

Fire Modeling and Emergency System Response



AREVA utilizes Fire Dynamics Simulator (FDS), a Computational Fluid Dynamics (CFD) model of fire-driven fluid flow, developed by the National Institute of Standards and Technology (NIST)

Performance-Based Analysis

There is a movement toward risk-informed, performance-based analyses in the field of fire protection engineering, both domestically and worldwide. In response to this movement, the U.S. Nuclear Regulatory Commission (NRC) has amended its fire protection requirements in Regulatory Guidance 1.189 to permit existing reactor licensees to voluntarily use risk-informed, performance-based fire protection methods to supplement existing deterministic fire protection requirements.

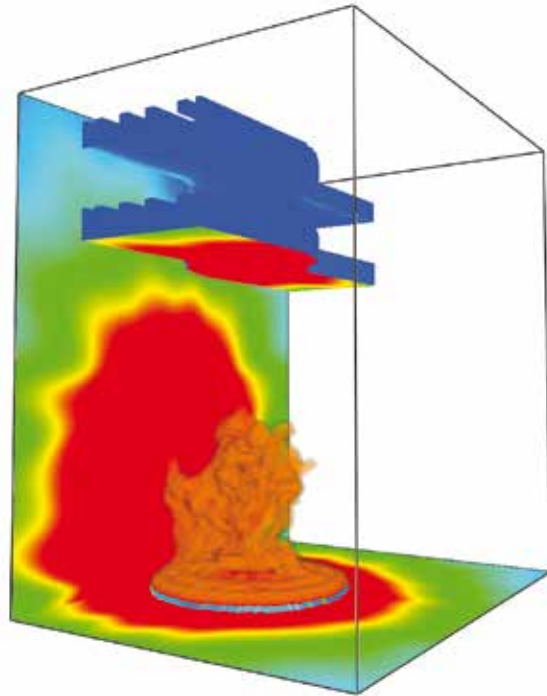
Fire Modeling

Fire modeling is the fundamental tool for evaluation of acceptance criteria in risk-informed, performance-based fire protection. Using fire modeling, it is possible to virtually assess the extent of damage, to impose design criteria, and to evaluate the effectiveness of emergency systems. AREVA engineers have the expertise and experience to perform detailed fire modeling computations consistent with the requirements of the NRC and National Fire Protection Association (NFPA). Our team is focused on delivering application-specific solutions to meet your performance objectives.

The Big Picture

To effectively utilize the results of fire modeling, it is important to understand the overall fire safety envelope. We have effectively used fire modeling output in Fire Probabilistic Risk Assessment (PRA) and to sustain/support code variances, alternative positions, risk-informed performance-based approaches, regulatory exemptions, and other legal positions.

AREVA fire protection engineers are mission-oriented, not task-oriented. We keep your needs in mind throughout every phase of the project. Our knowledge of the limitations and ranges of application of all fire modeling software approved for use in nuclear power plants allows us to select the most cost-effective methods to meet your project



goals. AREVA engineers know how to interpret the results of fire modeling, and we know how to clearly convey those results to our clients.

Features and Benefits

Cost reduction benefits can be provided in applying fire modeling techniques as follows:

- Provides clients with alternatives to prescriptive regulatory requirements
- Produces system designs tailored to meet your specific performance objectives

Features of the fire modeling application include:

- Uses state-of-the-art computational fire and egress modeling software
- Calculations performed by engineers with industry-recognized expertise
- Computational methods based on NFPA requirements using NRC-approved calculation procedures

Tools, Techniques & Applications

In applying fire modeling to performance-based analysis, AREVA retains experienced engineers with degrees in fire protection to construct the necessary scenarios for evaluation. Fire modeling requires skillful application to ensure that the input data is appropriate for the conditions being analyzed. Following are some potential fire modeling applications.

Fire Suppression Systems

AREVA engineers can model the effects of a wide range of fire scenarios to determine the necessity and suitability of fire suppression systems such as wet, dry, pre-action and deluge sprinkler systems, fixed water spray, water mist, and gaseous fire suppression systems. We can also utilize fire modeling to gain insight on various fire suppression system designs and their associated performance.

Fire Detection and Alarm

AREVA engineers can model detection devices within a compartment, establishing a sequence of events. Detector types supported by available fire models include heat detection, ionization, photoelectric, beam type and air-sampling incipient stage type smoke detection. We can also represent fire alarm system signal reporting logic as required for modeling suppression or smoke control system activation, closing fire and smoke dampers, and initiating other alarm sequences.

Building & Target Survivability

AREVA engineers can produce a real-time analysis of target performance criteria. We can evaluate survivability of mechanical, electrical, instrumentation and control systems, analyze thermal impact to building structural elements, and evaluate extent of damage for post-incident recovery.

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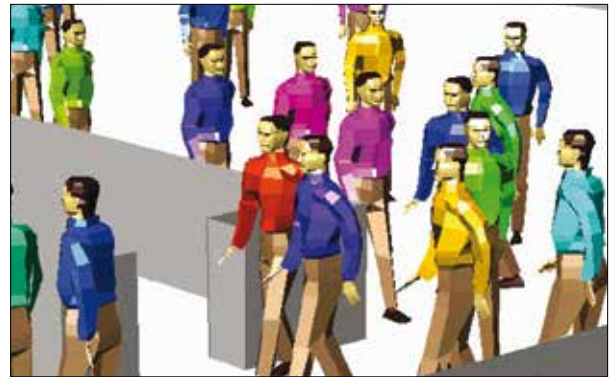
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AREVA employs sophisticated egress models that can track the movement of individual site personnel and create a three-dimensional video animation of building evacuation.

Smoke Control Systems

Our team has the technical expertise to correctly model smoke control systems including smoke exhaust, post-event smoke purging systems, smoke and heat vents, opposed airflow systems, elevator, stairwell and corridor pressurization systems.

Tenability & Timed Egress Analysis

AREVA engineers can establish emergency system design criteria to maintain tenability in occupied spaces such as the MCR, and can also use timed egress analysis to demonstrate the effectiveness of emergency systems during evacuation. Timed egress analysis is applicable for zoned evacuation, building evacuation, and site-wide evacuation.

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