Forensic Science Insights

Gossman Forensics - David Gossman, Louise Denlinger

Volume 1 January 2018 Issue 1

Fires and Explosions
Evidence Gathering and Preservation

Why Sample Early?

It is imperative to conduct a thorough on-site chemical sampling program as soon as access to the fire and/or explosion scene is available. High activity at the incident scene can destroy, modify, contaminate and/or compromise evidence. Once the fire scene has been demolished, altered or repaired, the opportunity to collect evidence has been severely reduced or eliminated.

Chemical residues from the fire scene can provide a great deal of information to the investigator. Detailed knowledge of the chemistry and behavior of fires makes it possible for an experienced investigator to identify sources of potential chemical clues from a fire or explosion. As an example, often chemical traces can be captured by materials that might not be obvious to collect, such as silicone based materials found on equipment that happens to be at the scene. Evidence directly linked to the fire may be found at the point of origin, such as fuel sources and incendiary devices. Areas surrounding the point of origin offer critical chemical clues for the investigator and often contain important chemical residues.

Early chemical sampling of air, soil and/or debris helps ensure volatile substances and other chemical elements do not escape, interact, degrade or become contaminated. It minimizes loss of information related to positioning of debris and reduces the likelihood of loss of evidence critical to understanding the causative chain of events. Early sampling can highlight the need for additional sampling and can ultimately make or break the outcome of the case.

Scene Photography and Videography

Videography and still photography of an incident scene allows the investigator to preserve a visual, permanent record of the scene during all aspects of the investigation. The fire and explosion scene is usually complex and challenging due to fire suppression and other emergency personnel operations. Shortly after access is allowed into a fire and/or explosion scene, police and fire investigators, insurance adjusters, forensic teams, lawyers, city and county personnel, and construction or excavating crews are conducting their duties, ultimately disturbing the scene. Evidence at a fire and explosion scene can change or disappear quickly.

Photography, both still and video, at the earliest possible time after a fire or explosion, will provide a more complete photographical representation of the site. This evidence is imperative for court proceedings as well as a reference for the investigator. The responding fire department will often create an investigative report that contains an extensive photograph log of the incident scene. This photo documentation may include interior, exterior, evidence discovered, and extent of damage photos taken at the earliest possible time, even potentially taken during the fire suppression process. Another source of photographic evidence may be found with surveillance video both at the location of the incident and at nearby locations. An immediate request should be made to any locations with potential surveillance imaging to ensure footage is not overwritten, lost or altered, as surveillance imaging is typically only saved for a limited time before being erased and the media reused.

Samples

Evidence collected from explosion and/or fire scenes will be varied and unique to the incident site. Materials suspected of containing ignitable/flammable liquid residues (ILR) are typically the most

common type of chemical evidence collected at a fire and/or explosion scene. Other evidence that may be collected for analysis includes comparison samples, liquid samples, solid materials, and residues in any containers involved in the incident. Samples may be collected from soils, sumps, depressions and areas of standing water beginning at the point of origin to a radius determined by the forensic investigator. Waste fire water may contain chemical residues that could provide insight.

If any part of the original receptacle where the explosion initiated is present, including any contents, residues or solids, diligent sampling is warranted. Any suspected materials involved in the incident should be tested to formulate the fire and explosion investigator's hypothesis about the origin and cause of the fire. Sampling of smoke detector systems have proven valuable in some instances.

Field blanks should be taken where possible. For example, water samples from the fire trucks involved in the extinguishment of the fire should be collected, if possible, to document any trace materials contained in their water source. If there are samples available elsewhere at the facility of the same materials that were involved in the incident, these should be sampled so that the investigator can make comparisons between what materials chemically "looked like" prior to the incident and after the incident.

Post fire/explosion evidence collection will be unique to each incident and requires the forensic investigator to understand explosion dynamics, chemistry and the correct methodologies for sample collection. In order for analysis results to be used by a forensic investigator in forming an opinion and supporting court testimony, QA/QC methods and sample chain of custody must be strictly followed. An accredited laboratory with appropriate experience must be used and relevant quality assurance testing associated with the evidence samples must be requested at the time of submittal of the samples to the laboratory. Sample preservation and storage may be a critical step in the process.

Sampling Issues

Various containers have been used for sampling fire debris; however, unlined metal paint cans are often the most suitable because of their excellent sealing capabilities and robust design. Their interior surfaces generally do not generate chemical interferences with most analytical techniques. Sterile plastic or glass jars are also frequently used and offer many of the same benefits as metal paint cans. Plastic bags are easily pierced and are prone to diffusion of vapors both into and out from the bag. Liquid evidence collected for laboratory analysis must be immediately placed in laboratory-approved, unused, vapor tight containers such as sterile paint cans, plastic or glass jars. Labeling should be detailed and include the date and time of collection, a sample number, description, location of collection and name of the sampler. Sampling itself is often documented with photographs or video to document the integrity of the process. Packing and shipping samples of potentially hazardous materials typically requires special procedures for shipment and completion of chain of custody documents.

Conclusion

It is crucial in a fire and/or explosion case that evidence collection, preservation, and chain of custody standards and procedures are followed precisely by the forensic investigator. The collection, chain of custody, laboratory procedures and analysis, and evidence preservation methods will be scrutinized in any litigation. Gossman Forensics personnel have decades of experience in sampling and quality control procedures, as well as in laboratory operations, procedures and analysis. We are equipped with the knowledge and experience to identify the testing methods that will provide optimum information. This allows us to provide our clients with an unbiased scientific investigation that will be detailed and complete.

References:
Lentini, John J., *Scientific Protocols for Fire Investigation*, CRC Press, 2016, Section 4.12.
NFPA 921: Guide for Fire and Explosion Investigations, 2017 Edition, Chapter 17.

Forensic Science Insights is a publication by Gossman Forensics, a division of ChemRight Laboratories, Inc. Please contact David Gossman, Chief Investigator, at 563-652-2822, by email at dgossman@gossmanforensics.com or visit us on the web at GossmanForensics.com.