

## RELEASE NOTES

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This document summarizes the new features available in 64-bit StressCheck 10.1 Professional Edition. For more details, please refer to the Master Guide Addendum available in the main menu of StressCheck under Help.

### FILE MANAGEMENT SYSTEM

The StressCheck file system was completely redesigned in version 10.1 to simplify, improve stability, and make its usage intuitive. The input file (\*.sci) and database (\*.scm) have been replaced with the StressCheck workfile (\*.scw) and the StressCheck project (\*.scp).

- The StressCheck project file (\*.scp) is designed to be the default file format when saving and opening StressCheck data. This single file solution replaces the database (\*.scm), associated files and its dataset folder.
- The StressCheck workfile (\*.scw) replaces the StressCheck input file (\*.sci). As solution data can significantly increase the file size of StressCheck projects, the workfile exists as a smaller alternative that does not contain solution data. It is a snapshot of the model in its current state.

The most significant feature of the project file is that StressCheck does not write to it during a session unless the user selects the save option. All temporary files are kept in a separate location which can be changed by the user in the Options dialog.

### TLAP LOADING

Several improvements were made in the way StressCheck handles imported TLAP points.

- The Status column of the Case Definitions window now reflects the current point assignment status for TLAP points. If a point is assigned in a load, the Status column is updated with "Assigned(x)" where the number in parenthesis (x) is the number of times the point has been assigned in a load record.
- Mouse wheel-scrolling was disabled for the Case ID dropdown in the Load tab. Attempts to use the mouse wheel to zoom the Model View window can no longer inadvertently change the Case ID selection when assigning loads or constraints.
- A new system picker was added for the selection of the system from the Model View window for the assignment of TLAP-Bearing loads.
  - The system picker is available for other load methods as well.
- A warning was added if more than one surface is selected for the application of a TLAP-Bearing load.

## LOAD RESULTANTS

- Checking the resultant of applied loads can now be computed with respect to a local coordinate system in the Model Input/Loads interface.
- Resultant extraction after solution can be computed with respect to a user-selected coordinate system in the Results/Resultant interface.

## RESIDUAL STRESSES

- A new module was added to StressCheck for predicting the distortion caused by subsurface residual stresses (SRS) induced in a part by surface treatments. Subsurface residual stress profiles can be represented in StressCheck with pre-defined profile options or with formulae for general profiles. Any number of these profiles can be assigned directly to the finite elements or to solid geometry imported from a CAD model.
- A new module was added to StressCheck for determining the distortion after machining of a part with bulk residual stresses (BRS). The BRS can be entered by formulae or imported from a LS-DYNA \*.k file.

## FRACTURE MECHANICS

Two new extraction procedures of fracture mechanics parameters are now available in StressCheck for the computation of Stress Intensity Factors (SIFs) for crack in bodies with residual stresses.

- A modification of the Rice J-integral for cracks in a residual stress field was implemented in which the residual stresses are treated as initial strains. A J to K conversion was also implemented for obtaining the SIFs  $K_I$ ,  $K_{II}$  and  $K_{III}$  for cases in which the full residual stress tensor is available.
- A modified contour integral method was implemented for loaded crack faces (CIM-LC) which is applicable for the extraction of SIFs when the component of the residual stress tensor normal to the crack face is known. For example, cracks in cold-worked holes when only the hoop component of the residual stresses is available can be analyzed with this technique which is based on the principle of superposition: The effect of residual stresses are accounted for by loading the faces of the crack with the traction distribution required to restore the traction-free boundary condition when the crack is introduced in the residual stress field.

## LAMINATE COMPOSITES

Laminate stacks may be now assigned to geometric surfaces such that the material 1-direction of the laminate maps to geometric curves. This removes restrictions on the mesh design, as the orientation of the laminate material properties no longer depends on the selection of element edges. The 1-direction of the laminate follows the assigned reference curves, and the 3-direction of the laminate is normal to the selected surfaces.

**MISCELLANEOUS IMPROVEMENTS**

New import/export options: LS-Dyna imports are now supported to accept a mesh with initial stresses. STL files can be exported of the undeformed or deformed shape of a model being displayed in the model view window of StressCheck.

Enhanced Formula Window: The window used to enter formulae has been made resizable to assist in entering, editing, and viewing very long formulae.

New Graph component: A new 64-bit graph component was implemented in StressCheck 10.1.

Object Numbering: Objects such as systems are no longer ordered “SYS1, SYS11, SYS12, SYS2...” but instead follow numerical order “SYS1, SYS2, SYS3...SYS10” in drop-down menus.