NIST improves performance, capabilities of its computer fire modeling tools

May 21 2014, by Mark Bello

National Institute of Standards and Technology (NIST) scientists and engineers recently enhanced the capabilities of NIST's computer fire modeling software, a powerful suite of tools used worldwide in research, arson investigations, firefighter training, and development of fire-protection designs and standards.

The just-released sixth version of the NIST Fire Dynamics Simulator (FDS) features new algorithms and other problem-solving routines, more accurate methods for predicting smoke concentrations and soot deposition, a new turbulence model, and other significant improvements. NIST also added features to its Smokeview program for visualizing fire behavior and phenomena predicted by FDS.

Together, the fire modeling tools help to unravel the complex physics and chemistry of fire. Since they were first issued for public use in 2000, FDS and Smokeview have proved to be one of the most important advances in the field of fire protection research and engineering in the last decade.

FDS "has become the tool of choice by both the fire research and fire engineering communities," according to the International Forum of Fire Research Directors, an organization that promotes international cooperation in fire safety research. As a result, the forum says, "many new insights have emerged, further extending our understanding of the behavior of fire phenomena."

And as NIST and collaborators continue to improve the software tools' capabilities for predicting the spread, growth, and suppression of fire, use is spreading to a growing number of nations. Volunteer translation services for FDS and Smokeview support and documentation are offered in at least 15 languages.

The tools were essential to the NIST study that determined the factors that led to the collapse of the World Trade Center towers in the aftermath of the terrorist attacks on Sept. 11, 2001. The software also has aided reconstructions and experimental studies of fires in houses and high-rises, mines, aircraft cabins, nuclear facilities, road tunnels, movie theaters, parking garages, subway stations and more. In addition, FDS and Smokeview have been used to investigate circumstances in line-of-duty deaths of firefighters, and architects and engineers employ the tools when designing fire-protections systems for buildings and other structures.

FDS and Smokeview also are contributing to efforts to strengthen the scientific underpinnings of modern firefighting tactics and training. For example, the combination of fire experiments and computer modeling has greatly increased knowledge of how air flow influences the behavior of building fires. This understanding is leading to new tactics that improve the occupants' likelihood of survival and reduces hazards for first responders.

"Our aim is to bridge the gap between basic research and practical application, while maintaining the highest standards of scientific rigor," says Kevin McGrattan, the mathematician who is one of the leaders of the NIST fire modeling project. "At the same time, we are working to make the tools more accessible and useful to the entire fire-safety community."

More information: To learn more about FDS and Smokeview, go to

www.nist.gov/el/fire_research/fds_smokeview.cfm

Provided by National Institute of Standards and Technology