D39 Sometimes Electrical Work Results in Damage, Fire, Injury, or Electrocution

Thomas P. Shefchick, BSEE, 853 Enisgrove Way, The Villages, FL 32163-2447*

The goal of this presentation is to illustrate how to use burn patterns to determine the origin and cause of an electrical problem.

This presentation will impact the forensic science community by discussing methods to determine the cause of an electrical occurrence.

The first case is concerns an 8,000 horsepower synchronous motor that broke down and subsequently was repaired by an electrical mechanical apparatus repair company. Three months after the motor was repaired and reinstalled, problems were encountered. The motor's rotor had been rewound after the initial breakdown. Rewinding a rotor involves taking it completely apart and replacing the electrical components that produce its magnetic fields. Inspection of the motor installation found no evidence of damage. Therefore, the motor was removed and disassembled. The motor's stator showed no visible damage but the rotor's components had sustained heat damage. The rotor had cooling fins to ventilate its heat during operation; however, the motor repair company had installed the fins in a manner that would entrap the heat which caused damage to the rotor windings. This problem could have been prevented by marking the proper cooling fin orientation before the rotor was disassembled.

The second case discusses mufflers which had been installed on generators that supplied electrical power to a luxury residential establishment. The mufflers were installed to reduce the noise produced by the generators. Three generators were installed in a stand-alone building and controlled by a computer system which rotated operation of the generators. One evening the computer system failed to transfer from generator number 1 to generator number 2 and subsequently the roof of the generator building caught fire. Examination of the burn patterns indicated that heat leaking from a muffler connection ignited the combustible roof. The mufflers were removed from the generators and their internal metal components were found severely heat damaged which indicated that the problem originated within the mufflers. Analysis of the materials in the mufflers revealed that the wrong type of metal was used to manufacture them.

The third case involves a severe electrical injury at a luxury hotel. The hotel had an electrical contractor install equipment to improve their electrical power factor. The purpose of improving the power factor was to reduce their electrical utility bill; however, the contractor was not able to complete the installation because a door covering the control components did not fit properly. When the correct door was obtained, the contractor suggested that a hotel employee could install it. Subsequently, a maintenance man of the hotel was severely electrically burned when he attempted to install the door. The burn patterns on the door and motor control center indicated that his screwdriver slipped while attempting to attach the door. This problem would not have occurred if the motor control center was completely de-energized as required by warning labels on the motor control center.

The last case is relates to electrocution at a school. The school had been experiencing a problem with a steamer oven in the kitchen of their cafeteria. A repair company was contacted and sent an electrical repairman to fix the steamer oven. The repairman removed covers from the steamer oven to examine the operation of its internal components. While examining the components, the man was electrocuted. Components on the interior of the steamer oven had burnt hair on them which indicated that the man's head had made contact with the electrically energized components. In addition, the workman was surrounded by grounded metal equipment. This problem could have been avoided by mounting a disconnect switch at the steamer oven and providing sufficient workspace around equipment as required by the national electrical codes.

Burn Patterns, Electrical, Electrocution