

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF SAFETY AND ENVIRONMENTAL ENFORCEMENT
GULF OF MEXICO REGION

ACCIDENT INVESTIGATION REPORT

For Public Release

1. OCCURRED

DATE: 10-MAY-2018 TIME: 1730 HOURS

2. OPERATOR: **Murphy Exploration & Production**

REPRESENTATIVE:

TELEPHONE:

CONTRACTOR: **Diversified**

REPRESENTATIVE:

TELEPHONE:

- STRUCTURAL DAMAGE
- CRANE
- OTHER LIFTING
- DAMAGED/DISABLED SAFETY SYS.
- INCIDENT >\$25K
- H2S/15MIN./20PPM
- REQUIRED MUSTER
- SHUTDOWN FROM GAS RELEASE
- OTHER

3. OPERATOR/CONTRACTOR REPRESENTATIVE/SUPERVISOR 8. OPERATION:

ON SITE AT TIME OF INCIDENT:

4. LEASE: **G32504**

AREA: **GC** LATITUDE:

BLOCK: **432** LONGITUDE:

5. PLATFORM:

RIG NAME: **T.O. DEEPWATER ASGARD**

- PRODUCTION
- DRILLING
- WORKOVER
- COMPLETION
- HELICOPTER
- MOTOR VESSEL
- PIPELINE SEGMENT NO.
- OTHER

6. ACTIVITY:

- EXPLORATION(POE)
- DEVELOPMENT/PRODUCTION (DOCD/POD)

9. CAUSE:

- EQUIPMENT FAILURE
- HUMAN ERROR
- EXTERNAL DAMAGE
- SLIP/TRIP/FALL
- WEATHER RELATED
- LEAK
- UPSET H2O TREATING
- OVERBOARD DRILLING FLUID
- OTHER _____

7. TYPE:

- HISTORIC INJURY
 - REQUIRED EVACUATION
 - LTA (1-3 days)
 - LTA (>3 days)
 - RW/JT (1-3 days)
 - RW/JT (>3 days)
 - Other Injury

- FATALITY
- POLLUTION
- FIRE
- EXPLOSION

- LWC
- HISTORIC BLOWOUT
 - UNDERGROUND
 - SURFACE
 - DEVERTER
 - SURFACE EQUIPMENT FAILURE OR PROCEDURES

- 10. WATER DEPTH: **3464** FT.
- 11. DISTANCE FROM SHORE: **95** MI.
- 12. WIND DIRECTION:
SPEED: M.P.H.
- 13. CURRENT DIRECTION:
SPEED: M.P.H.
- 14. SEA STATE: FT.
- 15. PICTURES TAKEN:
- 16. STATEMENT TAKEN:

COLLISION HISTORIC >\$25K <=\$25K

17. INVESTIGATION FINDINGS:

On May 10, 2018, a fire was reported on the drillship Transocean Deepwater Asgard, while contracted to Murphy Exploration and Production Company in Green Canyon Block 432 on well 002. The small fire occurred in the mud pit room while commissioning a Precision Fluid Injection (PFI) System with Constant Volume and Constant Temperature prior to well operations commencing. The fire activated the flame, heat, and smoke detectors, and a full muster occurred. The fire was put out with portable fire extinguishers and there were no injuries reported.

Diversified Well Logging (DWL) installed two PFI Systems with Constant Volume Traps (CVT) and Constant Temperature to improve the sampling of the drilling fluids for gas.

One system was located in the shaker room on the flowline and the other in the mud pit room on the active pit. Constant temperature was achieved using Precision Fluid Injection Heaters (P-Heaters), which were installed with each CVT system to raise the temperature of the drilling fluids for better analysis due to cooling of the mud. The P-Heater system was equipped with a Process Controller module (6040) designed to maintain a constant temperature and an over temperature module (6050) that will shut the system off to prevent overheating. The 6040 module read the real time temperature of the fluid passing through the outlet of the heater and also set the target temperature of the fluid (140 degrees F). The 6050 over temperature module read the real time temperature of the heating elements inside the heater, and the safety shut-off was set to 250 degrees Fahrenheit (F). At 250 degrees F, the 6050 control module would shut down the heater and power could only be restored after manually resetting the control module. Both control modules used thermocouples to provide temperature readings.

On the afternoon of May 10, 2018, the system in the shaker room was commissioned without incident, and DWL technicians started commissioning the system in the mud pit room at approximately 1530 hours. The P-Heater was filled with drilling fluid and the heater was energized. The reading on the 6040 module was holding at 97 degrees F, but the 6040 was set for set for 140 degrees F. While trouble shooting this discrepancy, the DWL technician drained a small amount of fluid from the heater to compare with the reading of 97 degrees F. The temperature sensor he had with him was not working and he was unable to obtain a reading. The DWL technician returned to the mud logging unit at approximately 1720 hours, and at approximately 1730 hours flame, heat, and smoke detectors activated in the active mud pit room. The rig's Derrickman investigated the alarms and confirmed the fire, which was on the fluid discharge hose of the P-Heater. He used two 30 pound dry chemical fire extinguishers to extinguish the fire. Once the fire was extinguished, the mud logging unit and all associated control systems were de-energized. The PFI system in the shaker room was also removed from service as a precaution.

The Bureau of Safety and Environmental Enforcement (BSEE) investigation team conducted the initial onsite investigation on May 11, 2018. The team collected evidence, took photographs, and interviewed personnel. The investigation team inspected the P-Heater and the associated wiring, and noted that the fluid discharge hose from the heater was melted. The heat source appeared to come from within the heater, and there was no visible damage to the equipment around the heater. The electrical wires for the P-Heater appeared to be in acceptable condition and the investigation team could not identify any external issues with the wiring. The investigation team attempted to trace the wires from the P-Heater to its power source but the wires went into a large cable tray with multiple other wires and could not be traced with any level of certainty. During the interview, the rig electrician stated that he showed the DWL technician where to connect his equipment but he was not involved with actually hooking up the DWL equipment. One of the DWL technicians stated that the system appeared to be running fine prior to the fire, though he did note a discrepancy between the heater set point of 140 degrees F and the temperature reading of 97

degrees F. He also noted after the incident that the temperature reading never changed from 97 degrees F, even after the heater was powered off. The team was informed that DWL would be carrying out an in depth investigation into the incident, and BSEE would be provided with that investigation report.

DWL conducted a visual inspection of the wire connections and found one wire (yellow) from the 6050 over-temperature thermocouple was not connected to the black wire from the junction box in the mud pit room. This left the circuit open, and with the circuit open the 6050 control module should not have allowed the heater to operate. Power was then applied to the 6040 and 6050 control modules to see if they were reading correctly. Both devices read between 72 and 74 degrees F, which indicated another problem that was yet to be found. The 6050 module should have been reading "open" and not reading any temperature.

Further investigation revealed that the Mud Logging unit junction box wires went to another junction box labeled H2S Pit, but the sensor leads from the 6040 and 6050 control modules ran to the junction box labeled CH4 Pit. Inside the H2S Pit junction box there were two pairs of wires that were twisted together (blue to black and red to white) and these wires provided a false signal to both the 6040 and 6050 control modules. These twisted wires mimicked a thermocouple and both controllers detected a safe temperature (97 degrees F), which allowed them to operate under a false reading and prevented the heater from shutting down. Because the P-Heater detected a safe operating temperature below the target temperature, the heater continued to heat the mud in an attempt to reach the target temperature of 140 degrees F, allowing the one inch discharge hose to ignite. BSEE Houma District held a meeting with Murphy Exploration, Transocean, and DWL to discuss these findings, and after considering the data, the Houma District Inspectors and Engineers agreed with these conditions.

The BSEE investigation team also learned the DWL technicians had incorrectly connected the wires into the CH4 Pit junction box in the pit room as directed by the rig's electrician. The system should have been connected into the H2S Pit box. Both boxes were located in the mud pit room, and during the installation of the PFI system in the mud pits, the DWL technician twisted the wires in the CH4 Pit junction box and tested them for impedance with a multimeter. He saw a reading of zero impedance at the CH4 Pit junction box, so he believed that he had the correct wires which went back to the mud logging unit. The DWL technician received a false-positive on the impedance test and actually did not have the correct wires selected.

The BSEE investigation team was not able to identify who twisted the wires together in the H2S Pit junction box, nor when this occurred. It is thought that an electrician twisted these wires together at an earlier date while doing a similar impedance test for a separate job, and left the wires twisted together. With the junction box closed, it would be impossible to know the state of the wires within. The H2S Pit junction box was not opened until after the incident and the state of the wires were unknown until the DWL investigation found the issue.

Since the incident, the PFI and P-Heater systems have been taken out of service and removed from the shaker room and mud pit room. DWL plans to work with the manufacturer of the P-Heater to revise the manual to prevent such incidents from occurring. This would be done by adding a function test to the controller before connecting power to the P-Heater, adding warnings and training regarding the potential for the P-Heater temperatures remaining below the desired setting, and requiring commissioning tests to be done with water. They also plan to work with the manufacturer to install a puck in the thermocouple junction box that will be less susceptible to errors, change the hose material to flame resistant material, add an outlet flow meter to monitor for no flow conditions, and add emergency shut down buttons in any room where a heater is installed. DWL also plans to improve their own

procedures by requiring two people to inspect all connections, create an installation test sheet, and require three tests of all wire segments (open, short, and signal) before all commissioning tests.

18. LIST THE PROBABLE CAUSE(S) OF ACCIDENT:

The 6040 and 6050 control modules were unknowingly wired to the incorrect junction box. The incorrect wires of the CH4 Pit junction box mimicked a thermocouple and caused the 6040 and 6050 control modules to read a safe temperature.

19. LIST THE CONTRIBUTING CAUSE(S) OF ACCIDENT:

The procedure for commissioning the P-Heater did not call for adequate testing of the electrical wires to ensure correctness during installation.

20. LIST THE ADDITIONAL INFORMATION:

21. PROPERTY DAMAGED:

NATURE OF DAMAGE:

9 feet of 1" hose

Melted discharge hose.

ESTIMATED AMOUNT (TOTAL):

\$92

22. RECOMMENDATIONS TO PREVENT RECURRANCE NARRATIVE:

BSEE Houma District has no recommendations for the Office of Incident Investigations at this time.

23. POSSIBLE OCS VIOLATIONS RELATED TO ACCIDENT: NO

24. SPECIFY VIOLATIONS DIRECTLY OR INDIRECTLY CONTRIBUTING. NARRATIVE:

25. DATE OF ONSITE INVESTIGATION:

28. ACCIDENT CLASSIFICATION:

26. INVESTIGATION TEAM MEMBERS:

29. ACCIDENT INVESTIGATION

Brody Vial / Troy Boudreaux / Paul Reeves /

PANEL FORMED: NO

OCS REPORT:

30. DISTRICT SUPERVISOR:

Bryan A. Domangue

27. OPERATOR REPORT ON FILE:

APPROVED

DATE:

19-SEP-2018