

***** ABSTRACT ONLY *****

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Impact of Fire Fighting Agents on Drop Size

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As part of a study funded by the United States Fire Administration, the National Institute of Standards and Technology investigated the effectiveness of water additives for use in fighting fire. These additives, or surfactants, are of great interest due to numerous claims regarding their capabilities and benefits including decreased water requirements for extinguishment, reduced levels of toxins produced by fires, and prevented rekindling of fires. One of the properties of water which the surfactants affect is surface tension. The addition of a surfactant reduces the surface tension of water. This potentially enables the solution to break into smaller droplets resulting in more surface area being exposed to the fire.

To investigate the impact of surfactants on droplet size, droplet differences between water and water plus one of several surfactant agents was measured using a droplet analyzer. An optical array laser probe was used to record the droplet measurements. A typical fire fighting fog nozzle supplied with either water or a water-surfactant combination was used in the tests. Droplet measurements were recorded at four different locations within the circular spray pattern. Droplet sizes, distribution and velocity were measured and analyzed.

Analysis of the data obtained from this test series was conducted in accordance with ASTM E 799-92, Standard Practice for Determining Data Criteria and Processing for Liquid Drop Size Analysis. The measurement of most interest was the $D_{v,0.99}$ or drop diameter such that 99% of the total liquid volume is in drops of smaller diameter. Results from these experiments indicate that some agents have a significant impact on drop size. In addition, the drop size has an impact on the velocity of the drops and consequently their ability to penetrate the fire plume.