

**PACKAGE ID** - 000598IBMPC00 SAFSIM

**KWIC TITLE** - Gen Purpose 1-D Finite Element Network Fluid  
Flow Heat Transfer System Simulator

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**LIMITATION CODE** -COPY                   **AUDIENCE CODE** - LIM

**COMPLETION DATE** - 04/01/1993   **PUBLICATION DATE** - 09/01/1992

**DESCRIPTION** - SAFSIM (System Analysis Flow Simulator) is a FORTRAN computer program to simulate the integrated performance of systems involving fluid mechanics, heat transfer, and reactor dynamics. SAFSIM provides sufficient versatility to allow the engineering simulation of almost any system, from a backyard sprinkler system to a clustered nuclear reactor propulsion system. In addition to versatility, speed and robustness are primary SAFSIM development goals. SAFSIM contains three basic physics modules: (1) a one-dimensional finite element fluid mechanics module with multiple flow network capability; (2) a one-dimensional finite element structure heat transfer module with multiple convection and radiation exchange capability; and (3) a point reactor dynamics module with reactivity feedback and decay heat capability. SAFSIM can be used for compressible and incompressible, single-phase, multicomponent flow systems.

**PACKAGE CONTENTS** - Media Directory; Software Abstract; Overview of the Program; SAND92-0693; SAND92-0694 and Addendums; Media Includes Source Code, Auxiliary Material, Sample Problem Input and Output, README File;

**SOURCE CODE INCLUDED?** - Yes

**MEDIA QUANTITY** - 1 3.5 Diskette

**METHOD OF SOLUTION** - Equations of mass, momentum, and energy conservation for a compressible fluid are solved implicitly using a 1-D finite element network approach. Three numerical solvers are available: Gaussian elimination, Cholesky decomposition, and Gauss-Seidel. The fluid mechanics solution is convectively coupled to a 1-D heat conduction solution also based on a finite element approach. A space independent reactor dynamics solution can also be coupled to the fluid mechanics and heat transfer with Euler or RKF solvers.

**COMPUTER** - IBM PC

**OPERATING SYSTEMS** - Any system with a FORTRAN compiler

**PROGRAMMING LANGUAGES** - FORTRAN77

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**SOFTWARE LIMITATIONS** - Because the array dimensions can be modified, any problem size can be accomodated as long as the computer has sufficient memory.

**SOURCE CODE AVAILABLE (Y/N)** - Y

**UNIQUE FEATURES** - SAFSIM is a general purpose systems level program based on the finite element approach. The program excels in versatility with multiple input options available via the input file, and several interfaces built in to allow users to supply their own special purpose programming.

**OTHER PROG/OPER SYS INFO** - SAFSIM is written in FORTRAN77 and therefore can be executed on any computer with a FORTRAN compiler and linker. It was developed on a PC and has also been executed on VAX, SUN, and Hewlett-Packard workstation systems. .FOR extensions indicates FORTRAN source code. No additional libraries required.

**HARDWARE REQS** - No hardware restrictions; about 2 MBytes of memory required for the default array dimensions. Disk space for output is problem dependent.

**TIME REQUIREMENTS** - Very problem dependent. An order of magnitude estimate for a 25 MHertz 486 PC is 0.1 seconds of execution time per second of transient simulation time per fluid mechanics finite element.

**REFERENCES** - Dobranich, Dean, 'SAFSIM Input Manual, A Computer Program for the Engineering Simulation of Flow Systems', SAND92-0694 and Addendum, September 1992; Dobranich, D., SAFSIM Theory Manual A Computer Program for the Engineering Simulation of Flow Systems, SAND92-0693, November 1993; Dobranich, Dean, 'An Overview of the SAFSIM Computer Program', 1993.

**ABSTRACT STATUS** - Submitted August 1993. Released screened August 30, 1993.

**SUBJECT CLASS CODE** - H

**KEYWORDS** -

COMPUTER PROGRAM DOCUMENTATION  
S CODES  
HEAT TRANSFER  
FINITE ELEMENT METHOD  
FLUID FLOW  
HYDRAULICS  
COMPUTERIZED SIMULATION  
REACTOR KINETICS  
MULTIPHASE FLOW

**EDB SUBJECT CATEGORIES** -

990200 220100 420400

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ENERGY SCIENCE & TECHNOLOGY SOFTWARE CENTER  
SOFTWARE ABSTRACT

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**PACKAGE TYPE** - SCREENED