

PACKAGE ID - 001356MLTPL00 GFM

KWIC TITLE - Glass Furnace Model

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

COMPLETION DATE - 04/01/2001 **PUBLICATION DATE** - 04/01/2001

DESCRIPTION - GFM is a three-dimensional, furnace simulation model that provides a more accurate representation of the entire furnace, and specifically the glass melting process, by coupling the combustion space directly to the glass batch, and glass melt via a rigorous radiation heat transport model. No assumptions are made with regard to interfacial parameters of heat flux, temperature distribution, and batch coverage as must be done using other available applicable codes. These critical parameters are calculated. A preprocessor is used to enter the input parameters of burner configuration, placement, and operating data (e.g. fuel and oxidizer mass flow rates), feeder location and configuration, and furnace geometrical values. The GFM can be used for furnace design and/or parametric, sensitivity, and optimization studies to identify and define strategies for improving energy efficiency and minimizing emissions.

PACKAGE CONTENTS - Media Directory; Software Abstract; Media Includes Source Code, Programmer Documentation in Office 2000 Word and plain text;

SOURCE CODE INCLUDED? - Yes

MEDIA QUANTITY - 1 CD Rom

METHOD OF SOLUTION - A number of novel solution methodologies are incorporated in GFM. An enhanced Simpler algorithm was developed for analyzing multi-phase reacting flows. An integral reaction model was introduced to stabilize the numerics associated with chemical reaction in the combustion space. A reduced reaction set hydrodynamic model incorporating the principal reactions impacting the flow field was included for computation of large reaction sets

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METHOD OF SOLUTION - (CONT) and a novel spectral radiation methodology implemented to provide more rigorous and accurate heat transfer computation.

COMPUTER - MLT-PLTFM

OPERATING SYSTEMS - The software is operable on any operating system with a FORTRAN 90 compiler.

PROGRAMMING LANGUAGES - FORTRAN 90

SOFTWARE LIMITATIONS - In practice, the maximum number of mesh points is limited by the amount of memory (RAM) available.

SOURCE CODE AVAILABLE (Y/N) - Y

UNIQUE FEATURES - There are a number of unique features including the following: a) a multi-phase flow capability in the glass melt that allows direct calculation of the batch coverage, b) a rigorous spectral radiation model that computes the radiant heat transport through each cell in the grid and crown surfaces, c) direct calculation of key interfacial parameters, such as heat flux, temperature, and batch coverage, and d) the capability to handle large reaction sets.

RELATED SOFTWARE - Standard naming conventions are used for input/output and executable files. No dynamic link libraries are required other than the standard FORTRAN support libraries. A preprocessor, written in Visual Basic, is provided to aid in creating the input files for the grid system parameters and flow conditions at the inlets, and a postprocessor, also written in Visual Basic, is available to create color gradient, gray gradient, or contour plots of 2-dimensional sections of the system domain.

HARDWARE REQS - The minimum PC capability required is a 600 MHz Pentium III with at least 256 Mbytes of available storage (RAM).

TIME REQUIREMENTS - A converged solution to a reasonably sized grid problem can usually be reached in 24 to 48 hours.

ABSTRACT STATUS - Released AS-IS 5/18/2001.

SUBJECT CLASS CODE - Z

EDB SUBJECT CATEGORIES -
990200

SPONSOR - DOE

PACKAGE TYPE - AS - IS