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SoMAM Fall 2024 Seminar Series

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Friday, October 4 • 2:30 PM

PWEB 175

The Combined Use of Modeling and Large-scale Experiments in the Development of Fire Protection Solutions

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Abstract: Practical fire protection challenges are often not easily amenable to solutions that can be developed from a single approach. The tools that are more frequently used include: engineering correlations, reduced-scale physical modeling, large-scale testing, computer simulations. The last two find wide application in addressing loss prevention questions. Large-scale testing, however, is very expensive and not always feasible. CFD modeling, on the other hand, is not fully reliable in the absence of experimental validation. These limitations can be overcome by combining the two approaches. The seminar will discuss two cases where that was done and will highlight the challenges that were encountered.

Biographical Sketch: After doing initial work on the computer modeling of fires and coordinating for several years FM's research activities in the area of explosions, Dr. Tamanini moved in 2004 to the Consulting Research Scientist position and eventually to Sr. Research Fellow. In his current role, he provides support to the Manager of Research, and to the entire scientific and engineering staff, on issues spanning all research topics of interest to FM. They include: fire testing, material flammability, CFD modeling of fires and explosions, impact of natural hazards (wind, flood, earthquake) on property, risk assessment, equipment reliability, and material damage. During April 2021-June 2023 he has been the Acting Director for the Equipment, Cyber and Materials Science Area.

He has contributed original work in several technical areas:

- extinguishment of fires by water sprays;
- computer modeling of turbulent buoyancy controlled flames;
- measurements of the flammability properties of materials;
- large scale experiments on the combustion behavior of hydrogen releases into confined volumes;
- definition of the reactivity characteristics of silane;
- vent sizing requirements for explosions in layered vapor/air mixtures;
- engineering tools for dust explosion protection vent sizing;
- protection of storage of cellulose nitrate film;
- interpretation of ceiling layer temperatures in large-scale fires; and
- various other fire problems, as well as dust and gas explosions.

Franco started working at Factory Mutual Research in 1974 after receiving a Ph.D. in applied physics from Harvard University. He also holds an MS degree in aeronautics from the California Institute of Technology and a Laurea in mechanical engineering from the Politecnico di Torino in Italy. He has served as the Chairman of the Eastern States Section of the Combustion Institute, is the 1996 recipient of the Bill Doyle award of the AIChE, and has published numerous refereed papers and technical reports.

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