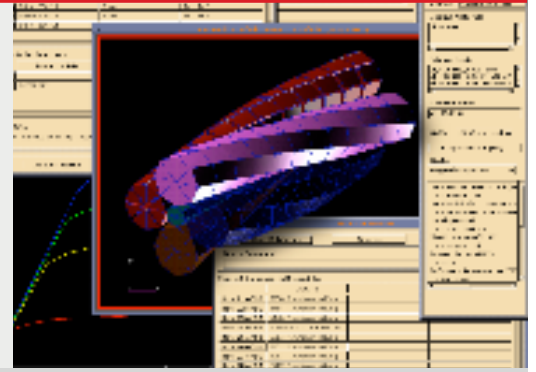


# MSC Mvision Materials Databanks

## Quick, Simple and Auditable Access to Materials Engineering Data, Wherever You Are



### Overview

To improve time-to-market in today's competitive environment, engineers need an easy-to-use method of comparing, evaluating, and analyzing the large number of materials alternatives commercially available.

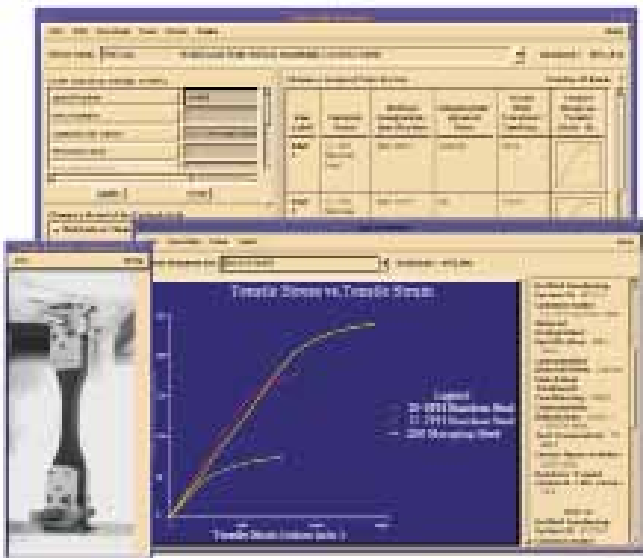
The Mvision Materials Databanks are the largest collection of technical materials information in electronic format in the world today. Developed and maintained through MSC's partnerships with premier sources of materials information, they provide an up-to-date, comprehensive source of property data for use by engineers for design and analysis.

### Mvision Materials Databanks

#### Reference Databanks

#### ASM REFERENCE DATABANKS, ASM International

ASM Reference Databanks are based on ASM International's Material Properties Database System (Mat.DB), ASM Materials Data Rover Electronic DataBooks, published by William Andrew, Inc., and MAPP published by ESM Software. The ASM Center for Materials Data collects and reviews material property data for publication in books, reports, and electronic databases. These databanks are useful to the engineer screening materials for design.



### ASM Alloy Steels Databank

- Data from ASM Metals Handbook, ASM Heat Treater's Guide, ASM Alloy Digest, the Atlas of Isothermal Transformation Diagrams and Cooling Transformation Diagrams, ASM Hardenability of Steels, ASM Structural Alloys Handbook, ASM Source Book on Industrial Alloy and Engineering Data, and steel manufacturers.
- 76 standard AISI grades of Alloy Steel from AISI 1330 to AISI 9430, including H-Grade compositions.
- Extensive information on processing and heat-treating procedures and applications.
- 280 graphs include tempering and end-quench hardening bands.
- Composition, designations, and specifications for alloys from 12 countries.
- 829 physical, thermal, electrical, and mechanical property values.

### Capabilities

- Customized Interfaces to each Mvision Databank optimizes searching, selecting, printing, and exporting data.
- Regular updates, timely and accurate information.
- Automatic Units Conversion adhere to ASTM E-380 standards.
- Full Annotation provides a complete pedigree for each material and data entry.
- Accessible by all Mvision products - MSC Mvision Builder & Evaluator, MSC Enterprise Mvision, and MSC Patran Materials.
- Direct Data Export to FEA - MSC Nastran, MSC Fatigue, ABAQUS, ANSYS, and COSMOS, or customize to export to other analysis software programs.

### Benefits

- Easy, global access to high quality material data improves team efficiency and reduces time-to-market.
- Design confidence is increased with access to data for a broad range of material alternatives.
- Quality and consistency improve when engineering data comes from a single source. Electronic data transfer reduces transcription errors.
- Candidate materials are prescreened using properties from the databanks, reducing material testing.
- Accuracy of predictive analysis increases when materials data is modeled and imported directly to CAE software.

### ASM Aluminum Databank

- Data from the ASM Metals Handbook, Vol. 2, 9th Ed., 1979.
- 111 wrought and cast standard aluminum alloys.
- Composition, designation, and specifications for alloys from 16 countries.
- 4,500 physical, thermal, electrical, and mechanical property values, 40% above or below room temp.
- Extensive textual information on applications, fabrication, and processing.
- 24 fatigue curves and 75 curves of strength and elongation as a function of temperature, time, processing, and impurities.

### ASM Composites Databank

- Derived from ASM Engineered Materials Handbooks, Vols. 1 and 2, 1987 and Reinforced Plastics Properties and Applications, R. B. Seymour, ASM, 1991.
- 55 reinforcement and resin matrix materials, carbon, ceramic, metal, and resin matrix composites.
- 950 electrical, physical, thermal, and mechanical property values, 10% at elevated temperature.
- 141 curves include stress vs strain (12) and strength vs temperature (16).

### ASM Copper Databank

- Derived from the ASM Metals Handbook, 9th Ed, Vol. 2, ASM, 1979.
- 119 wrought and cast copper alloys.
- 169 graphs depict tensile properties.
- 4,563 mechanical, electrical, physical, and thermal property values, 15% above or below room temp.

### ASM Corrosion Databank

- Data from ASM Corrosion Databank, B. Craig, D. Anderson, 2nd Ed., ASM, 1995. Original data sources are identified for each material record.
- Numeric and qualitative corrosion ratings for 280 different environments, 50% above room temp.
- 1,162 materials represented in 38,879 records.
- Materials include copper, irons, nickel, leads, magnesium, tin, tungsten, refractory metals, stainless steels, and zinc metals and alloys.
- Textual data on the mode of attack, material condition, environmental parameters, exposure medium and concentration, temperature, and exposure time.

### ASM Magnesium Databank

- Derived from the ASM Metals Handbook, Vol. 2, 9th Ed., ASM, 1979.
- 34 standard grades of cast and wrought magnesium alloys.
- 48 graphs of stress vs strain, fatigue, creep and tensile strength.
- 554 electrical, mechanical, physical, and thermal properties, 11% above room temperature.

### ASM Nylons Databank

- 989 engineering polyamide materials.
- 14,833 electrical, physical, mechanical, thermal, and processing property values.

### ASM Stainless Steels Databank

- Data from American Iron and Steel Institute, Alloy Digest, Engineering Properties of Steel, Structural Alloys Handbook, Source Book on Industrial Alloy and Engineering Data, and steel manufacturers.
- 2,456 material records on 61 standard AISI grades of martensitic, ferritic, duplex, precipitation-hardened, and austenitic stainless steels.
- Alloys from 12 countries are cross-referenced using composition, designations, and product forms.
- 273 graphs of specific heat, coefficient of thermal expansion, density, modulus, electrical resistivity, hardness, elongation, thermal diffusion, and impact strength as a function of temperature, stress-strain, fatigue, and creep curves.
- 3,270 thermal, electrical, and mechanical property values, 87% above room temperature
- Textual information on forgeability, heat treatment, composition, application.

### ASM Structural Steels Databank

- Compiled and reviewed by Battelle, Columbus, OH (abstracted from Structural Alloys Handbook, Vol. 1, 1987, ASM Engineering Properties of Steel, 1982, ASM Metals Handbook, Vol. 1, 9th Ed., and 1986 SAE Handbook, Vol. 1).
- 60 High Strength Low Alloys (HSLA) Steels and 110 American Iron and Steel Institute (AISI) Carbon Steels, representing the 1005 to 1566 Series of AISI Alloys (509 material records).
- 2,060 electrical, mechanical, physical, and thermal property values, 15% above room temperature.

### ASM Thermoplastics Databank

- 3,902 materials for 20 subclasses of thermoplastics.
- 2,118 material records contain descriptions and composition.
- 3,444 processing records include mold shrinkage, methods, and melt flow index.
- 26,594 mechanical, electrical, thermal, and physical property values.

### ASM Titanium Databank

- Derived from the Metals Handbook, Vol. 3, 9th Ed., ASM, 1980.
- 343 records for 27 standard Titanium alloys.
- 90 graphs of tensile, creep, corrosion, fatigue, and thermal properties.
- 778 electrical, mechanical, thermal, and physical property values.
- 46 textual records on application, microstructure, and processing.

### ASM Cross-Reference Databanks, ASM International

The ASM Cross Reference Databanks are compiled by ASM from data provided by standards organizations around the world and from the popular ASM Alloy Finder. These databanks are useful to the engineer desiring to match or substitute materials known by specification, designation, manufacturer, name, or composition.

### ASM Worldwide Guide to Irons and Steels Databank

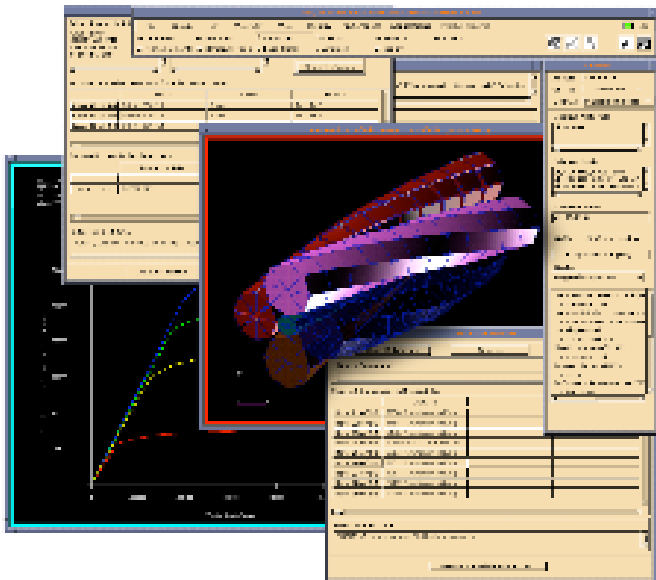
- Derived from ASM's Worldwide Guide to Equivalent Irons and Steels, 4th Ed., ASM, 2000.
- Data from 70 standards organizations from 50 countries.
- Over 25,164 material records for Alloys Steels, Carbon Steels, Cast Irons and Steels, Stainless Steels, and Tool Steels.
- Identify equivalent alloys using UNS numbers, Standards Organization's designations, and compositions.

### ASM Worldwide Guide to Nonferrous Metals Databank

- Derived from ASM's Worldwide Guide to Equivalent Nonferrous Metals and Alloys, 3rd Ed., W. C. Mack Ed., ASM, 2012.
- Data from 40 standards organizations from 29 countries.
- Nearly 20,000 material records for Cast Aluminum (2296), Wrought Aluminum (4363), Cast Copper (1775), Wrought Copper (4328), Lead (665), Magnesium (811), Nickel (1811), Miscellaneous Noble and Refractory Metals (449), Tin (617), Titanium (1009), and Zinc (694).
- Identify equivalent alloys using UNS numbers, Standards Organizations' designations, and composition.
- 9,200 property values include:
  - Tensile Ultimate Strength (7,117)
  - Tensile Yield Strength (4,680)
  - Elongation (5,858)
  - Hardness (1,190)

### ASM Worldman's Engineering Alloys

- Derived from Woldman's Engineering Alloys, 8th Ed., J.P. Frick, Ed., ASM, 1994.
- 53,000 records for approximately 1,700 current and obsolete manufacturers.
- Use this information to cross-reference between manufacturers from 23 different countries, based on composition.
- Data for Commercial Ceramics (885), Ferrous Alloys (14, 581), Irons (1,850), and Steels (12,124).



Plastics Design Library Databanks

### PDL Handbook Series, William Andrews, Incorporated

These databanks contain data for thermoplastics, thermoplastic elastomers, rubbers, and thermoset plastics. Trade name, grade, supplier, and generic descriptions are used to identify each material. Details of the test specimen are provided.

### PDL Chemical Compatibility Databank

This databank provides information on the degradation of plastics and rubbers in a given environment, expressed as a percent effect. It is useful for predicting a plastic's performance in its end-use environment, when used with baseline values from another source.

- Test results for over 180 different plastics materials (over 900 grades) exposed to 4,300 exposure media.
- Sort materials by exposure media or Generic Material Family.
- Specimens are tested as a function of temperature, time, stress level, and reagent concentration.
- Test results are reported by a defined PDL Rating, as % change in weight or length, % retention of tensile strength, modulus, elongation, or impact strength, and related notations.

### PDL Effect of Creep Databank

This databank provides the design engineer a comprehensive source of long-term plastics property data tested as a function of time, temperature, and load displayed in tabular and graphical formats.

- Compiled from test results for over 62 different Generic Families.
- Test results indicate the apparent (creep) modulus at 1, 10, 100, 1000, 5000, and 10,000 hours.
- The creep modulus may be substituted for the instantaneous modulus in appropriate design equations to predict creep, the result of long-term exposure of a plastic to identified load and temperature conditions.
- Many specimens contain thermal aging data and Poisson's Ratio.

### PDL Effect of Temperature Databank

This databank provides the design engineer comprehensive source of plastics data on the effect of temperature and other environmental factors.

- Compiled from test results on over 52 different Generic Families.
- Specimens are tested as a function of temperature, humidity, strain, frequency, and strain rate.
- Test results are displayed in both tabular and graphical formats, categorized by stress type: tension, flexure, torsion, impact, or compression.
- Over 600 stress-strain curves. Other curves include flexural and tensile strengths and moduli, dielectric constant and strength, impact strength, coefficient of linear thermal expansion, and moisture content as a function of temperature or humidity.

### Materials Selector

### Machine Design's Materials Selector, Penton Media, Inc.

Machine Design's Materials Selector issue is a publication familiar to most engineers and designers as a source of basic information for a wide range of generic material forms and types. Many records contain complete data sets for analysis.

- Over 3,200 material records covering a broad range of engineering materials and topics:
  - Irons and Steels
  - Nonferrous Metals
  - Plastics
  - Rubbers and Elastomers
  - Ceramics, Glass, Carbon, Mica
  - Fiber, Felt, Wood, Paper
  - Finishes and Coatings
  - Composite Materials
  - Parts and Forms
  - Joining and Sealing
  - Testing and Evaluation
  - Manufacturers and Addresses

- Physical, thermal, electrical, and mechanical properties, environmental resistance, forms, uses, descriptions of test methods, and general textual information are included.
- This electronic format facilitates materials selectors' capability for screening materials by property values.

## FEA Databanks

### MPDB Temperature-Dependent Databank, Jahm Software, Inc.

This dynamic and rapidly growing databank was developed by JAHM, Software Inc. to provide data for use in engineering analysis.

- 2,060 materials and 10,933 sets of temperature dependent data in graphical format, fully pedigreed.
- Includes the following analysis-related properties as a function of temperature, and more:
  - Poisson's Ratio (337)
  - Tensile Yield Strength (1,033)
  - Elastic Modulus (947)
  - Coefficient of Thermal Expansion (1,289)
  - Shear Modulus (456)
  - Specific Heat (736)
- Material coverage includes but is not limited to:
  - Carbon compounds
  - Ceramics
  - Chemical elements
  - Ferrous and nonferrous metals
  - Insulation materials
  - Intermetallics
  - Plastics
  - Optical materials
  - Oxides
  - Plastics
  - Salts
  - Semiconductor material

### ASM Temperature-Dependent Aluminum Databank

This exciting and definitive collection of aluminum data provides the design engineer typical temperature-dependent properties for a wide range of wrought and cast aluminum for tensile, creep, and fatigue data.

- Data from the ASM Properties of Aluminum Alloys - Tensile, Creep, and Fatigue at High and Low Temperatures by J. Gil Kaufman of The Aluminum Association.
- Data developed from years of testing at Alcoa Laboratories of Aluminum Company of America.
- Each value in the database results from careful analysis of many tests for specimens and tempers made in strict accordance with ASTM standard methods.
- 138 wrought and cast standard aluminum alloys.
- 16,063 temperature dependent curves for tensile, creep, and fatigue.

### Analysis Databank, MSC.Software Corporation

This analysis-ready databank is abstracted from MSC's Materials Selector Databank.

- 1,010 metallic and ceramic materials with complete data sets for direct export to analysis software.
- FEA Properties tables were abstracted from the tables in the Materials Selector Databank and verified for accuracy. Additional values were acquired from other sources and footnoted.

## Standards Databanks

### Material Sciences Corporation

#### MIL-HDBK-17-2F, Polymer Matrix Composites

Vol. II: Material Properties developed under sponsorship of the Dept of Defense and Federal Aviation Administration. All data are subject to review and approval by the Data Review working group, the MIL-HDBK-17 Coordination group, and a DOD coordination review.

- Data Quality is indicated for each entry as the attribute "Status": Screening Data, Interim Data, and Fully Approved Data (B-Basis Values).
- 137 records from Chapters 4 and 10 of MIL-HDBK-17-2F:
  - Carbon-BMI Composites
  - Carbon-Epoxy Composites
  - Carbon-Polyimide Composite
  - Quartz-Bismaleimide Composite
  - S-Glass-Epoxy Composites
  - E-Glass-Epoxy Composite
- The following materials contain the minimum data set to support linear static analysis:
  - Carbon/BMI
  - Carbon/Epoxy
  - Carbon/PEEK

#### MIL-HDBK-17-2A, Reinforced Plastics

Compiled from the Military Handbook of Plastics for Aerospace Vehicles, Part I. The source exists in the appendix of MIL-HDBK-17-2E.

- 634 material records for the following reinforced plastics:
 

11	Fiberglass Epoxy Laminates
1	Fiberglass Phenolic Laminates
5	Fiberglass Polyester Laminates
1	Fiberglass Silicone Laminates
1	Astroquartz Polyimide Laminates
2	Boron Epoxy Laminates
- Includes mechanical and thermal constants and temperature and strain-dependent data. Appropriate for use in for linear static analysis.

#### MIL-HDBK-17-4F, Metal Matrix Composites

Compiled from the Military Handbook of Plastics for Aerospace Vehicles, Part I-Reinforced Metals.MIL-HDBK-17-4F.

- 17 material records for the following materials:
  - 1 Nextel 610 Reinforced Aluminum
  - SiC Reinforced Titanium
  - 1 Titanium
- Includes mechanical and thermal constants and temperature and strain-dependent data. Appropriate for use in for linear static analysis.

#### MIL-HDBK-17-5F, Ceramic Matrix Composites

Compiled from the Military Handbook of Plastics for Aerospace Vehicles, Part I-Reinforced Ceramics.MIL-HDBK-17-5F.

- Data for:
  - Carbon / Carbon / CVI SiC
  - Oxide / Oxide
  - SiC /BN / MI SiC
  - SiC / BN / Si3N4
  - SiC fiber/ BN-SiC / MI SiC

- SiC fiber/ Carbon / SiC

- Includes mechanical and thermal constants and temperature and strain-dependent data. Appropriate for use in for linear static analysis.

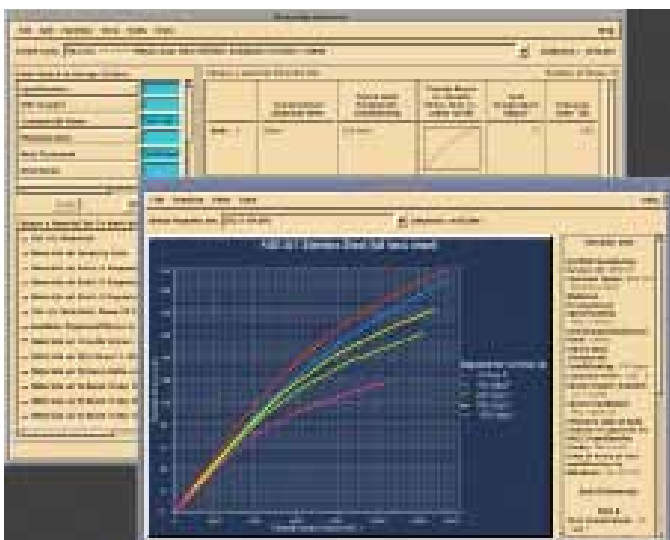
**MMPDS (Mil-Handbook 5), Battelle Memorial Institute**

This databank is based on MMPDS, Metallic Materials Properties Development and Standardization (previously known as Mil-Handbook 5.) It features:

- The highest quality, comprehensive, electronic property data on metal alloy systems available. Battelle Memorial Institute maintains this databank, validates data entry, and renders new test data.
- 119 aerospace metal alloys:

Materials	Tables	Graphs
33 Steels	210	2090
45 Aluminum Alloys	785	2508
10 Magnesium Alloys	109	628
11 Titanium Alloys	148	1080
13 Nickel-based Alloys	89	677
7 Copper-based/Specialty Alloys	36	50

- Mechanical and thermal constants and ample temperature and strain-dependent data for various forms and temps. A large number of materials contain all properties required by the material models for analysis programs.
- Searchable by chapter or topic.
- Includes the current electronic version of Mil-Handbook 5, allowing viewing of
  - Chapter 1 – General Information
  - Chapter 8 – Structural Joints
  - Chapter 9 – Guidelines for the Presentation of Data
  - Appendices and Index



**PMC 90 Advanced Polymer-Matrix Composites Databank, University of Dayton Research Institute**

“Development of Engineering Data on Advanced Composite Materials”, report numbers AFWAL-TR-81-4172, February 1982, and AFML-TR-77-151, September 1977, is a compilation of test data performed by the University of Dayton Research Institute, authorized by the Air Force Materials Laboratory and the Air Force Wright Aeronautical Laboratories.

- Maintained by UDRI, who also validates data entry and renders test data.

- 10 composite materials included:

Materials	Tables	Graphs
4 Graphite/Epoxy	32	314
3 Graphite/Polyimide	24	239
1 Graphite/Polysulfone	8	109
1 HMG/Epoxy	8	69
1 Silicon Carbide/Epoxy	8	67

- Mechanical and thermal constants, and temperature and strain-dependent data. Appropriate for use in for linear static analysis.

**Metallic Materials Data Handbook, ESDU Ltd.**

This databank is based on ESDU’s Metallic Materials Data Handbook, provides validated engineering design data for aerospace structural metallic materials for use by designers and their customers.

Professional institutions worldwide endorse ESDU - the result of over 60 years experience providing engineers with information, data and techniques for fundamental design and analysis. ESDU data is an important part of the design operation of companies large and small throughout the world.

- This databank, the European equivalent of Mil-HDBK 5, offers validated engineering design data for use in aerospace.
- 453 aerospace metal alloys:

Materials	Tables	Graphs
58 Corrosion-Resistant Steels	583	1019
94 Non-corrosion-resistant Steels	853	275
66 Heat-Resistant Alloys	626	1352
142 Aluminum Alloys	2382	2609
21 Magnesium Alloys	238	380
52 Titanium Alloys	529	893
20 Copper-based/Specialty Alloys	240	17

- Mechanical and thermal constants and ample temperature and strain-dependent data for various forms and temps. Most materials contain all properties required by the material models for analysis programs.

**Producer’s Databanks**

This data is suitable for use by the designer to compare materials for a specific application. All materials have manufacturer’s information and property data. 10% of materials contain the minimum data set for isotropic linear analysis. Most include usage information.

**IDES Plastics Selector, IDES, Inc.**

The IDES Plastics Selector Databank is based on IDES, Inc.’s Plastics Selector, compiled from product literature, manufacturer’s materials information sheets, and data obtained directly from the vendor. Property values are tested to ISO and ASTM standards.

- The Int’l Plastics Selector Databank 42,975 unique materials stored in 66,825 product forms from 374 manufacturers, including:
  - 6,317 Elastomers
  - 10,946 Nylons
  - 563 Acrylics
  - 2,000 Films
  - 5,85 PC and derivatives
  - 4,280 ABS and derivatives
  - 835 PVC and derivatives
  - 9,247 Polyethylene’s

- 270 property fields
- 28,770 materials measured above or below room temperature
- 5,118 materials have the minimum data requirements for FEA analysis

### Mvision Specialty Databanks

The following is a collection of specialty databanks available free of charge to Mvision customers.

#### Demo Metals

- Subset of MIL-HDBK 5G Change Notice 1, the "Military Handbook for Metallic Materials and Elements for Aerospace Vehicle Structures", produced under U.S. Air Force Contract, generated for tutorial purposes.
- Demo Metals Q4 1995 is a version of the Demo Metals Databank, used for existing tutorials.

#### Demo Composites

- Subset of MSC's PMC 90 Databank, generated for tutorial purposes.

#### GE Plastics Databank

- Derived from the GE Plastics Engineering Design Database (EDD), Engineering Resin Information System (ERIS), and other internal GE Plastics data for materials manufactured in the U.S. and Europe.
- Mechanical and thermal constants and temperature and strain-dependent data make this databank useful for analysis.

#### MSC.Dytran Databank

- Derived from data in the MSC.Pisces documentation (with explosives data added), this Mvision databank is designed for use with MSC. Dytran.

#### CAMPUS® Support Files

- This collection of files reproduces the M-Base interface to CAMPUS® data using Mvision software. It includes a schema file, a CAMPUS® disclaimer file, export mapping files, and a units conversion file.
- The Mvision Databanks User's Guide and Reference provides information on how to obtain the merged vendor data from M-Base, pre-formatted to input into Mvision.

#### EMAS Materials Library Databank

This property data is used to define electromagnetic materials for analysis purposes. It is based on the macro file used in the MSC.Aries default database.

#### Fiber Test Databank

- Typical test data for composite fibers from numerous sources. Specific references are not available.

#### Fatigue databank

- Typical fatigue data for generic engineering materials from numerous sources in the automotive industry. Specific source references are not available.

#### Thermal Databank

- Typical thermal property data for a wide range of materials, liquids, and gases. The data was assembled from numerous sources for which references are provided in the databank.

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