



Engineering Sciences Section – 2007

C33 Case Studies: Exploding Portable Gasoline Containers

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After attending this presentation, attendees will learn the concept of flame arresters and the probability of gasoline container explosions.

This presentation will impact the forensic community and/or humanity by demonstrating the probability of gasoline container explosions in the home. A simple engineering solution to this problem is the installation of a flame arrester, which is already used in metal safety containers.

Sir Humphrey Davy developed the first miner's flame safety lamp in 1815. The Davy lamp focused on a safe way to provide lighting for coal miners, and involved the use of a perforated metal barrier (or flame arrester) to prevent the propagation of flame through a flammable vapor mixture. The principle of the Davy lamp has been utilized in various applications over the past two hundred years, including metal safety containers used for gasoline storage.

This paper describes case studies of portable plastic gasoline container explosions and fires that have occurred while emptying the container. In one example, while working at home on a science project to determine the burn rates of different types of wood fuel, a fourteen-year-old boy was severely burned after flames traveled back up into the portable gasoline container and exploded. A neighbor heard the explosion and saw flames go ten feet in the air, resulting in a spray of burning gasoline in all directions. It is shown by experimentation that a flame arrester installed in the pour opening of the portable gasoline container would have prevented an explosion inside the gasoline container.

It is also shown by experimentation that portable gasoline container explosions are more likely to occur at cold temperatures or if the light ends of the gasoline have been evaporated. For example, the saturated vapor of 40% evaporated winter-grade gasoline will ignite and explode if the ambient temperature is 43°F or below, with the greatest explosion pressure expected at about 25°F, independent of the amount of liquid gasoline in the container. A video showing the destruction of a two-gallon plastic gasoline container containing two cups of 40% evaporated gasoline will be viewed at the presentation. The possibility of a BLEVE (Boiling Liquid Expanding Vapor Explosion) occurring in a portable gasoline container will also be discussed.

Gasoline, Fire, Explosion