



Design Studio for GENESIS 2022

A Graphical User Interface
for the *GENESIS*
Structural Analysis and Optimization Software

New Features and Enhancements

Version 21.0

September 2021

-
- **Introduction**
 - **General Enhancements**
 - **Display Enhancements**
 - **Analysis Preprocessing Enhancements**
 - **Design Preprocessing Enhancements**
 - **Postprocessing Enhancements**
 - **New Example Problems**
 - **Compatibility with Previous Versions**

1 Introduction

This document describes the enhancements and new features added in Design Studio for *GENESIS* 2022.

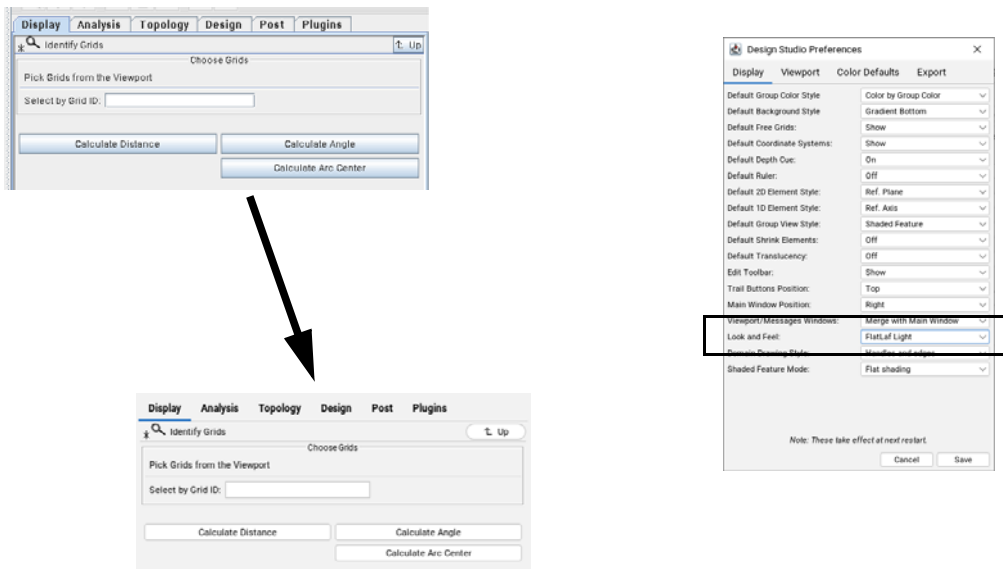
Enhancement Summary

- *GENESIS* 2022 Compatibility
- New Look and Feel
- Accessibility Improvements
- Convert Between BCPAIR and CGLUE
- Set Per-Element Shell Thickness
- Create Connecting Domains
- Plot Principal Stress Directions
- Log Scale for Color Plot
- Create Vector Synthetic Results

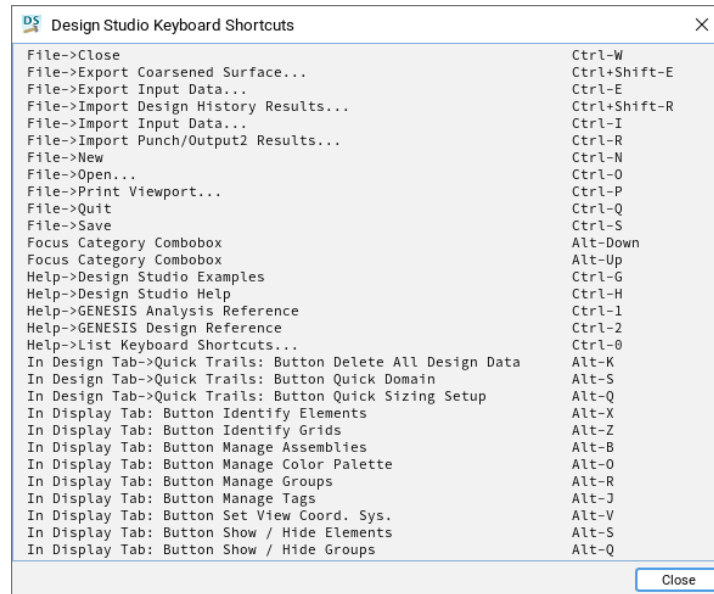


2 General Enhancements

1. *GENESIS 2022* Compatibility. Design Studio has been enhanced to handle all of the new capabilities of *GENESIS 2022*. New features in *GENESIS 2022* include: Fatigue responses for optimization; Frozen regions in topology optimization; New options for extrusion/filling directions on topology fabrication constraints; Enable/disable loadcases; New options for resonance responses for frequency response optimization.
2. New Look and Feel. A more modern look and feel with a flat appearance is now the default. There is a preference to change back to the old Java cross-platform look and feel if desired.



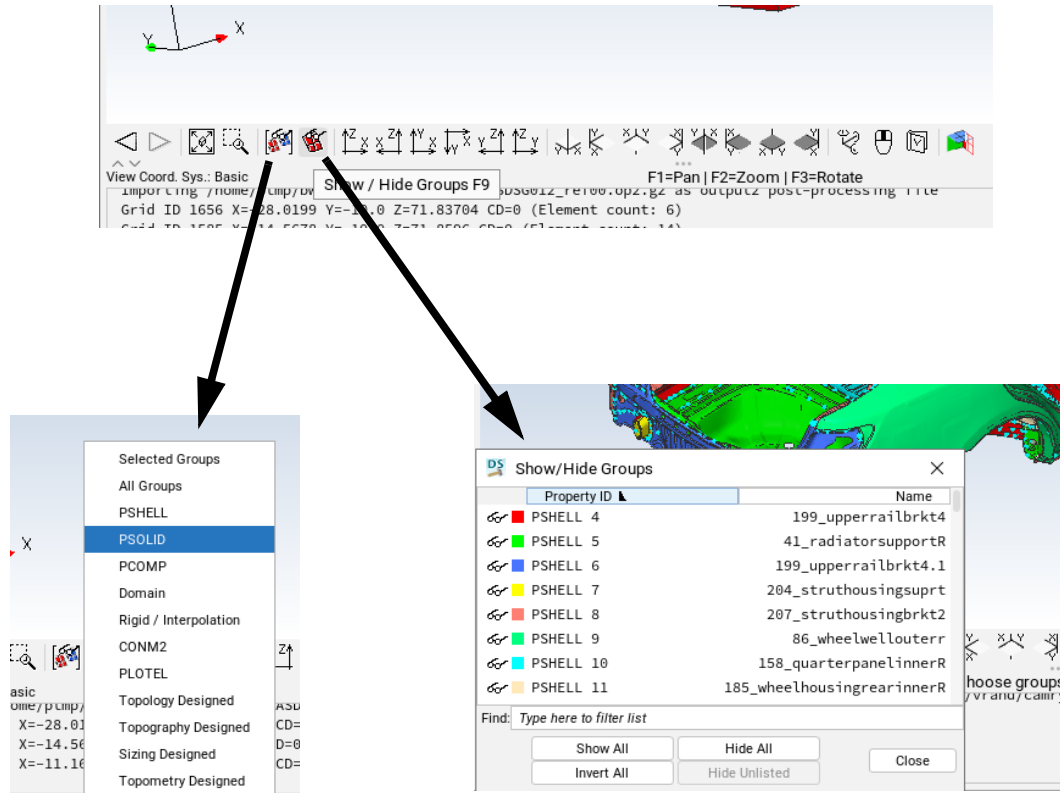
3. Improved Accessibility. There are now keyboard shortcuts for all menus, buttons and main tabs. All dialog windows now use the escape key as a shortcut for close. A new option in the Help menu shows a list of all the keyboard shortcuts.



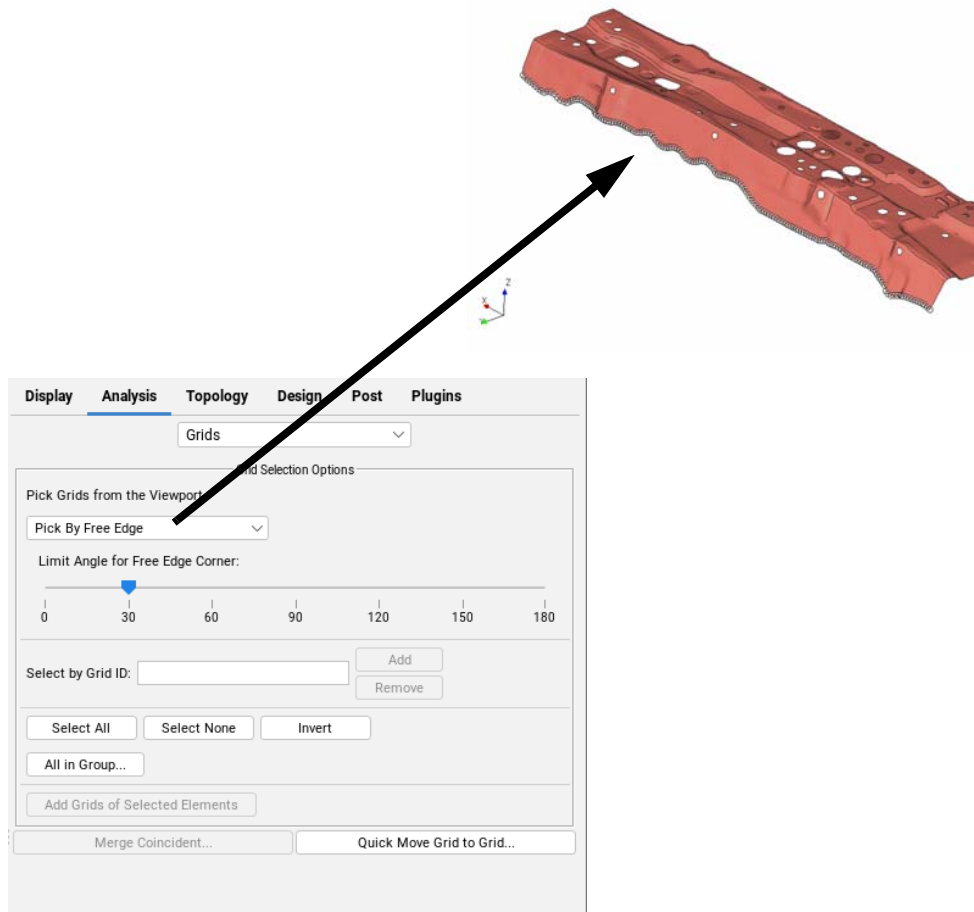
4. New Examples. There are eight new step-by-step example problems in the Design Studio Examples manual that illustrate new capabilities of *GENESIS*.

3 Display Enhancements

1. New Viewport Toolbar Buttons. Two new buttons in the viewport toolbar enable quick access to group visibility from any main window page. The Show Assembly button pops up a menu of assemblies, which will show only the chosen assembly. The Show/Hide Groups button pops up a dialog window with a list of groups that works just like the Show/Hide groups function of the Display Tab.

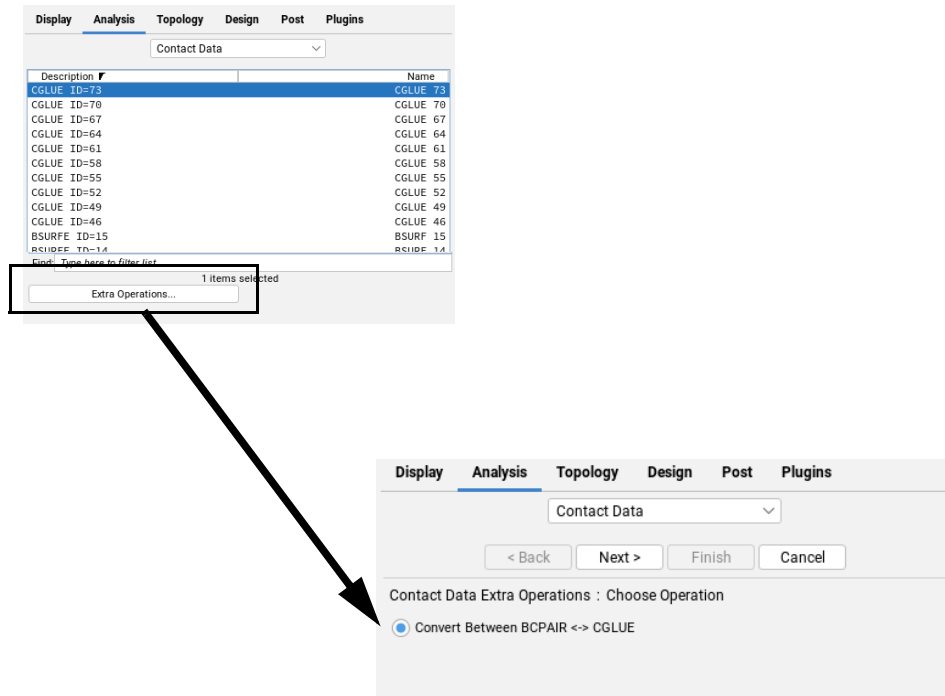


2. New Grid Selection Option. There is a new option in the grid selection panel to select all grids along a free edge of a 2-d group. This differs from selecting along feature lines in that feature line selection stops when the line ends or bifurcates, while free edge selection stops at corners. The edge selector has an angle control that identifies corners of the edge, while the feature line selector has an angle control that determines the feature lines themselves.

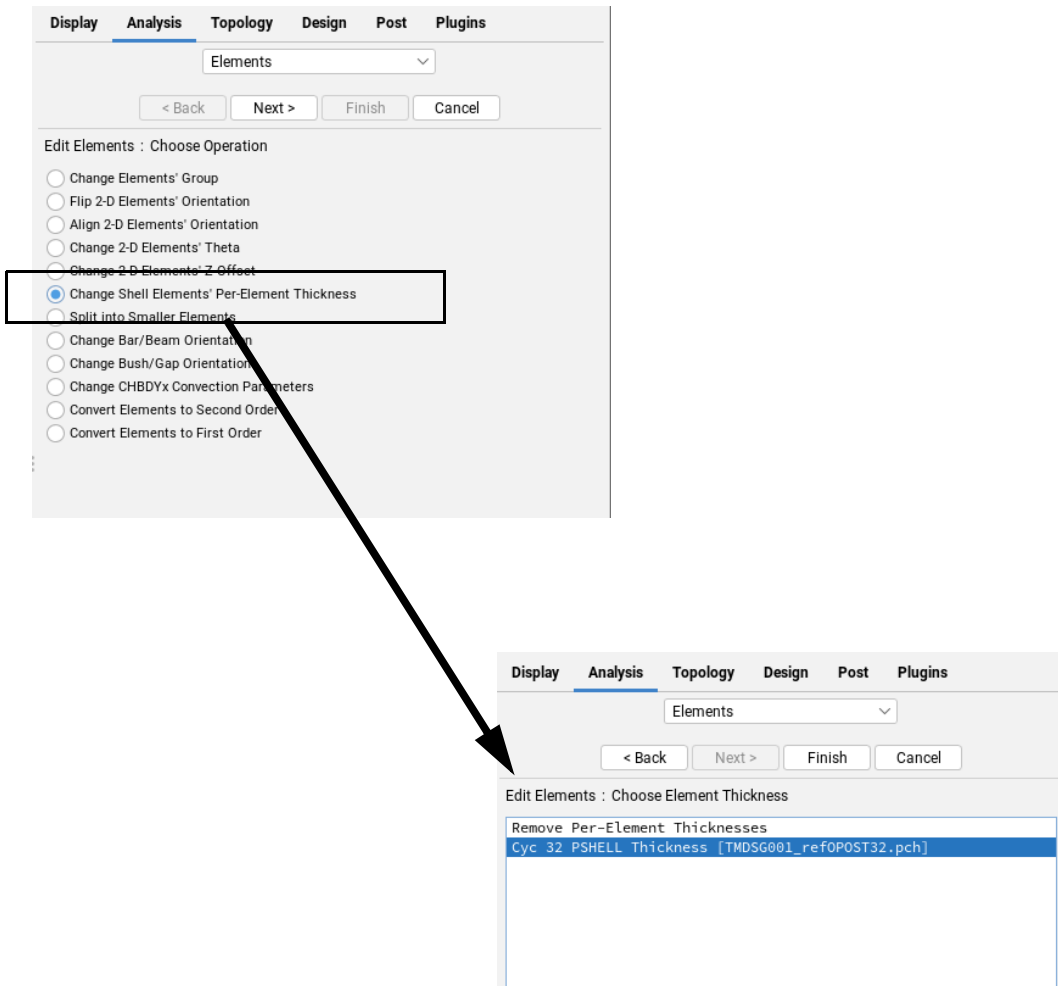


4 Analysis Preprocessing Enhancements

1. Surface Pair Conversion. There is now an option in the Contact Data category to convert between BCPAIR and CGLUE data. Both sets of data identify surface pair connections. The conversion will change selected BCPAIRs into CGLUEs and vice-versa. This conversion option enables the ability to easily approximate nonlinear contact with permanent connection for a quicker analysis.

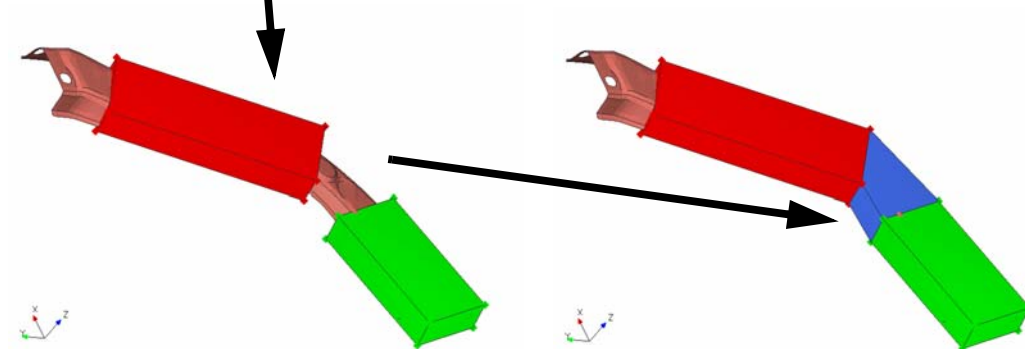
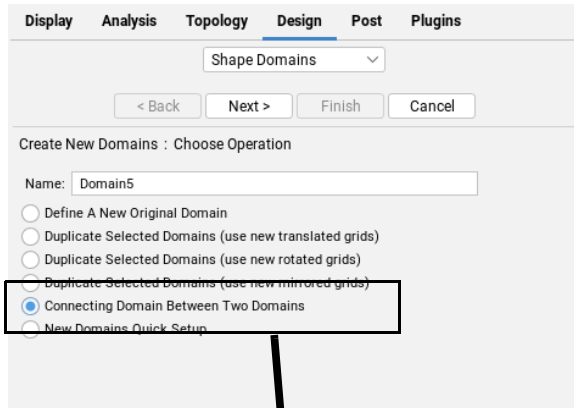


2. Edit Per-Element Shell Element Thickness. An option has been added to set shell element thicknesses for selected elements. The thicknesses can be based on OPOST results or they can be removed entirely, so that the elements use the PSHELL thickness. Setting the per-element thickness allows visualization of topometry results when 2-d elements are displayed as solids.



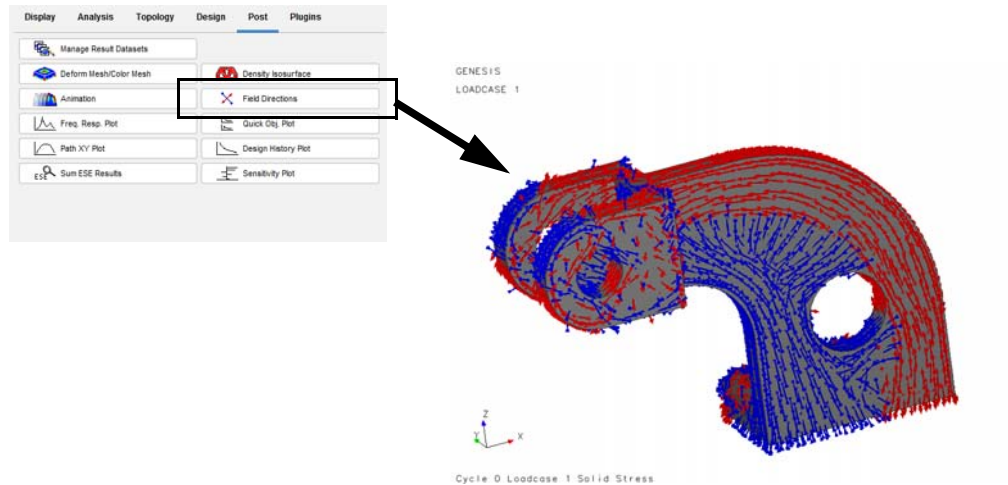
5 Design Preprocessing Enhancements

1. Option to Create Connecting Domains. There is now an option in the New Domain trail to create a connecting domain between two selected domains. The operation will determine the most appropriate faces of the selected domains and create a new domain with those grids.

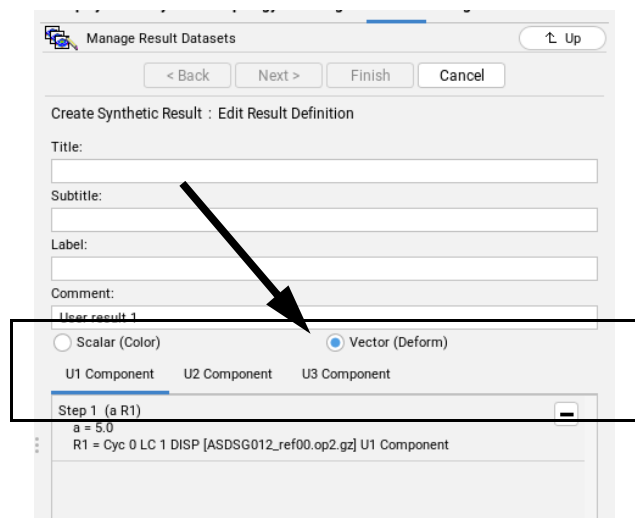


6 Postprocessing Enhancements

1. Principal Stress Directions Plot. A new result plot type can show arrows indicating the directions of the major and/or minor principal stresses.

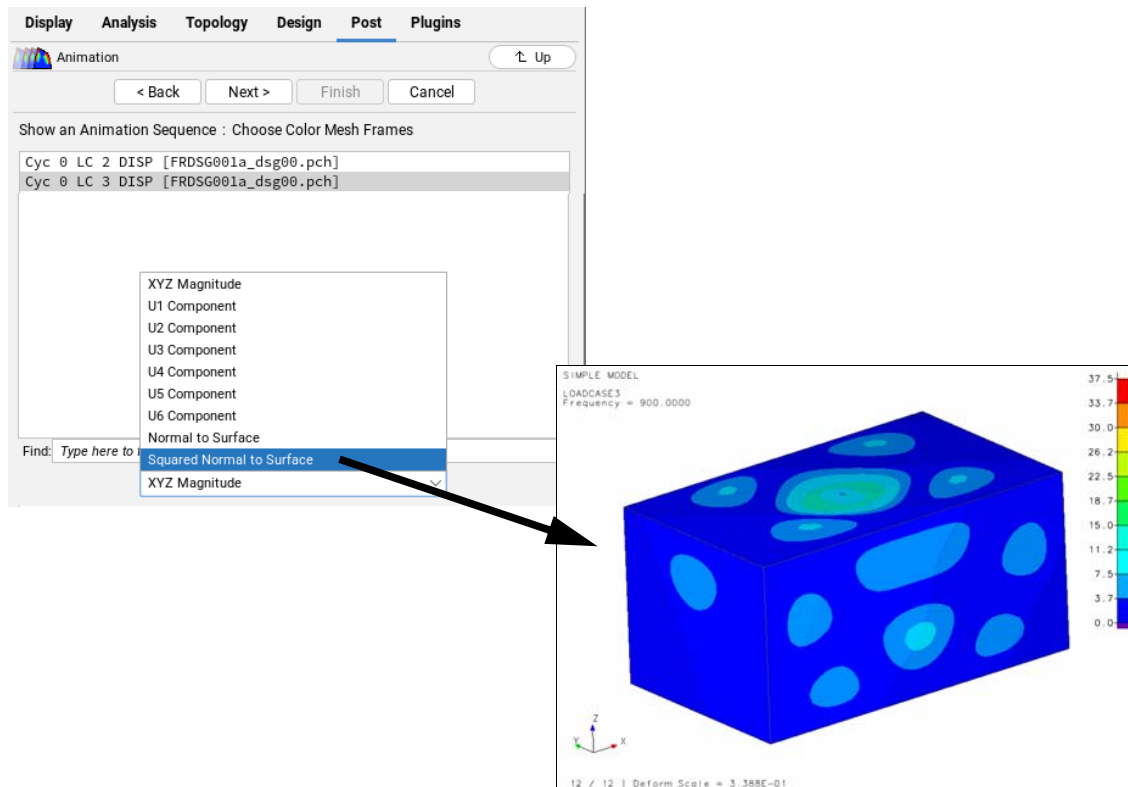


2. Vector Synthetic Results. There is a new option to create vector synthetic results. These results can be used in Deform Mesh plots. The process is similar to the previous scalar synthetic result, except that a separate set of operation steps is created for each of the u1, u2, and u3 directions.

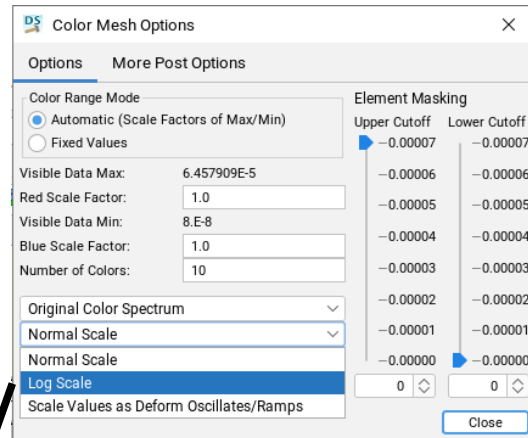


New Features

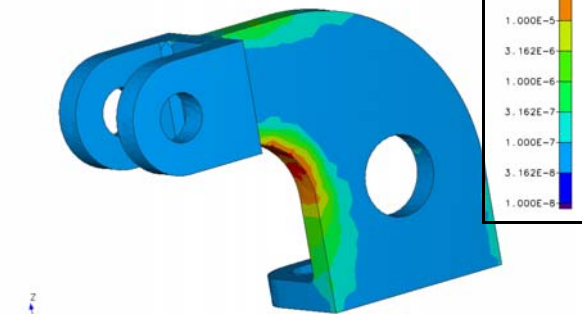
3. Squared Normal to Surface for ODS. Operating deformed shape (ODS) is an animation of a frequency response displacement/velocity/acceleration over one period of a single loading frequency. A new color component option is the square of the normal to the surface. Equivalent radiated power (ERP) is an integral of the square of the normal component of velocity over a panel. The new color option enables easy visualization of which areas have the largest contribution to ERP.



4. New Color Scale Options. Color Mesh result plots have new options for the color scale. There is now an option to use a log scale, which is useful when the color value range covers many orders of magnitude. In addition, there is an option to scale color values with the same factor used to scale the deformation when the Deform Mesh Oscillate or Ramp animations are active.



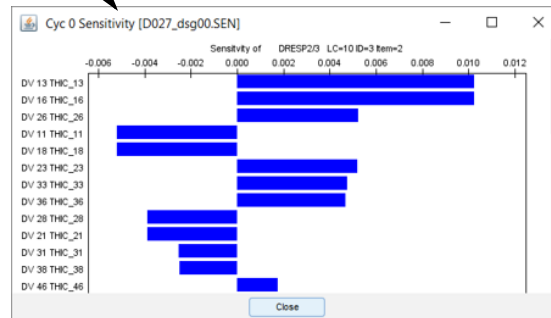
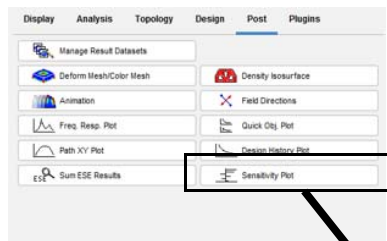
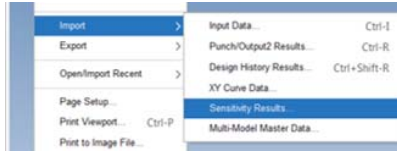
GENESIS
LOADCASE 2



Cycle 0 Loadcase 2 Grid Fatigue Damage/Life Damage

New Features

5. Sensitivity Bar Charts. Sensitivity result files (*.SEN) can now be imported. Sensitivity values can be visualized through bar charts showing which variables have the largest sensitivity values for a selected response.

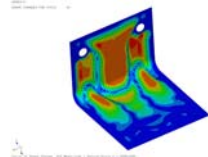
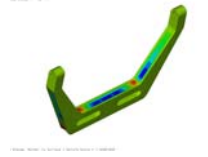


7 New Example Problems

The following table describes new examples and their corresponding input file names. The listed files are provided with the installation:

Name	Problem	Special Features	Figure
TPDSG042 .dat	Topology Optimization with Heat Transfer Convection	<ul style="list-style-type: none"> Convection Minimize heat compliance 	
TPDSG043 .dat	Topology Optimization with Fatigue Response	<ul style="list-style-type: none"> Fatigue response 	
TPDSG044 .dat	Topology Optimization with Normal to Surface Fill Direction	<ul style="list-style-type: none"> Using Normal to Surface Fill Direction Constraints 	
TPDSG045 .dat	Topology Optimization with Frozen Regions	<ul style="list-style-type: none"> Creating Frozen Regions in Topology Optimization 	
TPDSG046 .dat	Topology Optimization with Curved Extrusion Constraint	<ul style="list-style-type: none"> Extrusion Constraints along a Curve/Path 	
TMDSG017 .dat	Topometry Optimization with Fatigue Response	<ul style="list-style-type: none"> Fatigue response 	

New Features

Name	Problem	Special Features	Figure
TGDSG009 .dat	Topography Optimization with Fatigue Response	<ul style="list-style-type: none"> <li data-bbox="769 310 1003 340">• Fatigue Response 	
TGDSG010 .dat	Topography Optimization with Grid Fatigue Response	<ul style="list-style-type: none"> <li data-bbox="769 567 1052 596">• Grid Fatigue Response 	

8 Compatibility with Previous Versions

1. Design Studio database files (*.dsg) written with version 19.0 or earlier can be opened with Design Studio for *GENESIS* 2022. However, database files written with Design Studio for *GENESIS* 2022 are not compatible with previous versions.