



## CASE STUDY

OISD/CS/2026-27/E&P/06

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### INTRODUCTION

**Title:** HVAC fire in machinery deck.

**Location:** Offshore drilling rig.

**Loss/ Outcome:** Financial loss.

### BRIEF OF INCIDENT

A major fire occurred due to fire in the Air Conditioning compressor unit. At the time of incident, Chief Electrician was present inside the workshop where compressor is located and observed a blast with subsequent fire in HVAC compressor. He immediately attempted to douse the fire with portable fire extinguishers but failed and escaped.

Fire Team moved in with SCBA and entered the workshop to carry out firefighting operations using carbon dioxide fire extinguishers. Due to heavy smoke and very poor visibility inside the workshop, firefighting could not be done.

It was observed that the fire had spread upwards towards glass wool insulation located around the HVAC duct and to the storage facility built over the workshop. To control the situation, openings were made by cutting the main deck above the workshop to allow routing of a firewater hose and to create an escape path for smoke.

Firewater hoses were passed through the main deck opening, and water was applied directly onto the burning insulation. Also, hose of smoke extractor was passed through one of the openings for smoke removal. The fire could be completely extinguished after 3 hrs. 50 minutes.

### OBSERVATIONS/ SHORTCOMINGS

- Two out of the three live terminals of the HVAC compressor were found blown off.
- Parameters like temperature and oil pressures were not monitored, except suction and discharge pressures.
- There were no written OEM guidelines available for what to cover during monthly inspection of HVAC unit.
- Records for arc Chute test of terminal were not available. No record was available for calibration of Low-Pressure and High-pressure switch installed on the compressor.

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- The duct insulation near the HVAC unit was found burnt after the incident indicating the presence of combustible material in the insulation that ignited after the explosion. Also, there was a platform built above the affected room which was being utilized as a storage area for combustible materials like compressor separator filters, air filters, and other mechanical spares etc.
- There was no provision of fixed fire suppression system in the workshop area as per original rig firefighting arrangement.
- There was no structured training module for electrical crew members which would equip them with the knowledge and skills necessary for effective maintenance and troubleshooting of the AHU and compressor systems.

### **PROBABLE REASONS OF FAILURE / ROOT CAUSE**

The immediate cause of the incident is dislodgement/ snapping of terminals at the compressor entry points. This led to the spraying of compressor oil onto exposed live terminals, resulting in the explosion leading to fire.

The probable reasons for dislodgement/ snapping of terminals are as follows:

- Short circuit to the ground within the compressor
- High resistance at the electrical terminal due to loose connections.

### **CONTRIBUTING FACTORS**

- a. Inadequate preventive maintenance of HVAC compressor.
- b. Inadequate hazard identification and mitigation measures.
- c. Insulation material soaked in oily deposits.
- d. Storage of combustible materials near and above the compressor. The area where this compressor is installed, the leftover area is used as mechanical workshop.

### **RECOMMENDATIONS**

- The risk for electrical fault/ explosion in the AC compressor should be included in the rig risk register and control measures should be identified and implemented.
- Management should strengthen preventive maintenance and inspection based on OEM recommendations for early detection of comprehensive defects and hazards of all HVAC units. A detailed preventive maintenance checklist should be developed and followed.
- It is recommended that the insulation provided around the HVAC ducts should be of non-combustible type and free of any combustible material. Periodic inspection of duct insulation and its surrounding area should be ensured to maintain its integrity and fire safety performance.
- A training program should be developed and imparted to maintenance crew members to equip them with the knowledge and skills necessary for effective troubleshooting, maintenance and early detection of failure symptoms of the HVAC systems.
- A fire assessment study for complete rig should be conducted to determine the necessity of a fixed firefighting system in the workshop and similar locations throughout the rig.

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- Periodic Mock Fire drills should be conducted for confined spaces for fire emergencies at such locations. Location specific firefighting strategies should be worked out and practiced during emergency drills.



**Figure 1: Terminal of the HVAC compressor after the incident**



**Figure 2: Damage to duct insulation of HVAC**

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