Marc 2017

MSC Software

Welcome to Marc 2017

Improved Material Modeling and Data Fitting

Obtain material coefficients based upon experimental data for more advanced material models

Material Data Security and Encryption

Material properties can be stored into an encrypted material data file

Thermally Driven Contact

Changes in contact behavior based on a specific temperature criteria

New Method for Finite Element Mesh Transition

New pyramid elements have been added for better mesh transitions

Expanded Element Technology for Piezoelectric Analysis Types

New 3D higher order elements have been added to support coupled electro-mechanical analysis types

Solver Enhancements

Improvements added to Marc solvers which provide significant reductions in time and memory

Fracture Mechanics

Global adaptive meshing supports higher order tetrahedral elements for better accuracy

For more details on this release, please visit https://mscsoftware.subscribenet.com for the release guide. Several examples are also available in Marc's documentation to help you use these capabilities.

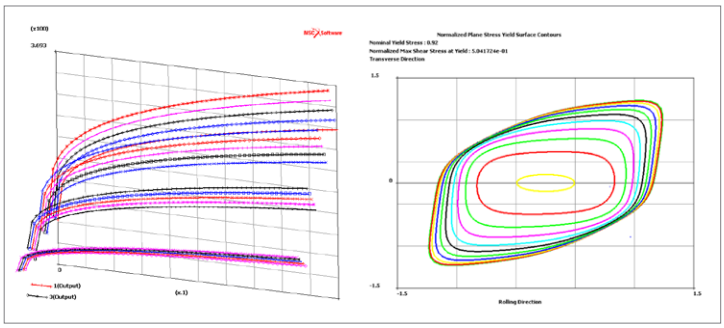
Thank you for your continued support of Marc.

Marc Product Team

New and Enhanced Material Data Fitting and Correlations

To obtain accurate simulation results one must have knowledge of the material model to be used during the analysis. While for many engineering applications, linear elasticity is sufficient, for most nonlinear simulations this is inadequate and can lead to incorrect results. The latest structural models, such as the Parallel Rheological Framework provide the ability to capture large strain elasticity, viscoelasticity, damage and permanent set. These are used to model rubber and plastics for a wide range of applications encountered in the automotive, energy and consumer products industries.

Using Marc 2017, engineers can quickly obtain the material coefficients and determine the best correlation with the test data.



Material Data Fitting with Marc

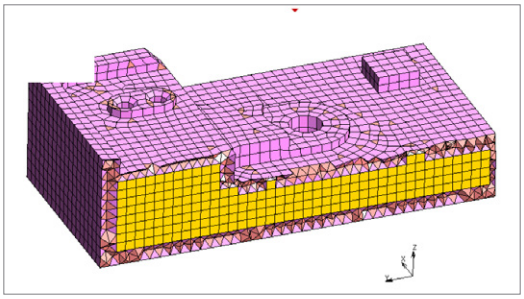
Material Data Security

In many cases, OEM and suppliers collaborate on design and simulation, but do not want to fully share the material data. Marc 2017 now provides an option to store material properties in an encrypted data file. The material file can be protected such that it is only available to an individual site or a person to maintain Intellectual Property (IP).

Furthermore, a time stamp may be applied to the file, which denies access after the selected time. This ensures that all users are accessing the latest certified data.

Better Mesh Transitions with the Newly Added Pyramid Elements

New pyramid elements have been added to obtain a conforming mesh transition between hexahedral and tetrahedral elements. These elements can be used with all material models and are supported for both structural and thermal simulations. In Mentat, pyramid elements can be created by activating the Hybrid mesher. By using a combination of these solid elements one can easily mesh any region of the model. The Tetrahedral elements can fill complex geometries and the hexahedral elements provide high accuracy while reducing the number of elements and minimizing costs.



Pyramid Elements

Higher Order Piezoelectric Elements for Electro-Mechanical Simulations

The piezoelectric effect is the ability of certain materials to generate electric fields when subjected to mechanical stresses or vice versa. Piezoelectric simulations are often used to design actuators and transducers. In these applications the piezoelectric material is subjected to bending behavior.

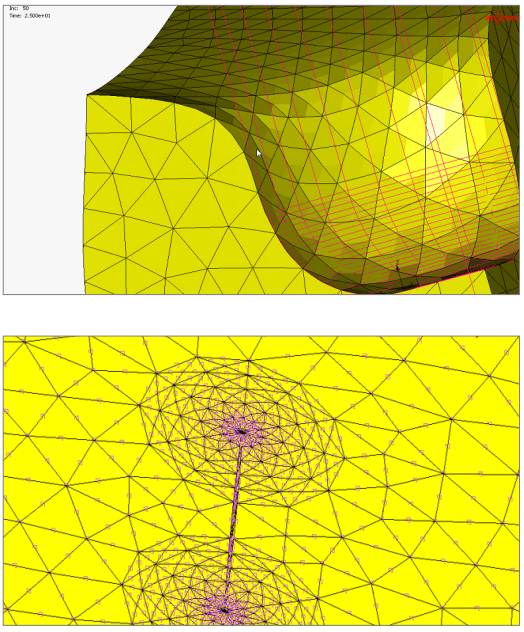
Marc 2017 includes new higher order 3-D elements to complement the existing lower order elements for these types of models. These elements may be used in static, modal, harmonic and transient analysis.

Global Adaptive Meshing

Automatic mesh refinement of elements is a powerful technique inside Marc

that is used to remove mesh distortions and increase accuracy for a wide range of simulations. Over the past years, global adaptive meshing has been extensively used in the manufacturing industry to perform large strain, rubber and fracture simulations.

The global adaptive meshing in Marc 2017 can now support higher order tetrahedral elements. These elements are advantageous in many ways, as they can accurately capture curvatures of the model and create better stress results.



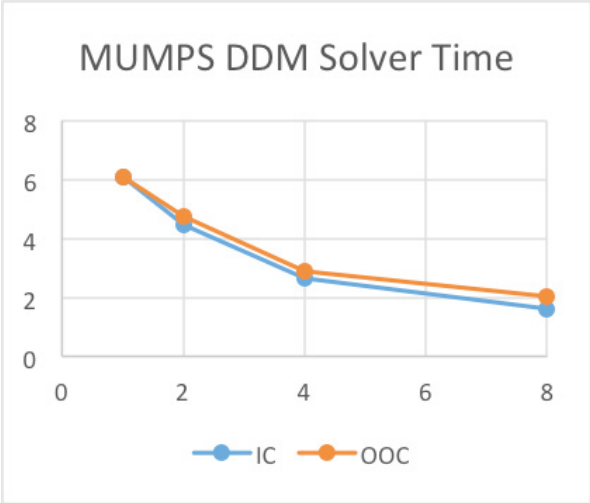
Higher Order Elements

Solver Enhancements

Aimed to improve performance, the Domain Decomposition Method (DDM) feature in Marc has been enhanced to improve efficiency. In the previous release, when using MUMPS the stiffness matrix of elements in each domain were assembled in parallel and then combined on the master processor.

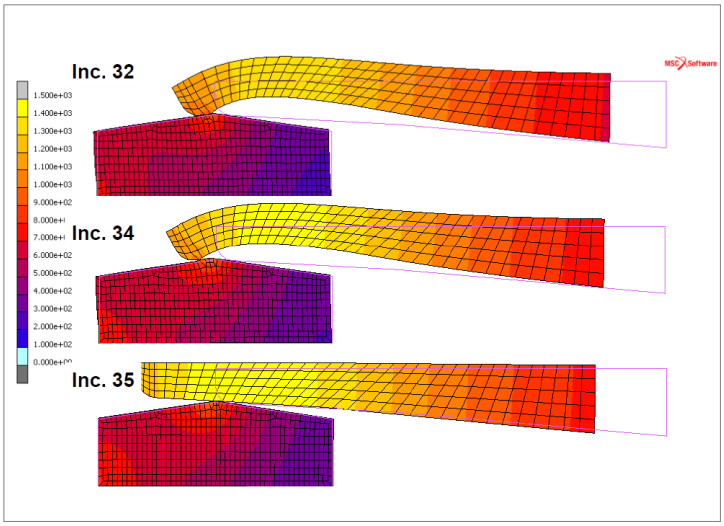
The global stiffness was then redistributed to the different computers to be decomposed in parallel. Where as in 2017, the assembly of the global stiffness can be done in a distributed manner across different processors. This is advantageous, because less memory is used on the master processor and less I/O time is required.

This is advantageous when solving very large models that may be found in the powertrain and other industries.



Thermally Driven Contact

Real world structures have multiple parts and assemblies that undergo temperature and loading scenarios during their design life. Generally, contact is controlled by the proximity of the geometric surfaces. However, with this new release of Marc, the contact behavior can automatically change from Touching to Glued or vice versa when a critical temperature threshold is reached. This is especially useful in manufacturing and welding simulations that involve bonding or deboning of components.



Breaking Glue at Critical Temperature

User Interface Improvements

Mentat 2017 continues the evolution of better finite element modeling based upon CAD geometry. These changes are designed to facilitate the association between geometric entities and finite element entities and to ensure that there is no loss of information between the CAD and CAE process.