Daniel A. Martin, "The Use of a Water Mist Curtain as a Radiation Shield"
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Popular Science Summary

Can a curtain of tiny water droplets block the dangerous, invisible radiation produced by a fire? It was found that small water droplets that are generated at high pressures can block 40% - 95% of the radiation from a heat source.

Droplets of the smallest size are the best at blocking the radiation. As the droplets grow in size further and further away from the nozzle, the percentage of blocking decreases. Once the droplets reach a diameter that is a factor of 10 larger than the radiation wavelength, the blocking percentage increases to a maximum. Below that point, the droplets get even larger and the radiation blocking decreases again.

The blocking percentage of the spray, as you move away from the nozzle, follows the same trend as the amount or concentration of water within the spray. Close to the nozzle the spray is narrow and contains a lot of water and greater blocking. Further away from the nozzle the spray gets wider and the concentration decreases and the blocking decreases. At 30 cm below the nozzle, the spray width becomes constant. The concentration of water at this point begins to increases and so does the amount of radiation blocked by the mist curtain.

Two different gas burning heat sources were used to create the radiation measured in this project: a radiation panel and a straight line flame. Between the two radiation sources, the water mist was more efficient in blocking the radiation from the flame compared to the radiant panel. This is due to the fact that the radiation from the flame has several different radiation wavelength sizes that can be absorbed better since the mist has several different droplet sizes within it.

Laboratory experiments were designed and conducted in order to understand how a water mist curtain can block the dangerous radiation from a fire. Several previous studies have looked at water mist curtains supplied with low pressure and high water flow. These tests are the first to investigate the radiation blocking ability of a high pressure (100 bar), low water flow water mist curtain.

These results will not only benefit the scientific community, but building safety designers all over the world. This work provides a broad approach to understanding the complex scattering and absorbing capabilities of water mist curtains. Every day, people are looking for economical, low cost, and efficient ways of protecting their interests. It is the author's opinion that water mist curtains can be an excellent method of stopping the fire from spreading from compartment to compartment and save lives and property.

This work can be used as a stepping stone for future research projects in the private sector and academic fields; both experimental and computer simulations studies. Also, these results provide vital information to fire protection engineers in regards to system effective as they look to implement water mist curtains into their building designs to protect people and property.