## C1 The Development of a Cleaning Protocol for Mobile Devices Damaged by Fire

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**Learning Overview:** After attending this presentation, attendees will understand the cleaning protocols developed to aid in handling mobile devices following fire damage and extinguishment.

**Impact on the Forensic Science Community:** This presentation will impact the forensic science community by providing a best practice for evidence collection to safely handle, clean, store, and acquire data from mobile devices following fire damage and extinguishment.

Mobile devices damaged by fire can be problematic for forensic investigators. If the inner components of the mobile device are damaged or melted, the probability of collecting a successful cable acquisition decreases. In many cases, the outer shell and components of the device are easily destroyed, while the inner components of the mobile devices remain mostly intact, but blackened and soiled. In these cases, mobile devices may need to be cleaned utilizing a forensically sound protocol before they are sent to a forensic analyst.

Many fire marshals and fire departments do not have cleaning protocols for mobile and/or digital devices. Once collected and submitted to the forensic laboratory, digital devices may sit untouched for months due to backlog. Residue from extinguishers can be corrosive to devices and can damage the inner components. The goal for this project was to determine an appropriate, low-cost cleaning methodology and protocol for mobile devices damaged by fire that evidence collection teams, fire departments, and fire marshals can implement before forwarding the devices to the forensic laboratory for analysis.

The three most common ignition modalities are commercial gasoline, commercial diesel, and combustibles. Fire departments typically utilize water as the primary extinguishment method, while class A foam and dry chemical fire extinguishers are often the extinguishers used in a workplace setting. The ignition and extinguishment outlined were used during experimentation.

A total of 60 Blackberry® 8330 Curve and 9330 Curve 3 mobile devices were used during this experiment. All devices were initially imaged via traditional cable acquisition with Cellebrite® Universal Forensic Extraction Device (UFED) 4PC® version 7.18.0.199 and total file sizes were collected for the acquired physical image. The devices were then introduced to each of the methods of ignition, burned in a controlled setting, then extinguished. The devices were collected and cleaned utilizing various predetermined cleaning protocols. A Gas Chromatography/Mass Spectrometer (GC/MS) equipped with a Restek Rtx®-5MS column (30.0m x 250µm x 0.25µm) was utilized before and after cleaning each phone to confirm that there was no remaining residue from ignitable liquids or the extinguishers. Previous research determined a 15-minute cleaning cycle with 5% Elma Ultrasonics® Elma Tec® Clean A1 Solution followed by a 24-hour drying cycle is the ideal cleaning procedure for mobile devices that have been submerged in ignitable liquids.[1] Scrubbing Bubbles® was used as the second cleaning method for departments that do not have access to an ultrasonic cleaner. The third cleaning method used was a 95% solution of isopropyl alcohol because it is currently used in laboratories to clean water from the boards of mobile devices.

To determine that the data on the mobile devices remained intact after cleaning, the devices were re-imaged using cable acquisition as previously outlined or advanced acquisition methods (chip-off or JTAG) where cable acquisitions failed. For devices where acquisition was not possible, the conditions of the logic board and internal components were examined to determine whether it was fire/heat damage or the extinguishing chemical that prevented a successful acquisition. Using Cellebrite® UFED Physical Analyzer® version 7.7.0.93, the file sizes collected after cleaning were compared to the file size collected prior to damage to show that the data on the mobile device had not been changed.

**Reference(s):**

1. Nico Kresl, Chelsey McPhillen, HollyAnn Swann, et al. The Development of Cleaning Protocols for the Analysis of Mobile Devices That Have Been Submerged in Oil-Based, Flammable, and Clandestine Chemical Liquids. *Proceedings of the American Academy of Forensic Sciences*, 71st Annual Scientific Meeting, Baltimore, MD. 2019.

**Mobile Forensics, Damaged Devices, Fire**



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