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KBS DEVELOPMENT

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The KBS has two main objectives: 1) Provide easy access to all the industrial and scientific codes through an executive program. The executive provides common services such as browsing and printing, direct access to a specific code by clicking a button or selecting from a menu, and expert help and guidance for seal analysis and design using expert systems to assist the user. Other features of the KBS include online help and access to a database of test cases for the analysis codes. 2) Provide an easy to use user interface for the analysis codes. The user interface is designed to minimize the effort expended in dealing with the mechanics of using a computer, allowing the user to concentrate on seal design and analysis.

The KBS is implemented using the OS/2 Operating System with the Presentation Manager (PM) graphical user interface. The PM environment provides support for windows, menus, buttons, etc. to enable design of a friendly user interface. In addition, a rich set of functions are provided to support the development of interactive graphics applications. This facility will be used to provide capabilities such as interactive seal layout and grid generation to reduce the volume of numeric input required by the programs. OS/2 currently runs on IBM PC compatibles using Intel 80286, 80386, or 80486 processors. IBM and Microsoft plan to port the system to run on some of the RISC platforms by the end of 1992. The OS/2 Extended Edition from IBM also provides integrated communications and database support. These facilities will be used extensively when the scientific codes are integrated into the KBS.

The user interface is designed to reduce the mechanics of using a computer to simple operations such as menu selections, clicking buttons, etc. The basic operations and menu items are consistent for all the programs to reduce the learning time and to make the user feel comfortable when using the various programs. Context sensitive help is provided at all times and the user is protected from making obvious errors. The data entry procedures are designed using engineering terminology rather than computer jargon. The interactive portions of the input are being designed to conform to the level of abstraction used in the theoretical model so that the user does not waste time and effort translating information on the screen into the concepts used to build the analytical model. The end result will be to have the interface recede into the background, leaving the user free to concentrate on seal design and analysis.

○ Objectives

- Develop 3-D CFD Scientific Codes (CFDRC)
 - Highly accurate
 - Standards for 2-D codes
- Generate 2-D Industrial Codes
 - Expeditious analysis
- Develop Knowledge-based System (KBS)
 - Integrate all analysis codes and modules
 - Design guidance
 - An upgradable database
 - User friendly input and output procedures

○ Hardware and Software Configuration

- IBM PS/2 Model 80-A31
 - 25 Mhz 80386 processor
 - 25 Mhz 80387 math coprocessor
 - 8 Mb RAM
 - 320 Mb high speed hard disk
 - 1.44 Mb 3.5 inch floppy drive
 - SCSI adapter with cache
- IBM High Resolution (VGA) Color Monitor
- Microsoft Serial PS/2 Mouse
- IBM OS/2 Extended Edition (V 1.2)
 - OS/2 Standard Edition
 - Communication Manager
 - Database Manager
- IBM OS/2 Programming Tools and Information Kit (V 1.2)
- Microsoft C Compiler (V 6)
- Microsoft FORTRAN (V 5)
- Kedit for OS/2
- Asymmetrix Toolbook for OS/2
- Nexpert Object for OS/2

○ **Design Philosophy for KBS**

- A consistent user interface
 - Reduce learning time and make the user feel at ease
 - Appearance of windows, input screens, etc. will be the same in all modules
 - All modules will use similar procedures for standard operations such as opening or closing files, printing reports, selecting items from menus, etc.
 - Names of menu items will be standardized as much as possible
 - Context sensitive help available at every stage
 - Provide facilities to recover from errors
- The user has complete control
 - The user can perform functions in any order
 - The program will warn user if the information needed to do the job is not available

○ **KBS: Analysis Definition**

- Analysis Types
 - Interfacial (2-D and 3-D)
 - Dynamic response
 - Thermoelastic distortion
- Direct Selection by the User
 - User selects analysis type from a menu
- KBS Assistance
 - User provides information relative to the application
 - A knowledge base to analyze the information and recommend analysis type and the analysis codes to be used

○ **KBS: Design Guidance and Optimization**

□ Guide iterative analysis

- Optimization is an iterative process involving interfacial analysis, dynamic analysis, and thermoelastic analysis
- Analyze output data to determine if iterations should continue
- Recommend the analysis to run in the next iteration
- Recommend the parameters to be changed in the next iteration

○ **KBS: Databases**

□ Data to be Archived

- User Input data sets
- User Output data sets
- Data sets used in code validation

□ Database Procedures

- OS/2 Extended Edition Database Manager used for storing and retrieving data
- Networked database support provided through OS/2 facilities
- Data entry and retrieval screens will be designed using the Query Manager and SQL compatible commands
- Password protection will be provided to prevent unauthorized access

○ **KBS: Help and Guidance**

□ **Implementation**

- Hypertext capabilities of Toolbook and the Information Presentation Facility (IPF) included with OS/2 will be used to design the help system
- Graphics and text will be mixed as needed
- Context sensitive help

□ **Help: General**

- User Interface

□ **Help: Each Analysis Module**

- Purpose
- Capabilities and limitations
- Theoretical background
- References
- Code validation procedures
- Description of input and output variables
- Example problems with sample input and output

□ **Guidance**

- Design procedures
- Seal type recommendations

○ **KBS: Menu Structure**



