

RESULTS OF INVESTIGATIONS OF EFFICIENCY OF WATER MIST FOR FIRE SUPPRESSION

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In our numerous investigations we studied a mechanism and an efficiency of fire suppression by water mist at various conditions of its producing and application. The results of application of water mist are: reduction of temperature, removal of smoke and complete fire suppression. The basic mechanisms of fire suppression are the cooling of burning material and formation of steam cloud for localization of the center of fire. The reduction of droplet size intensifies these processes, however reduction of the droplet size causes the decrease of flow rate for droplets. In the case when kinetic energy of the droplets is not sufficient, they can not overcome convectional thermal flows and thermal conduction-radiation barrier. As a result the droplets can not reach a surface of burning and suppress this process. In this case the water mist can be considered as an auxiliary tool for a mitigation of conditions at a fire, but not as a tool of fire suppression.

The following principles of producing and transportation of water mist to the center of fire were investigated:

1. Dispersion of water and formation of the flow of droplets by high pressure (up to 150 bar) using small injector;
2. Dispersion of water and formation of flow of droplets by high speed stream of gaseous propellant;
3. Formation of combined flow of water droplets with small and large size of particles, where flow of droplets of larger size is used for transportation of water mist to the zone of combustion;
4. Generation of water mist using special nozzle of low pressure (below 12 bars).

These four types of water mist systems are used for extinction of class A and B fire sources. Our results show that it is possible to classify 90 % of cases of application of water mist systems as the cases of local fire suppression, and only 10 % of cases of fire extinguishing by water mist can be referred to total flooding fire suppression.

The results of investigations were used for development of above mentioned approaches which are now widely used for fire protection of technological equipment in sealed and semi-open enclosures, libraries and museums.