

DEATH OF AN ELECTRICIAN DUE TO ELECTROCUTION

AN OIL TANKER WAS ON PASSAGE WHEN THE SHIP'S ELECTRICIAN, WHO HAD BEEN WORKING ALONE, WAS FATALLY ELECTROCUTED WHILE PERFORMING MAINTENANCE OF THE INERT GAS SCRUBBER ELECTRICAL SYSTEM (FIGURE 1).

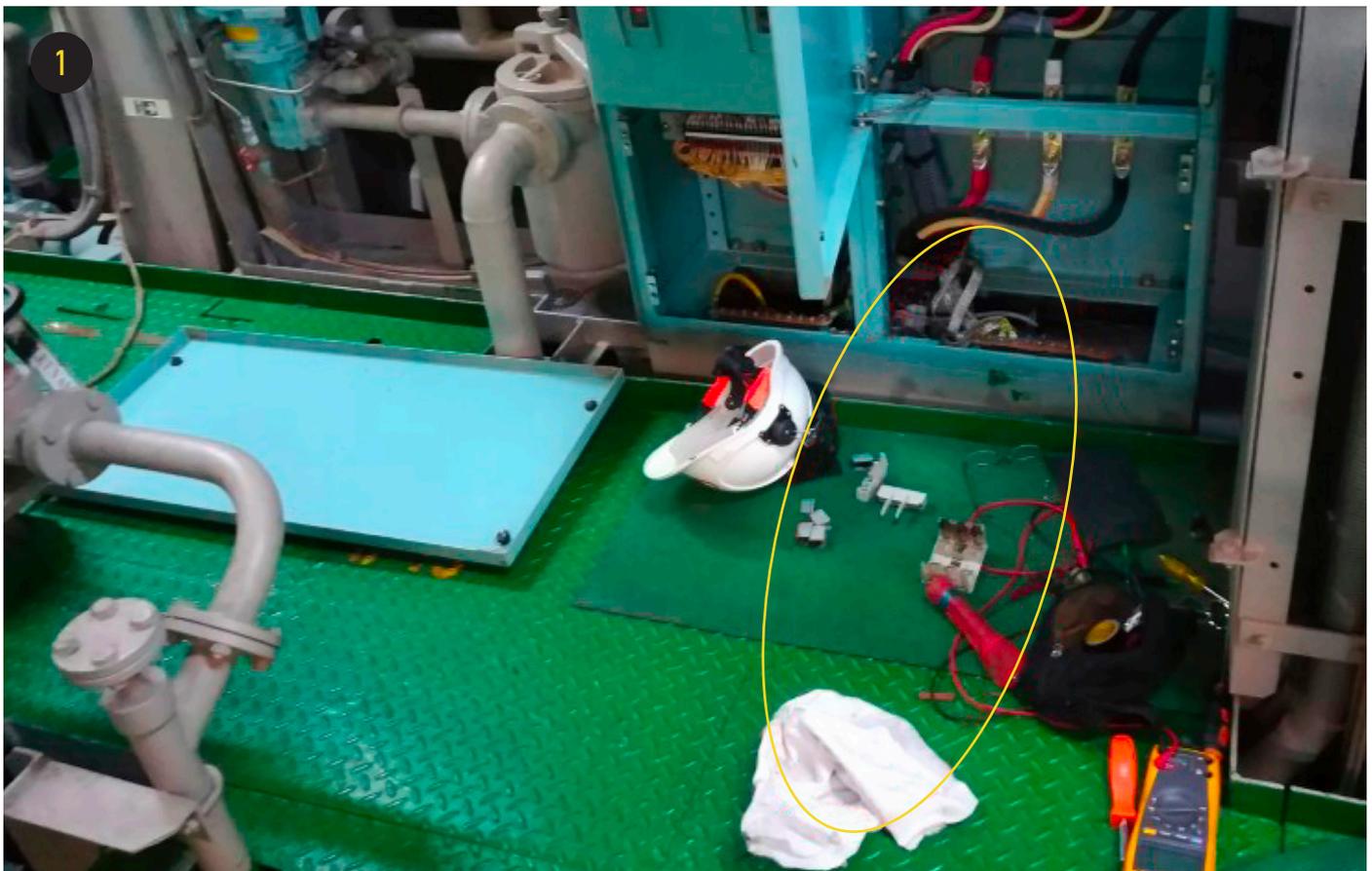
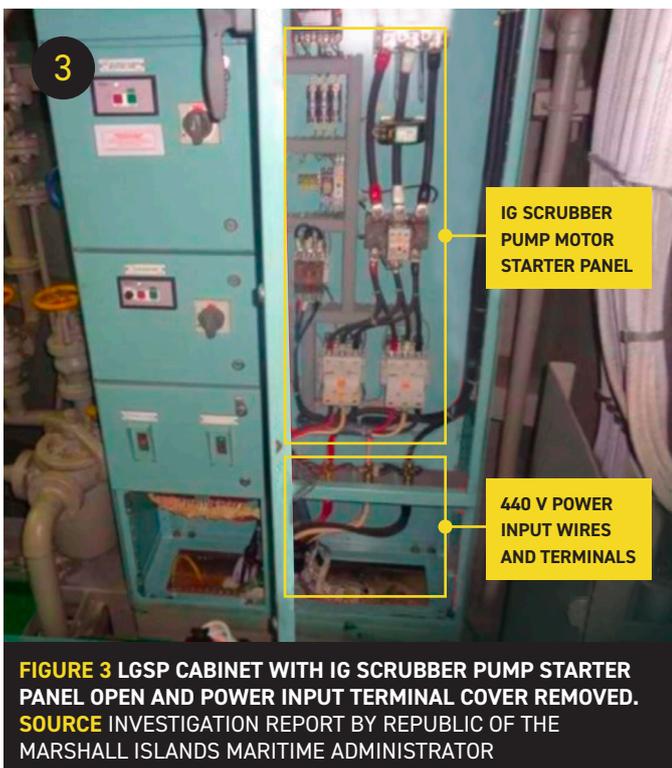
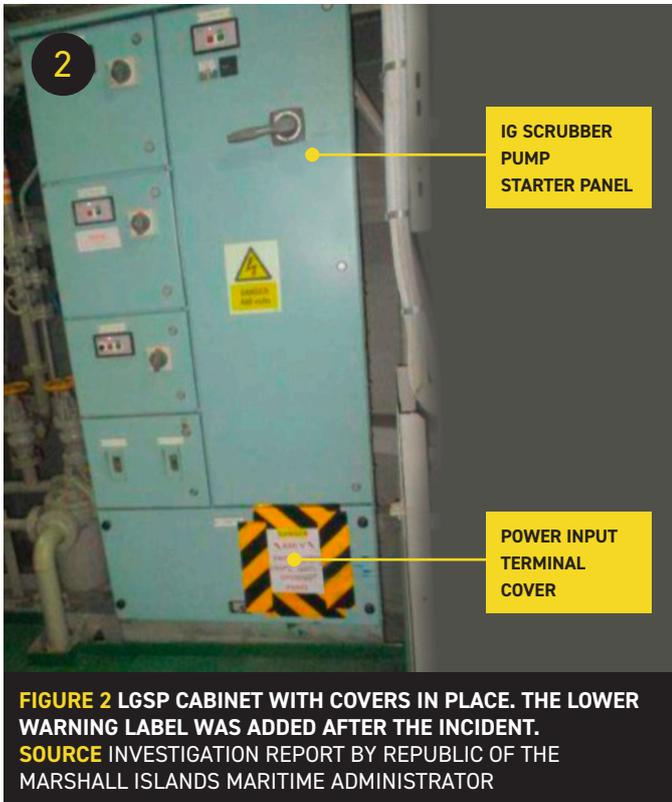


FIGURE 1 LOCATION OF THE ELECTRICIAN WHEN FOUND.
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WHAT HAPPENED

Before starting work in the morning on the day of the incident, the second engineer (2/E) held a Toolbox Talk to discuss the work planned for that day. The electrician mentioned he might work on the inert gas (IG) scrubber pump starter panel, but he did not specify the items to be completed, nor the timeframe for the work. No formal risk assessment, permit to work or Lock Out/Tag Out (LOTO) procedure were completed, although these were all specifically required by the Safety Management System (SMS).

At about 1130, the electrician told the engine cadet that he would be working on the IG scrubber pump starter panel. The cadet did not question the electrician about the work, nor did he tell any other engineering officer.



WHAT HAPPENED (CONTINUED)

The IG scrubber pump starter panel was located on the engine room's bottom platform inside a local group starter panel (LGSP) cabinet. The LGSP cabinet had several sections: the upper sections held starter controls for various types of machinery, while the lower section contained the 440V power terminals (**FIGURE 2**). The cover over the power terminals was fully removable (**FIGURE 3**). Unlike other starter cabinets on the ship, the LGSP cabinet had no horizontal divider between the upper and lower section. Also the three power cable terminals in the lower section did not have covers over the power terminals to prevent accidental contact. The pump starter panel door could only be opened after turning the main power breaker lever to the off position, which de-energized the equipment in the panel.

At 1144, the engine control room (ECR) received a low 440V insulation alarm. The 2/E, fourth engineer (4/E) and the cadet, who were in the ECR at the time, could not identify the cause of the alarm. The cadet was instructed to tell the electrician to investigate the cause of the alarm and proceeded to the bottom platform where he had last seen him.

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FIGURE 4 TOOLS AND SAFETY HELMET ON DECK WHERE THE ELECTRICIAN WAS FOUND.

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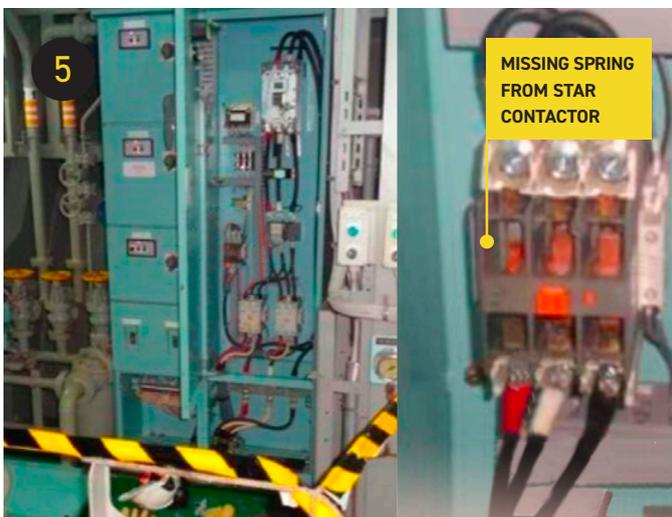


FIGURE 5 IG SCRUBBER PUMP STARTER CONTACTS AND THE MISSING STAR CONTACTOR SPRING.

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WHAT HAPPENED (CONTINUED)

On arriving at the LGSP cabinet, the cadet found the electrician lying on the deck with his head and hands inside the lower section (**FIGURE 1**). The cadet then removed the electrician, who was reported to be unconscious and unresponsive, from the LGSP cabinet by pulling on his safety shoes. The electrician's tools, safety helmet and rubber gloves were on the deck in front of the cabinet (**FIGURE 4**). The door for the IG scrubber pump starter panel was fully open, and the lower panel covering the 440V power terminals had been removed and placed to the left of the LGSP cabinet (**FIGURE 1**).

The cadet alerted the third engineer (3/E) and motorman working nearby about the incident. They then moved the electrician further away from the open LGSP cabinet, found he had no pulse and started cardiopulmonary resuscitation (CPR). The master was subsequently advised, a general alarm raised and emergency medical equipment brought to the scene. Despite continued CPR, the electrician could not be resuscitated. The ship diverted to a nearby port and the electrician was transported ashore the same day. He was pronounced dead by shore medical personnel and a post-mortem examination found that the cause of death was consistent with electrocution.

The main circuit breaker supplying power to the pump starter (inside the IG scrubber pump starter panel) was found in the off (open) position. The star contactor for the pump starter was missing a spring and cover locking pin (**FIGURE 5**). These were found on the cabinet's lower framing and deck. The investigation presumed that the electrician inadvertently touched the energized 440V power terminals in the cabinet's lower section while retrieving the star contactor spring or the cover locking pin.

LESSONS LEARNED ON NEXT PAGE

LESSONS LEARNED

THE FOLLOWING LESSONS LEARNED HAVE BEEN IDENTIFIED BASED ON THE AVAILABLE INFORMATION IN THE INVESTIGATION REPORT AND ARE NOT INTENDED TO APPORTION BLAME ON THE INDIVIDUALS OR COMPANY INVOLVED:

- Completing a formal risk assessment, as required by the SMS, should have identified the hazards of working in the cabinet, which included the 440V power cables and terminals, and would have resulted in adequate risk mitigation.
- Completing a Permit to Work (PTW), as required by the SMS, would have resulted in implementing LOTO procedures (which was a key condition of a PTW) and de-energizing circuits and equipment in and around the work area. This would have prevented the electrician from accessing the cabinet while the 440V power input was not secured.
- Carrying out a work-specific Toolbox Talk, as required after issuing a PTW, could have helped with appropriate pre-task hazard identification. The engineering officers reported after the incident that they were not aware that the electrician was completing this work and as a result they had not held a Toolbox Talk with him.
- The Company's SMS required that all scheduled work be planned at least one day in advance to allow adequate time for completing the required safety procedures. During the morning planning meeting, the electrician was not questioned or prevented from undertaking previously unplanned work.
- A completed PTW would have required another crew member to be present when working on electrical equipment. However, the electrician was working alone when the incident occurred. The presence of another crew member could have resulted in an appropriate challenge and stopped the unsafe work.
- The Company had implemented a Stop Work Authority (SWA) policy, which required that all crew members take action to prevent unsafe acts or conditions when observed. Using this authority, the 2/E and engine cadet could have prevented the electrician from working due to not complying with the requirements in the Company's SMS.
- An effective and timely scheduled maintenance would have resulted in recording and rectifying the missing physical safety barriers within the LGSP cabinet and prevented the electrician from accidental contact with energized circuits.
- Although it did not contribute to the incident, the cadet could also have been electrocuted when he immediately pulled the electrician from the LGSP cabinet. A more correct response would have been to ensure that the power was isolated and that the electrician's body was not energized due to contact with the live terminals.

CONTACT

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THE SOURCE OF THIS CASE STUDY IS AN INVESTIGATION CONDUCTED BY THE REPUBLIC OF THE MARSHALL ISLANDS MARITIME ADMINISTRATOR.

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