LUND UNIVERSITY

Validation of CFD codes

Quality assessment of CFD codes by means of comparison with experimental fire scenarios

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Use of CFD (computional fluid dynamics) software packages within fire performance based engineering and risk assessment is increasing substantially. An important part in the process is the quality assurance. For this reason the Swedish Rescue Services Agency (SRV) sponsored a unique research project. Within the project different codes for smoke spread and evacuation have been evaluated. This poster will focus on the evaluation of four CFD software codes.

CFD Codes used

- CFX-4.4
- FDS4
- SMAFS
- SOFIE

Method

- Comparing the simulation data with experimental scenarios
- Blind simulations
- Imitation of the working conditions for a consultant
- Simulations are dependent on many factors such as the CFD-code used, judgement of input data of the scenarios done by the operator, operator skill etc.

Scenarios investigated

1. Scenarios 1A (large room with vents), 1B1 and 1B2 (corridor with vents) with ceiling vents and ceiling jets.
2. Scenario 2 is a tunnel fire taken from the US (Memorial tunnel).
3. Scenario 3 is an atrium fire taken from Japan (BRI).
4. Scenario 4 is a retail premise in ½ scale at SP in Borås.
5. Scenario 5 is an experimental study from Australia including smoke spread from a fire room to an adjacent corridor and a room.

Conclusions

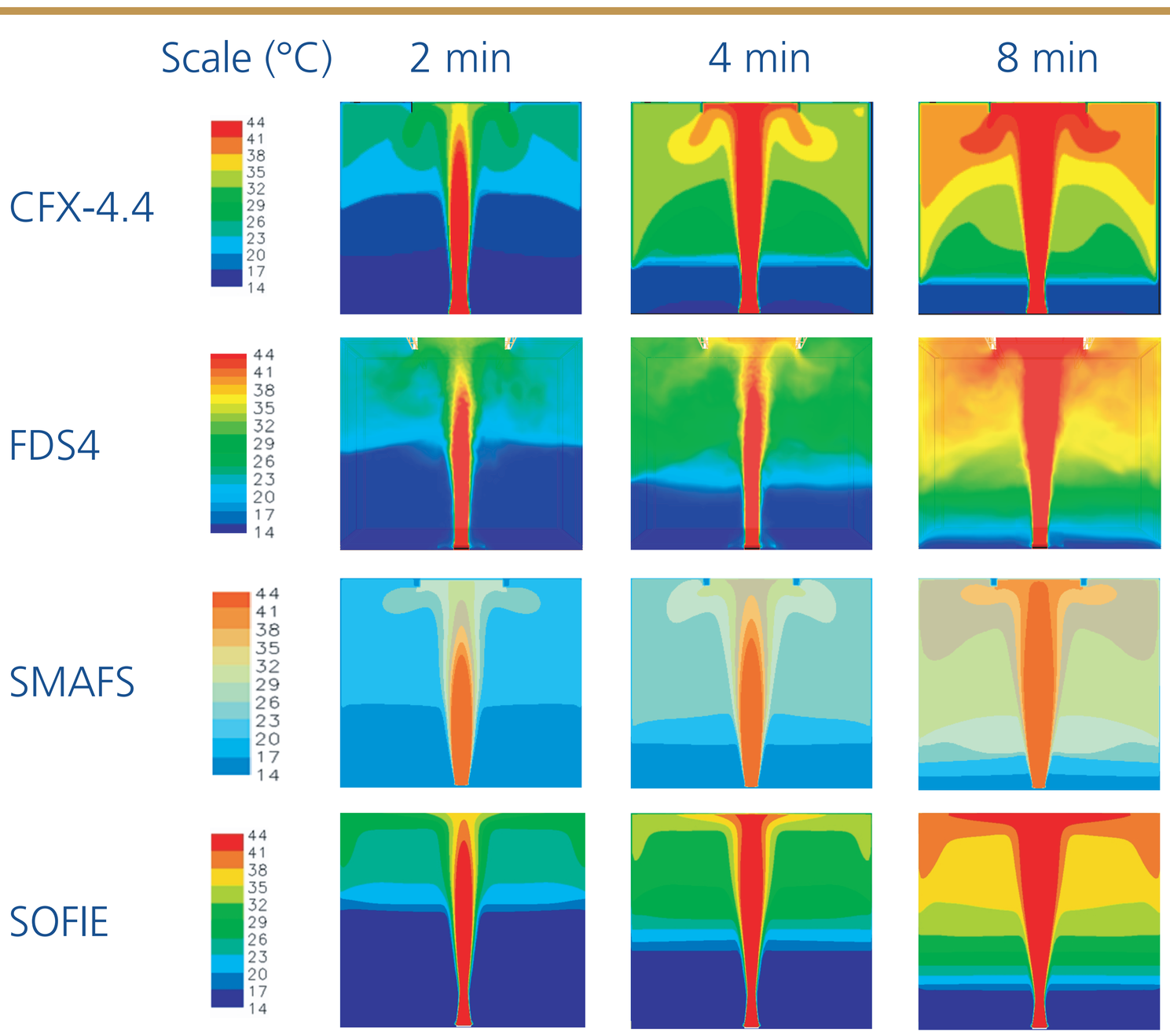
- Simulation results were generally a good description of the experimental fires studied.
- Limitations and specific properties of the different codes, together with the operator factor, can strongly influence the results.
- In depth education is necessary.

More information

Information about the study can be found in the abstract and at

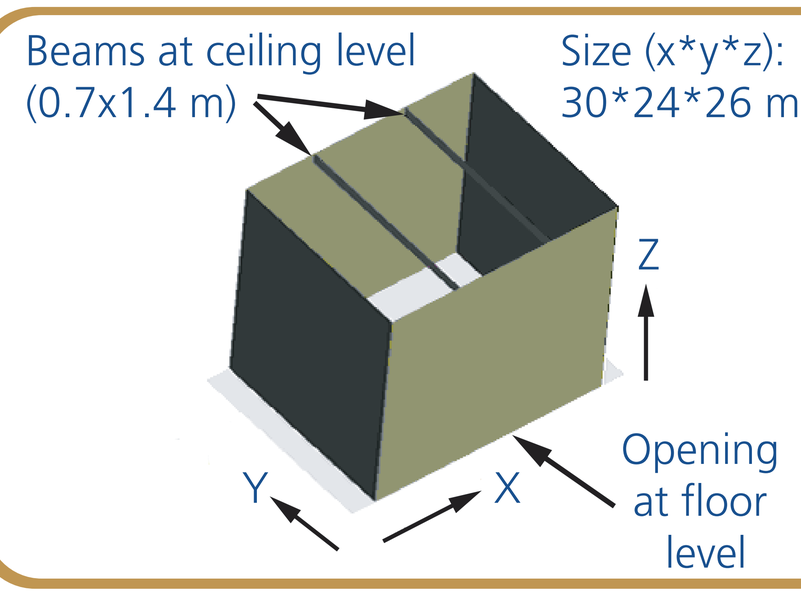
http://www.brand.lth.se/english/research/fire_safety_engineering/

Atrium scenario - comparison between CFD codes



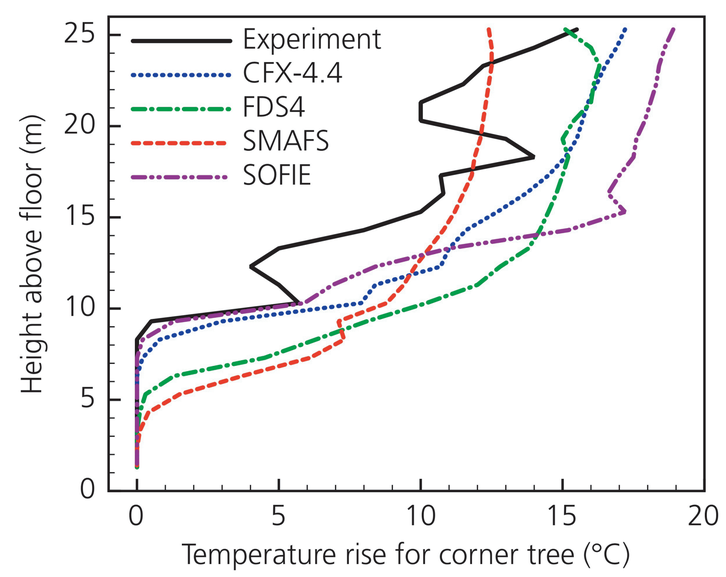
NOTE: The comparison between the codes shows strong influence of geometry aspects. The comparison with the experiment (see diagram on the right) shows different accuracies (e.g. smoke layer height and temperature) for the different codes.

Atrium - layout



Experiment vs. codes

Temperature rise vs. height (4 min)



Acknowledgments

Swedish Rescue Services Agency (SRV)