PACKAGE ID - 000647IBMPC00 RIBS

KWIC TITLE - Turbulent Flow Inside Pipes with
Two-Dimensional Rib Roughness

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LIMITATION CODE -UNL **AUDIENCE CODE -** UNL

COMPLETION DATE - 05/01/1993 **PUBLICATION DATE -** 05/01/1993

DESCRIPTION - A commonly used internal enhancement for single-phase forced-convective turbulent flow applications is tranverse and/or near tranverse ribs. These enhanced surfaces consist of a uniform inside diameter with periodic and discrete disruption of ribs. Enhanced tubes of this type are made by an extrusion process and are used in some condensers and evaporators in refrigeration systems. Tubes of this type fall into an enhancement category called separation and reattachment that has been identified as one of the most energy efficient. Lacking are prediction methods that are mechanistic based that can be used to calculate the heat-transfer coefficients and friction-factors for tubes with this enhancement type. This program calculates the Nusselt number and friction factor for enhanced tubes with tranverse, rectangular ribs with a spacing exceeding the reattachment length. The input quantities are the enhancement height, spacing, and the width. The Nusselt number and friction factor are calculated for a specific Reynolds number or for a range of Reynolds numbers. Users of the program are heat-exchanger designers, enhanced tubing suppliers, and research organizations or academia who are developing or validating prediction methods. The manufacturers of refrigeration heat exchangers and enhanced tube suppliers are potential users of this software.

PACKAGE CONTENTS - Software Abstract; Computer Listing of Main Programs and Subroutines; ANL/ESD/TM-55; Media Includes Source Code, Executable Module;

SOURCE CODE INCLUDED? - Yes

MEDIA QUANTITY - 1 3.5 Diskette

METHOD OF SOLUTION - RIBS obtains solutions of a modified form of the momentum and energy equations using an implicit finite difference method. These modified forms on the momentum and energy equations contain contributions from the roughness elements and also form the

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METHOD OF SOLUTION -(CONT) unaltered portion of the pipe.

COMPUTER - IBM PC

OPERATING SYSTEMS - MS-DOS

PROGRAMMING LANGUAGES - MS-FORTRAN 77

SOFTWARE LIMITATIONS - Can not be used for rib shapes that are not rectangular, rib spacing-to-height ratios less than about eight, rib height-to-diameter ratios greater than 0.065, and helix angles less than about 70 degrees.

SOURCE CODE AVAILABLE (Y/N) - Y

UNIQUE FEATURES - Throughout the code, attempts were made to use variable names that were close facsimiles of the symbols in the mathematical development in the text. $DECLARE and $STRICT commands of Microsoft FORTRAN were used that force the compiler to obey strict FORTRAN 77 standards for easing portability. The input is interactive and output is self-explanatory.

HARDWARE REQS - IBM PC or compatible computer

TIME REQUIREMENTS - About 17 seconds on a 386 IBM PC.

REFERENCES - C.A. James, B.K. Hodge, and R.P. Taylor, Validated Heat-Transfer and Pressure-Drop Prediction Methods Based on the Discrete-Element Method: Phase II, Two-Dimensional Rib Roughness, ANL/ESD/TM-55, May 1993.

ABSTRACT STATUS - Submitted January 31, 1994. Released tested February 28, 1994.

SUBJECT CLASS CODE - H

KEYWORDS -
COMPUTER PROGRAM DOCUMENTATION
R CODES
TURBULENT FLOW
HEAT TRANSFER
TUBES
VAPOR CONDENSERS
HEAT EXCHANGERS
FRICTION FACTOR

EDB SUBJECT CATEGORIES -
990200 420400

SPONSOR - DOE/CE

PACKAGE TYPE - SCREENED