

# FPSO / 02/01/10 Fatalities (1/4)



- A fatal accident occurred on the Pazflor FPSO hull in Okpo on Saturday 02/01/10 around 09:30 am.
- 2 workers entered in a tank (LDHI starboard) to perform the alignment of the pump and asphyxiated due to the presence of argon gas in the tank.
- The chronology of event is as follows (based on preliminary findings):
  - The team was actually made of 3 people; 2 entered the tank at 09:00 to work at the -18 m level when the 3rd stood by near the hatch;
  - Around 09:30 as he had no radio call from for his colleagues, he entered the tank, down to the -13 m level where he found one of his team mates unconscious.
  - He came out and called the emergency team for rescue around 09:35. The team arrived around 09:40.
  - The rescue team evacuated the first person at 10:45 and the second one was found at the -18 m level and was evacuated out of the tank later, around 11:15.
  - Both victims were declared dead on arrival at the hospital, but in fact passed away in the tank.
- The immediate cause of the death is asphyxia due to argon. According to rescue team the O2 level at the bottom of the tank was down to 5%... (but this is measured around 1 hour after the accident)

## FPSO / 02/01/10 Fatalities (2/4)

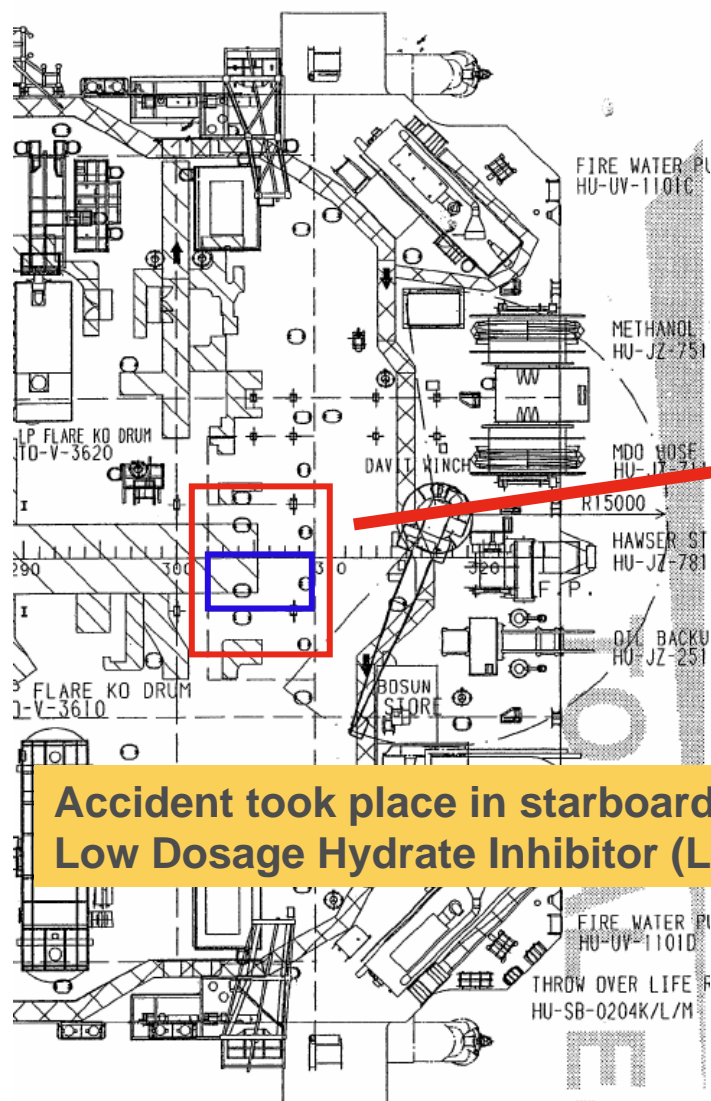


➤ If the immediate cause of the death is clear, many questions are still unanswered at this stage (argon came from a hose normally used to provide inert gas during welding activities, but the victims were not involved in any welding):

- Who had briefed these workers (from a sub contractor – Dang Sung)?
- Why was this hose left entering the tank through the other hatch (see sketch) as last welding took place on 27/11?
- Who connected the argon hose to the manifold and when and why? (Another sub contractor was involved at the same time in welding on the hull deck, but according to them they did not start welding before 09:30 so they could not have connected this hose – even by mistake – before that time)
- As it is heavier than air, argon accumulated in the bottom of the tank, but up to which level (which would give an indication of when the hose was connected to the manifold)?
- Why did the victims checked the atmosphere only near the surface before entering the tank ? Did they spot the Argon hose, without considering the potential danger ?
- One of the victim had a low oxygen alarm detector, but left it at the surface. Why ?
- More generally was the Permit to Work procedure followed, especially the Confined Space Entry part of it ?
  - It shall be noted there was no name tags attached to the sign at the entrance of the tank.
  - The oxygen level indicated on the sign board was 20.9 %. Who wrote that figure and how / when was it measured ?
  - There was no ventilation to the tank (in line with DSME procedure which does not required it is there is no risk of changing the atmosphere (e.g. unlike during welding))

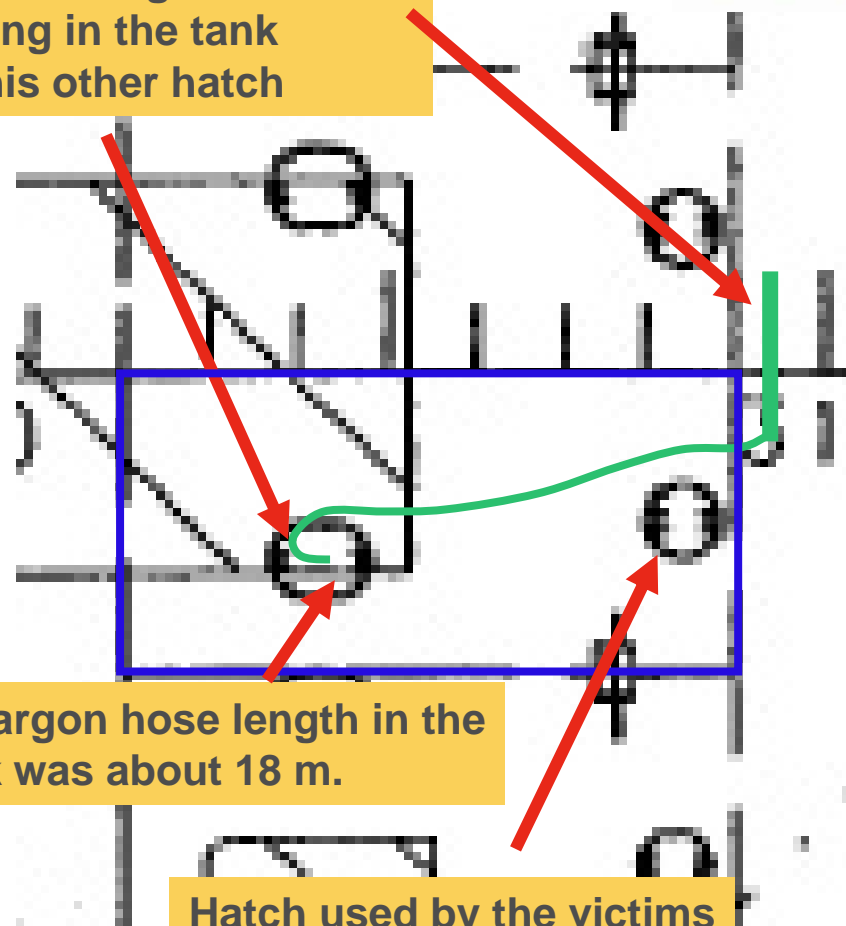
# FPSO / 02/01/10 Fatalities (3/4)

HULL DECK



**Accident took place in starboard Low Dosage Hydrate Inhibitor (LDHI)**

**A hose delivering argon and connected to the gas manifold was entering in the tank through this other hatch**



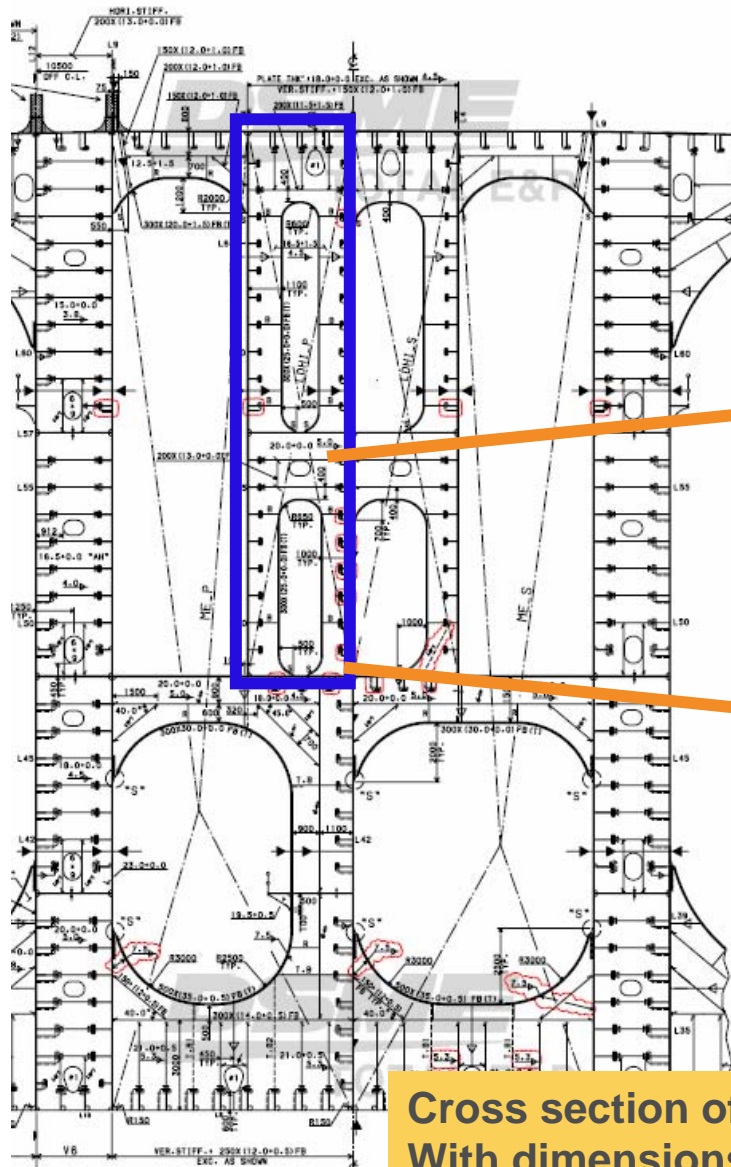
**The argon hose length in the Tank was about 18 m.**

**Hatch used by the victims to enter the tank**

# FPSO / 02/01/10 Fatalities (4/4)



In-Depth Experience,  
Bold Technology



Intermediate level (-13 m)

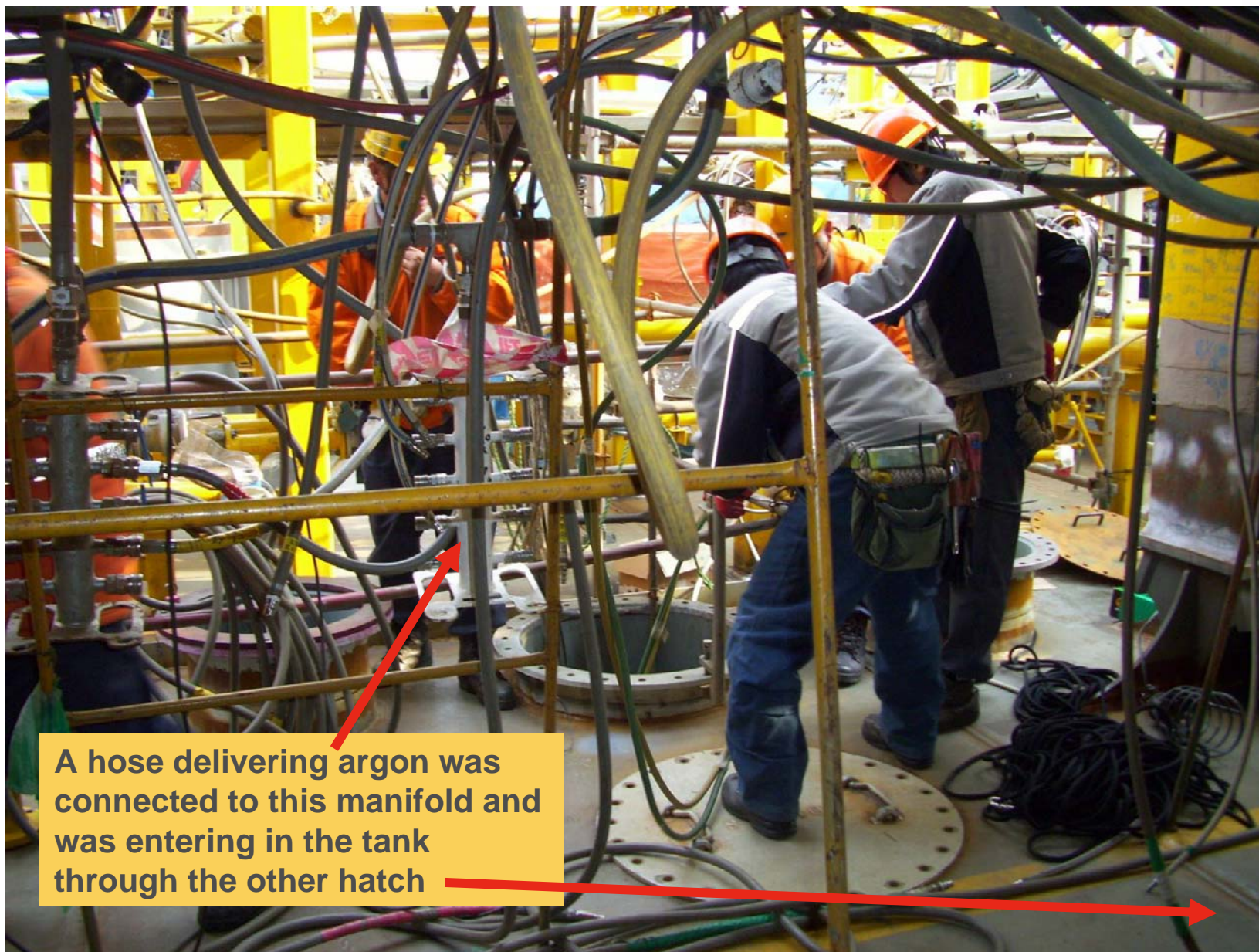


Bottom of the tank (-18 m)

**Cross section of the MeOH and LDHI tanks.  
With dimensions of 3.5 m x 7 m x 18 m, the  
LDHI ones are more like “wells” than tanks...**



## The hatch used to enter the tank



A hose delivering argon was connected to this manifold and was entering in the tank through the other hatch



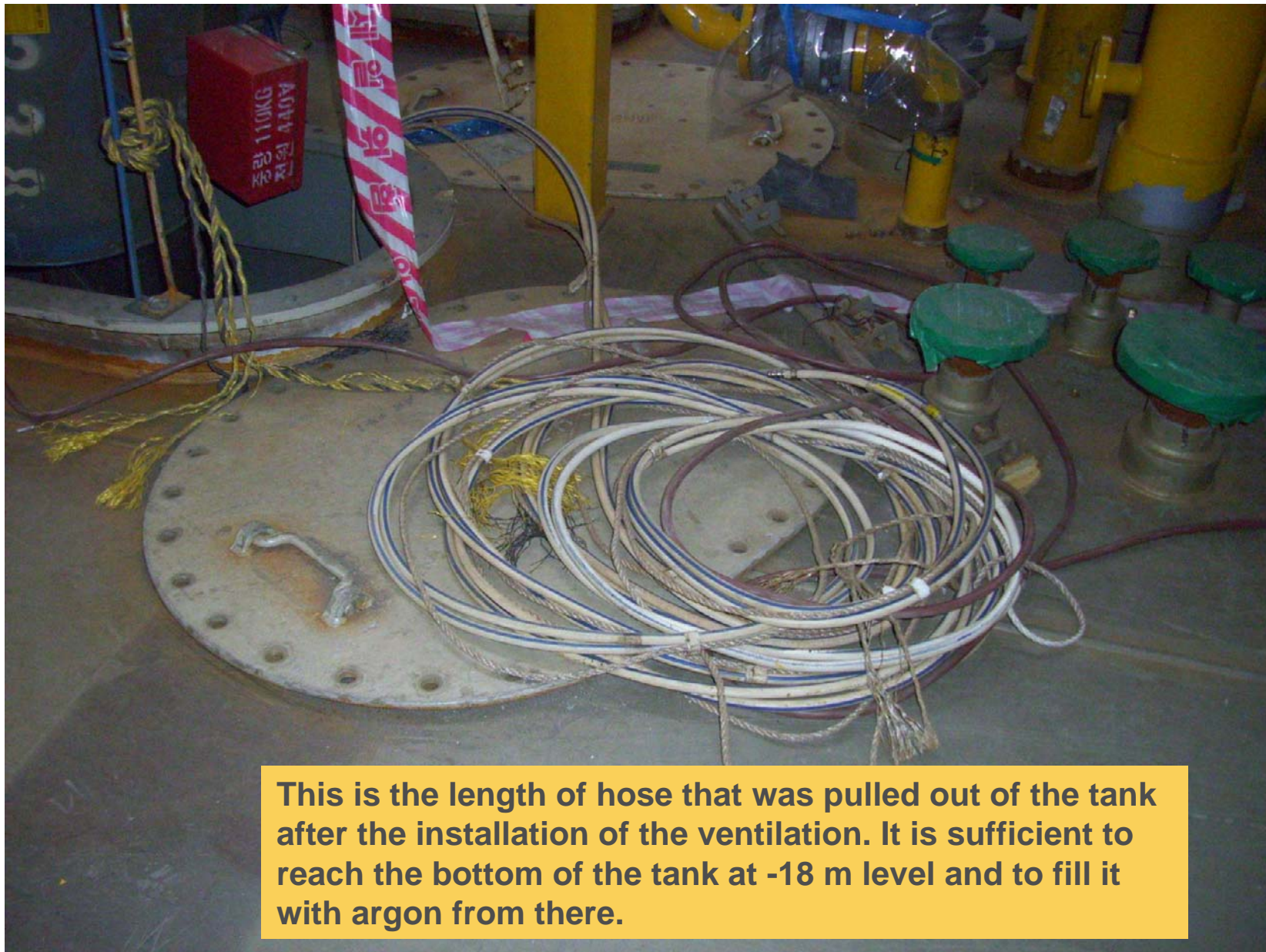
## The ventilation installed after the alarm was raised



The hose providing argon is still visible entering the tank, through the second hatch. It was removed after the ventilation was installed.



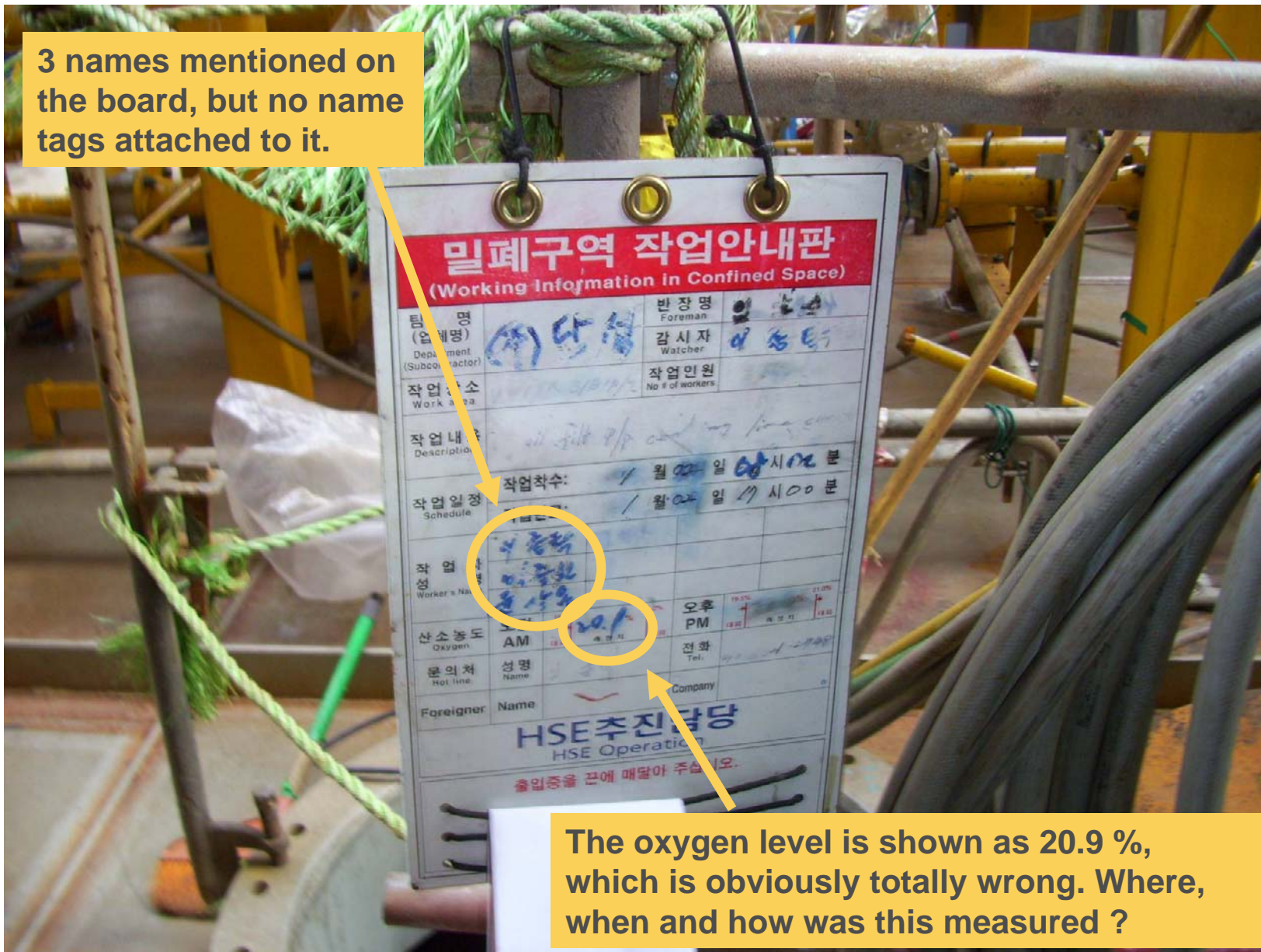
# The argon hose





## The sign board at the entrance

3 names mentioned on the board, but no name tags attached to it.



밀폐구역 작업안내판 (Working Information in Confined Space)	
팀명 (업체명) Department (Subcontractor)	반장명 Foreman
작업장소 Work area	감시자 Watcher
작업내용 Description	작업인원 No. of workers
작업일정 Schedule	작업착수: 1월 22일 08시 00분 1월 22일 17시 00분
작업자 Worker's Name	오후 PM
산소농도 Oxygen	전화 Tel.
문의처 Hot line	성명 Name
Foreigner	Company
HSE추진담당 HSE Operation	
출입증을 끈에 매달아 주십시오.	

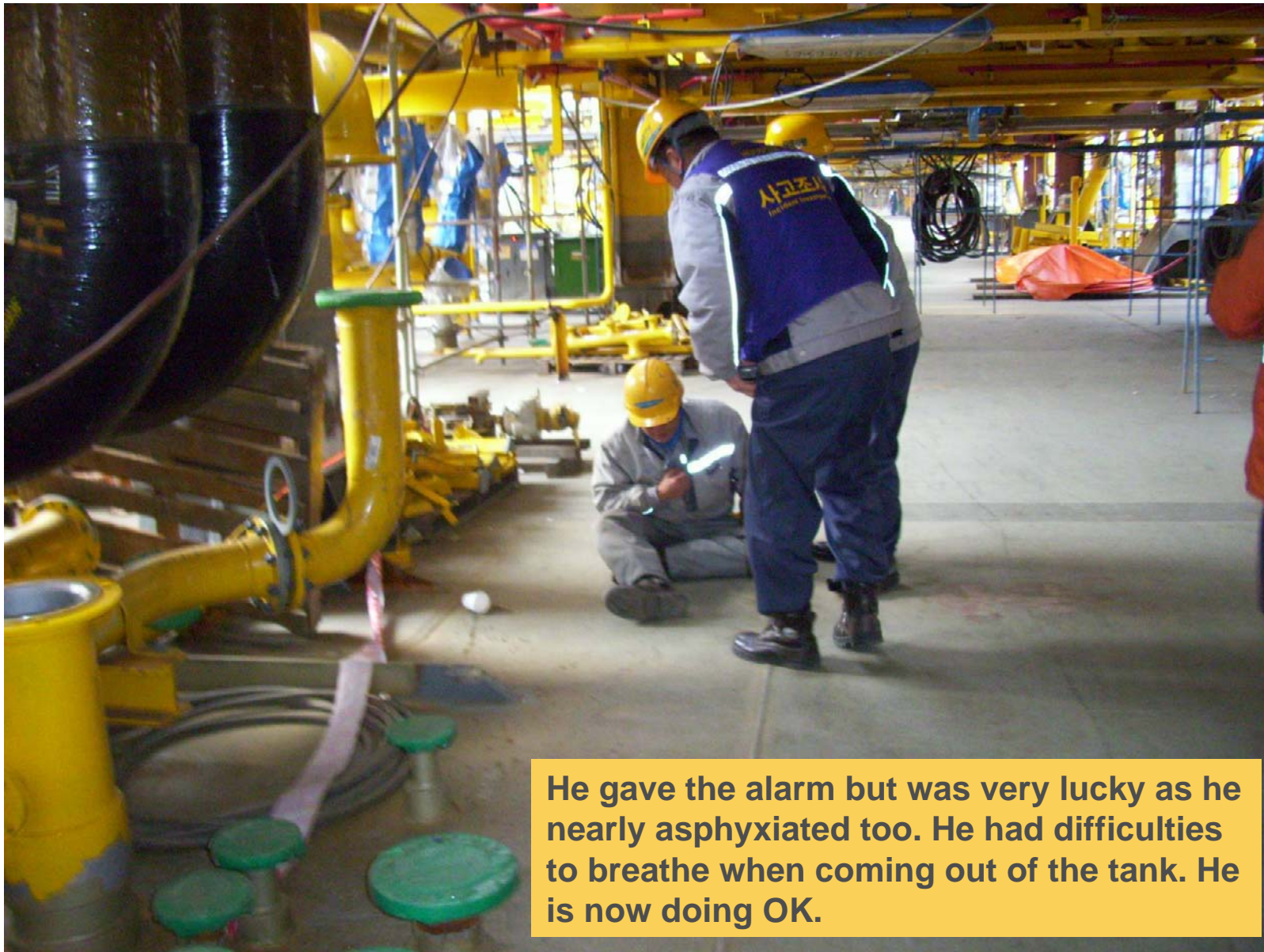
The oxygen level is shown as 20.9 %, which is obviously totally wrong. Where, when and how was this measured ?



*In-Depth Experience,  
Bold Technology*

**The PTW mentioned 5 names.**

## The 3rd member of the team



He gave the alarm but was very lucky as he nearly asphyxiated too. He had difficulties to breathe when coming out of the tank. He is now doing OK.



## FPSO / 02/01/10 Fatalities: way forward (1/2)



- Total was notified immediately of the accident and the team was present during the rescue team intervention. We could take pictures, question the witnesses...
- Immediately after the accident we asked for all Confined Space Entry activities to be stopped on the FPSO and this was verified during a tour by the RSES and the Safety advisor (people were still spotted in the tanks in spite of DSME commitment to stop the works).
- The police investigation took place on Saturday 02/01 afternoon (no feed back yet).
- On Sunday 03/01 morning, we attended - as observer -, a DSME internal meeting when they prepared for the arrival of their CEO (Mr S.T. Nam), so we could see what facts and explanations would be provided and cross check them with our own findings.
- On Sunday 03/01, DSME stopped all works on the FPSO hull (not only CSE) to perform with their HSE and construction teams a thorough survey of both all tank conditions and gas distribution network.



## FPSO / 02/01/10 Fatalities: way forward (2/2)



- **On Monday 04/01 morning DSME organized the following events:**
  - Numerous safety tool box meetings throughout the yard. This was already planned because it is the start of the year, but a particular focus was put on the 02/01 accident.
  - A safety stand down with ~ 1,200 workers related to the accident and risks associated with argon. Total delivered a short speech, focusing on a) danger of CSE activities and b) safety awareness towards co-workers (taking care of those working with but also after us).
- **On Monday 04/01 afternoon Total and DSME met to launch a common investigation to find out more about the facts and to try to answer the questions mentioned earlier. Each party will now summarize its findings and another joint meeting will be organized with site visit as required.**
- **Once the investigation has been completed to our satisfaction, the official report(s) will be issued, the root cause analysis performed and corrective actions put in place (which does not prevent implementation of temporary ones until then).**
- **As of 04/01 18:00 all activities were stopped on the hull (not only CSE ones) and DSME and the unions were discussing on how to restart the works.**
- **During the 04/01 meeting, DSME announced that from now on all people entering a confined spaces will have to be equipped with low oxygen detectors (which was not the case until now, although it had been a Total request for months).**

