PACKAGE ID - 000776IB48600 EMAF

KWIC TITLE - Engineering Model for Ash Formation

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

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DESCRIPTION - Ash deposition is controlled by the impaction and sticking of individual ash particles to heat transfer surfaces. Prediction of deposition therefore requires that the important factors in this process be predictable from coal and operational parameters. Coal combustion, boiler heat transfer, ash formation, ash particle aerodynamic, and ash particle sticking models are all essential steps in this process. The model described herein addresses the prediction of ash particle size and composition distributions based upon combustion conditions and coal parameters. Key features of the model include a mineral redistribution routine to invert CCSEM mineralogical data, and a mineral interaction routine that simulates the conversion of mineral matter into ash during coal burning and yields ash particle size and composition distributions.

PACKAGE CONTENTS - Media Directory; Software Abstract; Engineering Model for Ash Formation (EMAF) Input Description (6 pages); PSIT-1024; Media Includes User's Guide, Executable Model, Sample Problem Input Data;

SOURCE CODE INCLUDED? - No

MEDIA QUANTITY - 1 3.5 Diskette

METHOD OF SOLUTION - The EMAF program simulates the formation of fly ash during pulverized coal combustion. It uses coal particle size distributions, coal mineralogy composition distributions, mineral size distributions, bulk ash content, volatile fraction, and swelling indices as inputs to generate ash particle size and composition distributions. By accounting for particle-to-particle variations in mineral content, size, and composition, and by including phenomena such as char fragmentation and limited mineral coalescence, EMAF provides a physically realistic numerical analog of the processes involved in fly ash formation.

COMPUTER - IBM PC 486

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OPERATING SYSTEMS - DEC Microvax II (VMS version 5.3);MIPS M/120 (UNIX with a VMS shell); 386 PC (OS/2 version 1.3); 486 PC (DOS version 5.0)

PROGRAMMING LANGUAGES - FORTRAN

SOFTWARE LIMITATIONS - The main restrictions concern the types of coal and mineral distributions that can be treated. The maximum coal size range accepted by this version of EMAF is 300 mu m. The total number of coal particles greater than 10 mu m cannot exceed 40000. With this limit, it may not be possible to adequately simulate all coal size distributions with a discrete representation. In particular, distributions with high volume fractions in the 20 and 30 mu m sizes and that also have very low, but non zero, volume fractions in the large sizes > 200 mu m may result in discrete representations with zero coal particles in many of the largest sizes. To be adequately represented, mineral size distributions should not contain significant fractions of mass in sizes greater than 80 mu m because the largest discrete particle size used in simulating mineral distributions is 60 mu m. The last restriction concerns organically bound elements such as Ca and Na. Only two of these species may be treated in this version of EMAF. Thus, results for coal containing significant amounts of three or more organically bound elements may be unsatisfactory.

SOURCE CODE AVAILABLE (Y/N) - N

UNIQUE FEATURES - In addition to the ash size distribution, the program realistically simulates the wide variability of individual ash particle compositions which is important for estimating slagging and fouling potential. EMAF accounts for coal particle-to-particle variations in mineral content, size, and composition. It thus provides a physically realistic numerical analog of fly ash generation.

RELATED SOFTWARE - This program does not supersede or extend any earlier program.

OTHER PROG/OPER SYS INFO - The only action required by the user is to write the input file and run the code.

HARDWARE REQS - The executable code occupies about 120 kbytes. Array storage requires an additional 6 Mbytes RAM. The program has run on a 486-based PC with 20 Mbytes RAM, but would not run on a similar computer with only 8 Mbytes RAM. It has also run on a MIPS M/120 with 16 Mbytes RAM, and on a DEC MicroVax II with 11 Mbytes RAM.

TIME REQUIREMENTS - Run times (in cpu seconds) for a typical coal for each of the three ash formation options are listed for the MIPS M/120 (compiled without optimization) and the 486 33 MHz PC

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TIME REQUIREMENTS -(CONT) (compiled with and without optimization). On the DEC MicroVax II, cpu run times are about 8x those of the MIPS and clcok times are 2-3x the cpu times. 1-no coalescence, MIPS (55), 486 no opp (51), 486 op (41); 2-full coalescence, MIPS (70), 486 no op (66), 486 op (55); 3-char fragmentation, MIPS (462), 486 no op (392), 486 op (346).

REFERENCES - User's Guide On Media.

ABSTRACT STATUS - Submitted 1/4/95. Released AS-IS 1/20/95.

SUBJECT CLASS CODE - QU

KEYWORDS -
COMPUTER PROGRAM DOCUMENTATION
E CODES
MONTE CARLO METHOD
HEAT TRANSFER
PARTICLE SIZE
COMBUSTION
MINERALS
COAL
COALESCENCE
ASHES
FRAGMENTATION

EDB SUBJECT CATEGORIES -
990200 014000 400800

SPONSOR - DOE/FE

PACKAGE TYPE - AS - IS