INTERIOR FIREFIGHTING ANNO 2016: DO NOT FOCUS ON THE FLAMES ONLY!

POPULARIZED SUMMARY OF MASTER THESIS REPORT

MATTHIAS VAN DE VEIRE

With the ever more present danger of a hot gaseous layer igniting above a firefighting crew operating in an interior attack, the author focuses on a way to reduce this danger by cooling those gases that pose this threat.

Gas cooling has been introduced by the Swedish fire service in the 1980s. It is a method designed to cool down the smoke layer formed in enclosure fires by applying bursts of water in the gaseous layer. Since these gases are typically above 100°C, the water will want to vaporize. This vaporization requires energy which is taken from the heat of the hot gases, resulting in a cool down of these. Doing so, lowers the chances of ignition since a lot of heat is required to do so. Simultaneously, the flammability of the gaseous mixture is also decreased by the introduction of water vapour. Although water vapour or steam is added to the gas layer, it does not mean that the volume of this layer will expand since cooled gases also contract. If this contraction is larger than the added amount of steam, a better visibility is created for the operating crew.

While these techniques have proven themselves on the fire ground, they require good craftsmanship and a vast understanding of the science behind it. Several factors decide whether or not this technique can successfully be achieved. For example, in training, firefighters are told to let water touch the ceiling as little as possible so a maximum amount of heat can be transferred from the gas layer to the water. The goal of the author was to get a better understanding of what happens in an enclosure after gas cooling has been performed.

This research has performed several comparisons of different nozzles operated at different settings. In a miniature room a gas layer was generated by a fire in an adjacent room. Water was then applied in all possible ways a firefighter could do from stance.

These experiments showed that having sprays with smaller droplets are more important than the percentage of water that hits the ceiling. A relative small decrease in droplet diameter proved much better results than sprays with larger droplets that hit the ceiling less. Surprisingly there was one nozzle that performed very well with larger droplets due to its droplet distribution. This would definitely favour future research!

It was also observed that long pulses resulted in a more efficient cooling than applying the same volume of water in 5 different pulses. Applying one long pulse is also faster, allowing the fire crew to advance faster to the fire! Lastly, this long pulse also cools more gases further away from the nozzle, resulting in a colder and safer environment to advance to.

Although theoretically the gas layer should contract due to the water application, this was not seen in this experimental setup. However, conditions did not get worse too! Firefighters can thus be assured that this technique works and allows them better and safer working conditions as they advance to the fire source.