Bureau of Safety and Environmental Enforcement

SAFETY ALERT

Safety Alert No. 478

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BSEE Investigates Three Incidents Caused by Inadequately Maintained Electrical Connections and Compromised Wiring Integrity

The Bureau of Safety and Environmental Enforcement (BSEE) has observed a trend of safety issues linked to inadequately maintained electrical connections that compromise wiring integrity. This pattern has given rise to safety incidents, such as fires and arc flashes, underscoring the vital importance of averting these electrical hazards. Poor electrical connections pose a common and significant fire hazard, as they have the potential to generate substantial heat without significantly impeding electric current flow. This renders fuses and circuit breakers ineffective, allowing for escalation of the hazard. It is crucial to address these issues promptly and comprehensively to maintain a safe working environment.

Incident 1: Generator Cable Melting

This incident involved a complete power loss of a temporary generator within the production facility. Upon investigation, the platform electrician identified that the 480-volt alternating current (VAC) #2 phase cable had melted off at the generator bus connection (refer to figure 1 & 2). This was attributed to a loose cable connection at the cable lug. In response to the situation, power was switched over to the platform's emergency generator. Fortunately, no injuries or damage beyond the wiring were reported. The root cause of the incident was traced back to the faulty cable connection at the cable lug, leading to excessive heat generation and subsequent cable melting.

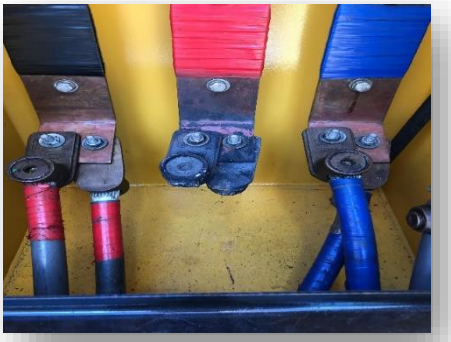

Fig.1 - Melted Cable Lug on Generator.

Fig.2 - #2 phase cable melted off lug connection.

Incident 2: Smoke and Cable Break

Fig 3 - Damaged insulation on heat trace cable routed along the top of the inlet flange.

This incident unfolded during a routine nighttime equipment check at a production facility. Crew members detected smoke emerging from a gap in the insulation near the inlet flange on the second flanged section of a fuel gas line run (refer to figure 3). An electrician was alerted and was able to take immediate action by turning off the breaker in the junction box, which supplied power to the heat trace section,[1] ensuring a termination of all power. To prevent smoldering, the crew soaked the insulation with water.

Upon subsequent investigations, a break in the heat trace cable insulation on the inlet flange of the gas volume bottle was found. The root cause of this incident was traced back to the failure of the breaker to terminate power to the heat trace, attributed to improper grounding. This failure resulted in excessive heat and smoldering of insulation.

Incident 3: Arcing at Generator Junction Box

Fig. 4 - Junction Box (400 Automatic Transfer Switch).

Personnel conducting daily checks during a rainstorm heard a sudden popping sound, which prompted immediate investigations and revealed wires arcing at the junction box (400 Automatic Transfer Switch (ATS); refer to figure 4) for the gas generator. Personnel promptly initiated an emergency shutdown for the gas generator, activating the emergency diesel generator to supply power to the facility. Personnel strictly followed Lockout/Tagout (LO/TO) procedures as part of the emergency shutdown protocol. All valves to vessels on the facility were isolated and stop work authority[2] was invoked to ensure immediate safety.

Personnel discovered that the top cable on the ATS from the platform diesel generator lacked a traditional drip loop. This absence allowed rainwater to flow onto the live power cable below, leading to its failure. Although designed to withstand weather, the improperly installed cable, exposed to constant sun and rain without adequate

[1] A heat trace system is an electrical system used to maintain or raise the temperature of pipes and vessels. Heating is achieved by utilizing a resistant element that is run alongside the piping or vessel.
[2] Stop work authority gives workers and contractors the authority and responsibility to stop work if they observe unsafe conditions or behaviors on the jobsite.

protection, developed small fractures in its casing. Over an undetermined number of years, rainwater seeped into the cable, causing material fatigue, and ultimately resulting in the cable's failure during a thunderstorm.

Therefore, BSEE recommends, where appropriate, that operators and their contractors, consider the following:

- Implementing a routine inspection and maintenance schedule for cable connections to ensure secure and correct function.
- Ensuring that personnel involved in cable connections and maintenance receive proper training and understand the importance of secure and reliable connections.
- Communicating and rehearsing emergency response procedures, such as switching over to emergency generators, in case of power-related incidents.
- Reviewing and enhancing existing procedures for connecting and securing cables.
- Reviewing and reinforcing LO/TO procedures to ensure the safe and secure isolation of electrical components during maintenance and investigations.
- Conducting periodic thermographic inspections using a forward-looking infrared (FLIR) camera to identify any signs of overheating or loose connections.
- Utilizing locking type connections in areas where fouling of electrical lines due to water ingress is a risk.

– BSEE –

A **Safety Alert** is a tool used by BSEE to inform the offshore oil and gas industry of the circumstances surrounding a potential safety issue. It also contains recommendations that could assist avoiding potential incidents on the Outer Continental Shelf.

Category: Electrical Safety