Performance Based Guidance in Specifying Clean Extinguishing Agent Protection Against Energy Augmented Data Center Fires Conditions

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Over the past two decades, a significant effort has been made by researchers attempting to quantify extinguishing performance of clean extinguishing agents on fires involving electrically energized or so-called energy augmented fires. The focus has particularly been on typical fires one would encounter in a data center or telecommunications facility. What has been discovered by the researchers as well as the technical committees for international standards governing clean agent use is that matching test results to real world experience is decidedly not straightforward.

Energy dissipation in a typical data center or telecommunications cabinet has been increasing dramatically in recent times. The modern data center environment was originally designed to support rack energy densities of less than 2kW per rack. With the growth of cloud computing, server facilities now incorporate rack densities between 10 and 20kW/rack, with all indications those densities will increase. The question is, what is the typical fire scenario, and what is the heat flux rate augmenting the fire?

In 2008, NFPA's Fire Protection Research Foundation sponsored a review of all relevant research to date on the subject.[1] With input from eight industry recognized technical experts and funded by twelve interested parties, the comprehensive report endeavored to summarize the work performed and provided scientific analysis. Heat flux rates reported in the FPRF report are in the range of 10-60 kw/m2, while the real heat flux rates in data centers and telecommunications facilities are an order of magnitude less, in the 1-4 kw/m2 range. Agent performance data at those lower heat flux rates is needed on which to correctly base energy augmented clean agent system design.

This paper reports on comparative test results for clean extinguishing agents at the lower heat flux rates using the REED and gives justification for their use with validation from independent telecommunications and data center industry experts.

[1] Linteris, Ph.D, Gregory T., National Institute of Standards and Technology BRFL, "Clean Agent Suppression of Energized Electrical Equipment Fires", January, 2009, prepared for the NFPA Fire Protection Research Foundation, Quincy, MA, USA.