data received	31/08/2018
Final category type <i>(based on final report)</i>	Dangerous Occurrence
Final category <i>(based on final report)</i>	Other kind needing immediate investigation
Brief description	OKNI- High level of H2S present in sludge tank
Location	Engine room
Subtype/s	Other
Summary <i>(at notification)</i>	Operator advised that during preparation for the pump out of sludge tank in the main machinery space, the sludge tank lid was removed. A test was conducted for H2S on the tank top and the level was zero. The testing device was lowered down into the tank and the level went off the scale (>120PPM). The job was suspended and two operators in BA then tested the tank again with the same result and the work was suspended again until further investigation is undertaken as a high level of H2S was not expected. The operator is investigating the matter further.

<p>Details (from final report)</p>	<p>Operator advised that during preparation for the pump out of sludge tank in the main machinery space, the sludge tank lid was removed. A test was conducted for H₂S on the tank top and the level was zero. The testing device was lowered down into the tank and the level went off the scale (>120PPM). The job was suspended and two operators in BA then tested the tank again with the same result and the work was suspended again until further investigation is undertaken as a high level of H₂S was not expected. The operator is investigating the matter further.</p> <p>On 29 June 2018, in order to pump liquid from the Dirty Bilge to the Sludge Tank via a temporary hose arrangement, a manway was removed from the Sludge Tank. This manway is located below the floor deck in the aft machinery space. H₂S was detected and the area evacuated. It is estimated that 2 personnel were exposed to H₂S concentrations up to 20 ppm, and the concentration of H₂S in the Sludge tank was above 120 ppm. Following the initial evacuation, the aft machinery space was evacuated using the PA system and swept by emergency response personnel wearing breathing apparatus. These personnel also replaced the manway while wearing BA.</p> <p>H₂S is a toxic gas at high concentrations and presents a serious safety hazard to personnel particularly in restricted / confined working areas. It was not expected to be found in the tank or the substructure.</p> <p>The investigation team identified two major causes that lead to H₂S being present in the aft machinery space:</p> <ul style="list-style-type: none"> • H₂S was present in the Sludge Tank due to a biological / bacterial mechanism, exacerbated by sewage being drained into the bilge/sludge system • Sludge tank manway was opened in order to carry out a temporary pumping operation <p>The recommendations are primarily to conduct further study work on the potential for H₂S to be formed in the substructure tanks and implement the necessary controls. In the meantime, the risk will be managed via monitoring, chemical dosing, H₂S awareness and cleaning the Sludge and Dirty Bilge tanks.</p> <p>The main reason why the temporary operation was required, was because the dirty bilge holding tank has a significant quantity of construction debris at the bottom of it. It is understood that this debris primarily consists of garnet from construction activities in the yard in Korea. The original plan had been to clean out the tank before Prelude left Korea, but this did not happen.</p> <p>It is recommended that the dirty bilge holding tank should be cleaned with as soon as it is practical, in order to avoid conducting the temporary pumping. Cleaning the tank is in the work plan for September 2018, and this timing is suitable, hence no additional action has been given.</p> <p>The risk assessment for the TPC was relatively high level and didn't include all of the major risks. The potential for dangerous gas was identified, and the control of gas testing and PGM was specified, however, that danger wasn't articulated clearly in the TPC, with the relatively lower risk of a pungent odour being more prominent.</p> <p>The main risks that were not identified in the TPC were</p> <ul style="list-style-type: none"> - the potential for the tank(s) to overflow when the manway had been removed, leading to flooding of the substructure, and - the potential for a person to fall through a manway into the tank. <p>The latter was identified in the JHA for the permit, and controls put in place, however, a more thorough TPC risk assessment could be expected.</p>
<p>Immediate cause/s</p>	<p>The causes identified were that the sludge tank manway was opened and H₂S was in the vapour space of the sludge tank.</p>
<p>Root cause/s</p>	<p>ED - DESIGN - Design review - independent review - hazard analysis NI, HPD - TRAINING - No training - task not analysed</p>
<p>Root cause description</p>	<p>The risk assessment for the TPC was relatively high level and didn't include all of the major risks. The potential for dangerous gas was identified, and the control of gas testing and PGM was specified, however, that danger wasn't articulated clearly in the TPC, with the relatively lower risk of a pungent odour being more prominent. The main risks that were not identified in the TPC were</p> <ul style="list-style-type: none"> - the potential for the tank(s) to overflow when the manway had been removed, leading to flooding of the substructure, and - the potential for a person to fall through a manway into the tank. <p>The latter was identified in the JHA for the permit, and controls put in place, however, a more thorough TPC risk assessment could be expected.</p>

Duty inspector recommendation	
Date	02/07/2018
Duty inspector	[REDACTED]
Recommendation	Do not conduct Major Investigation
Reasoning	Does not meet MI threshold based on information received
Supporting considerations	

Major investigation decision	
Date	02/07/2018
Decision	Do not conduct Major Investigation
Reasoning	Does not meet MI threshold based on information received
Supporting considerations	

Non-major investigation review and recommendation	
Date	02/07/2018
Inspector	[REDACTED]
Risk gap	Moderate
Type of standard	Established
Initial strategy	Investigate

Recommended follow up strategy	
Recommended strategy	Investigate
Supporting considerations	H2S should not normally be present in the sludge tank. It is also unusual to open a tank lid in order to pump/transfer contents. Moderate risk to be investigated.

Non-major investigation decision	
Date	02/07/2018
RoN	[REDACTED]
RoN review result	Agree with recommendation
Strategy decision	Investigate
Supporting considerations	

Associated inspection	
Inspection ID	1772