

Optimizing Fire Suppression Time in Buildings by Forming a Fire Feedback Loop

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Abstract : Fires in different types of facilities are a serious problem worldwide. It is still an unaccomplished science and technology objective to establish the minimum number and type of sensors in automatic systems of compartment fire suppression which would turn the fire-extinguishing agent spraying on and off in real time depending on the state of the fire, minimize the amount of agent applied, delay time in fire suppression and system response, as well as the time of combustion suppression. Based on the results of experimental studies, the conclusion was made that it is reasonable to use a gas analysis system and heat sensors (in the event of their prior activation) to determine the effectiveness of fire suppression (fire-extinguishing composition interacts with the fire). Thus, the concentration of CO in the interaction of the firefighting liquid with the fire increases to 0.7–1.2%, which indicates a slowdown in the flame combustion, and heat sensors stop responding at a gas medium temperature below 80 °C, which shows a gradual decrease in the heat release from the fire. The evidence from this study suggests that the information received from the video recording equipment (video camera) should be used in real time as an additional parameter confirming fire suppression. Research was supported by Russian Science Foundation (project No 21-19-00009, <https://rscf.ru/en/project/21-19-00009/>).

Keywords : compartment fires, fire suppression, continuous control of fire behavior, feedback systems

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