

Computer Models For Fire and Smoke

<i>Model Name:</i>	KOBRA-3D
<i>Version:</i>	WINKOBRA 4.6
<i>Classification:</i>	Field Model
<i>Very Short Description:</i>	Three-dimensional CFD model for complex geometries to be used for smoke spread and heat transfer analyses
<i>Modeler(s), Organization(s):</i>	Dr. Volker Schneider, I.S.T. Integrierte Sicherheits-Technik GmbH, Frankfurt / M., Germany
<i>User's Guide:</i>	WinKobra 4.6 – Users' Guide (hardcopy and complete online documentation – available in German and English)
<i>Technical References:</i>	WinKobra 4.6 – Technical Reference (hardcopy and complete online documentation – available in German and English) Internal Technical Notes
<i>Validation References:</i>	V. Schneider, J. Hofmann: Feldmodell-Simulation von Kohlenwasserstoff-Raumbränden und Sprühnebel-Löschversuchen, vfdb-Zeitschrift 2 (1993) 67 V. Schneider, R. Könnecke: Anwendung des Feldmodells KOBRA-3D zur Simulation von komplexen Brandszenarien auf Fragestellungen der automatischen Brandentdeckung, 10. Int. Konf. über Automatische Brandentdeckung AUBE'95, 4.-6. April 1995, Duisburg, Germany V. Schneider: Aussagefähigkeit von Feldmodell-Simulationsrechnungen im Vergleich mit Modell- und Realversuchen hinsichtlich einer Bewertung der Personensicherheit, VdS-Fachtagung Ingenieurmäßige Verfahren im Brandschutz, 27. April 1999, Köln, Germany

V. Schneider, S. Löffler, C. Steinert, E. Wilk: Application of the compartment fire CFD model KOBRA-3D in fire investigation, Proceedings Interflam '99, Fire Science & Engineering Conference, Edinburgh 1999

V. Schneider: Reconstruction of experimental and actual fires in enclosed spaces using numerical simulation techniques, International Congress on Fire Safety in Hazardous Enclosed Spaces, 8./9.11.1999, Vernon, France

- Availability:* I.S.T. Integrierte Sicherheits-Technik GmbH, Feuerbachstr. 19, 60325 Frankfurt / M., Germany, Phone (069) 72 11 68, Fax (069) 72 11 94, Email IST-HSK@t-online.de
- Price:* 29.850,- DM (not including VAT, including hotline service and training)
- Necessary Hardware:* Pentium III, Windows 98 / 2000 / NT
- Computer Language:* C++
- Size:* Approximately 10MB of disk space, at least 64MB of RAM required, disk space for data output depending on scenario (typically several hundred MB)
- Contact Information:* I.S.T. Integrierte Sicherheits-Technik GmbH, Feuerbachstr. 19, 60325 Frankfurt / M., Germany, Phone (069) 72 11 68, Fax (069) 72 11 94, Email IST-HSK@t-online.de

Detailed Description:

The development of KOBRA-3D was initialised within a joint German-Norwegian research project to study enclosed hydrocarbon pool fires offshore. Since then KOBRA-3D has been extended to describe fire and smoke spread in complex geometries. The CFD and fire modelling software of KOBRA-3D is embedded into a Windows 98/2000/NT user surface (WinKobra) with 2D and 3D visualisation tools, material data base and help functions assisting the user in generating the mesh and defining additional required computational parameters.

KOBRA-3D is based on the solution of the three-dimensional time-dependent local hydrodynamic conservation laws obtained by a modified version of the well-known SIMPLE algorithm, including various sub-models for heat transfer analysis, flame modeling, detector response, fire gas - sprinkler interaction, etc. . A fire is described by a volumetric heat source with a prescribed time-dependent heat release rate for combustion-controlled burning, together with the respective yields of combustion products, mass optical density of smoke, effective heat of combustion and air consumption. Local fields of temperature, pressure, density, velocity components, optical

smoke density and species concentration are calculated. Species included are carbon monoxide, carbon dioxide and oxygen. Ventilation controlled fires are treated either by global oxygen consumption depending on the calculated air inflow at openings or by the calculated local oxygen concentration in the vicinity of the fire sources.