D10 An Investigation Into the Cause of a Fire Engulfing Two Collided Buses

Qiang Chen, PhD, Chinese Automotive Technology Research Centre, Beijing 100070, CHINA; Xiao Hu*, Beijing 100070, CHINA*

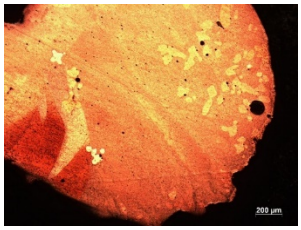
Learning Overview: After attending this presentation, attendees will understand how a fire started and its origin after two buses collided accidentally. Attendees also will get a better view of a magnetic-steel remanence detecting method and metallographic method as applied to the research.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by demonstrating the utility of a magnetic-steel remanence detecting method and metallographic method as a combined technique when carrying out vehicle-fire analysis.

Background: This case involves two urban buses both packed with more than ten passengers. When the two buses were traveling along a side road in the opposite direction, they had a head-on collision when passing each other. Only a few of the passengers were evacuated promptly and a dozen people got stuck between distorted seats. Within minutes, both buses burst into flames. Eventually, the buses were burned down to the bare metal frames, causing heavy casualties. Considering its social impact, the local government administrative departments required a forensic investigation into what had started the fire.

Methods: First, the overall appearance of the two buses' remains were checked to determine the approximate areas of the worst burning. In this operation, forensic engineers should pay particular attention to the colors of residual metal parts, which would tell the developmental trail of the fire. Second, electrical wires, fuel pipelines, and other combustibles around the possible epicenter of the fire were analyzed. As the previous analysis shows that the earliest flame started near one of the drivers' dashboards other than its mid-tank or rear-engine, forensic engineers should focus on examination of cables. Third, residual cables were tested with total coverage by magnetic remanence detector, and circuit melted beads were looked for. Fourth, samples of circuit melted beads were examined through metallographic analysis apparatus, then these microstructure images were compared to find the primary short-circuited melted mark.

Results: A magnetic remanence detector revealed that the highest test value is 6.3mT, compared with the rest of the area of no more than 0.3mT. Two circuit melted samples were collected from the residual cables nearby. In the lab, two samples were carefully observed under metallographic microscope respectively. The microstructure images indicated that one sample has distinct characteristics of primary short-circuited melted mark. Thus it is concluded that the deadly fire was caused by a primary short circuit that would ignite a fire around combustible materials.



Conclusions: Electrical circuits in all vehicles have become more and more complex. In cases of head-on collision, a primary short circuit actually has caused a number of fire accidents without obvious traces. The results of this study confirm that metallographic analysis combined with magnetic remanence detecting could help forensic engineers investigate and locate the fire point efficiently and accurately.

Fire Investigation, Metallographic Analysis, Magnetic Remanence Detecting

*Presenting Author