VEM DATABASE PROGRAM

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ABSTRACT

A three-tiered implementation of a viscoelastic material (VEM) database under development is described. Using low-level calls, searches for characterized VEM's may be conducted based on property constraints (e.g., modulus and loss factor at certain temperature and frequency) and/or other criteria (e.g., available thicknesses, type, etc.).

1. A graphical front end program that runs on a Macintosh personal computer is being written. It will be dynamically linked to VEM characterization and testing programs for data sharing.

2. A stand-alone program for UNIX machines using X windows is being written. Reports will be in the form of tables and X-Y plots. A similar program to run under MS-DOS is also being developed concurrently.

3. A VEM database engine which may be compiled and run on any computer that supports ANSI FORTRAN 77 is described. The engine consists of FORTRAN callable subroutines that search a VEM database created by a librarian program using VEM characterization data files.

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Payoffs of a VEM database

- Engineers have access to a larger set of up-to-date information
- The search-tabulate-analyze design cycle is much faster, more accurate, and spans more materials
- Centralized storage and distribution of information

User Community

- A materials reference program must meet the requirements of the user community
  - Testers
  - Characterizers
  - Designers
  - Fabricators
- These groups obviously have very different interests and requirements

User Community

Designers:

- Must search through material data for simultaneous occurrences of T, f, G, η
- Must tabulate material properties for analysis
- Need various other properties
  - Is material available in
    - sheets (available thicknesses)
    - liquid
  - Is material qualified for
    - outgassing
    - cohesion

User Community:

Testers and Characterizers:

- Need to trace VEM batches, test configuration, etc. (audit trail)
- Need place to store and order test data and characterizations

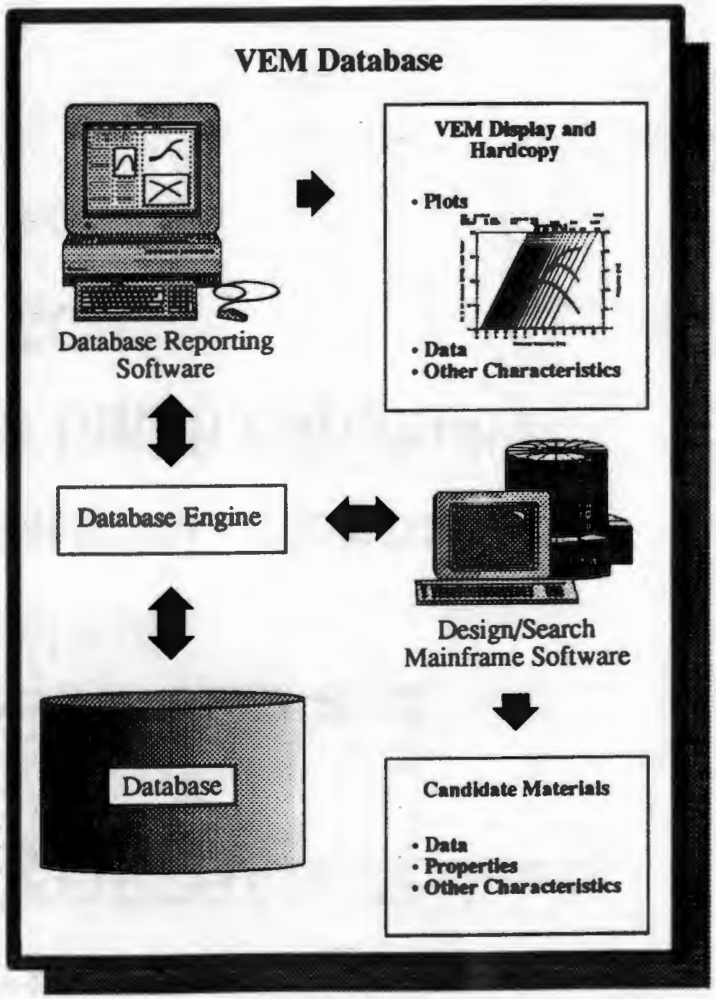
User Community:

Fabricators:

- **Handling**
  - **VEM's, constraining layers, adhesives, sealers**
- **Application**
  - **Contamination, environment control**
- **Quality control**
  - **Testing of treatment to determine bond quality**

Database Fields

- **Measured Properties**
  - (All are temperature and/or frequency dependent)
  - Shear modulus
  - Loss factor
  - Poisson's ratio
  - Outgassing characteristics
  - Creep characteristics
  - Non-linear effects
  - Pre-load effects
  - Strain effects
- **Other Properties/Information**
  - Sources
  - Availability
  - Type (adhesive, rubber, etc.)
  - Available forms (liquid, sheets, etc.)
    - Thicknesses
  - Density
  - Application techniques
  - Test conditions and apparatus
  - Environmental resistance
  - Cost
  - Quality of data



VEM Database Mainframe Module

- Database file architecture – FORTRAN 77 direct access
  - (EXP) file holds experimental data and characterization parameters
  - (INF) file hold all other material information
- Command line interface with batch capability
- Data import and export in ASCII
- Linkable to other software projects

Current Implementation

- File storage
- Command-line interface with batch
- Data import from ASCII
- Command List

```
EXIT
@<filename>.IND
OPEN <database>
CLOSE <database>
IMPORT <filename>.DAT <database>
DELETE <material name>
SHOW FILES
SHOW FILE <database>
SHOW REPORTS
SHOW REPORT <report number>
SHOW POINTS
SHOW POINT <point number>
SET PROMPT <prompt string>
SET UNITS <'ENGLISH' or 'SI'>
SET POINT <point number> [<temperature> <frequency>
                         <shear mod low> <shear mod high>
                         <eta low> <eta high>]
MATCH POINTS <point numbers> [OR <point numbers>]
EXPORT REPORT <report number> <filename>
EXPORT MATERIAL <material name> <filename>
```

Example

```
VEM Database v1.00

VEM_DB* OPEN VEMFILE
VEM_DB-Warning-VEMFILE.EXP not found

Create new database file? Y
VEM_DB-Info-'VEMFILE' created

VEM_DB* IMPORT C1002
VEM_DB-Info-File C1002.DAT added to VEMFILE

VEM_DB* IMPORT ISD113
VEM_DB-Info-File ISD113.DAT added to VEMFILE

VEM_DB* SET POINT 1
Enter temperature: 295
Enter frequency: 100
Enter lower modulus: 2
Enter upper modulus: 100
Enter lower loss factor: .5
Enter upper loss factor: 2
VEM_DB* SET POINT 2
Enter temperature: 295
Enter frequency: 1000
Enter lower modulus: 10
Enter upper modulus: 200
Enter lower loss factor: .5
Enter upper loss factor: 2
VEM_DB* MATCH POINTS 1, 2
VEM_DB-Info-  1 material found

VEM_DB* SHOW REPORT
Reports:
          1
VEM_DB* SHOW REPORT 1
Materials in Report 1
          EAR c1002
VEM_DB* EXPORT REPORT 1 VEMFILE
VEM_DB* EXIT
Exiting VEM_DB
```

Integration on Macintosh

- Test, characterization, and database programs run on same platform
- Graphical windowing interface
- High-resolution hardcopy
- Connectivity