

Case study: Saturation diver fatality due to hydrogen sulphide

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This is a very brief summary of a 2021 case report on the much earlier death of a saturation diver in the Bombay High oilfield, which occurred as a result of Hydrogen Sulphide poisoning.

What happened?

The summary is included as a reminder of the danger of Hydrogen Sulphide and as a means to facilitate discussion. The full case study, prepared by Dr Ajit C Kulkarni, of Hyperbaric Solutions, Mumbai, India, can be found [here](#).

The incident happened on board a vessel operating in an offshore oil field, on a long charter for carrying out inspection, maintenance and repair duties. An oil leak was discovered in one of the main 36-inch (91cm) diameter subsea lines carrying sour crude. The vessel was directed to proceed to the site and carry out pipeline repairs on an emergency basis at 74 msw depth.

A diver was deployed from the bell at 65m depth, a short distance away from the pipeline, not directly above it. On reaching the seabed, the diver approached the leaking pipeline to locate the rupture and conduct a close survey of the leak area and the pipeline. The seabed all around the trench was covered with oil sludge. After getting preliminary details, he returned to the bell.

Shortly after he had returned to the bell, first the bellman, then the diver himself, collapsed. Not having secured the safety harness, the diver fell into the water and was carried away by the current, and drowned. A bell-to-bell rescue of the bellman was arranged with equipment and divers from another nearby vessel. Following medical treatment, he made a full recovery and was diving a month later. The lost diver's body was recovered the following day.

What was the cause?

The presence of Hydrogen Sulphide (H₂S) in the bell was the root cause.

The diver, while working near the pipeline, had dislodged oil sludge which resulted in release of dissolved H₂S. Although the diving bell was not directly above the leak, there is a possibility that some H₂S entered the diving bell. At that time, an electronic continuous gas monitoring system was not fitted in the diving bell nor was a handheld detection unit carried in the bell. The diving supervisor would not have had any indication of H₂S in bell.

Another possibility is that there was a considerable amount of oil was on the diver's suit. His umbilical was also covered with oil sludge. Rising from the seabed to the bell, the pressure decreased by almost 100 kPa (one bar), reducing the solubility of H₂S in oil, and excess gas was released from solution and entered the bell,

causing the bellman and diver to collapse.

Hydrogen Sulphide

The permissible exposure limit of H₂S is 15 parts per million (ppm) for 15 min at normal temperature and pressure.



Actions

The case study notes that, ideally, a remotely operated vehicle (ROV) could have carried out a pipeline survey at zero risk.

When this accident happened, ROVs were not routinely available.

Today, work ROVs are present on MSVs and carry out pipeline surveys, marine growth removal, etc.

Divers continue to work on pipelines but a similar accident has not recurred.

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