

CADFEM Consulting

Transient Door Slam Analysis With ANSYS® Workbench™

Component Mode Synthesis (CMS) for Large Models

Your Contact Person:

Dipl.-Ing. Fendy Kumala MSc.

Phone +49-711-990745-30

E-Mail fkumala@cadfem.de

Task

Door slam analysis is a task typically performed with explicit FE solvers due to higher requirements of solver resources for transient analyses of large models observed with implicit FE solvers.

CMS allows us to overcome this limitation with its divide and conquer methodology. The complete model will be divided into smaller parts and these parts will be reduced to a single element leaving only its few interface nodes as degree of freedom.

Some additional advantages using this method are a higher result quality in comparison to explicit solvers through local mesh refinement without reducing the time step size down to an unpractical magnitude and a significantly reduced computing time in comparison to standard implicit scheme.

Solution

Since CMS is available in ANSYS® Mechanical™ but not yet in ANSYS® Workbench™, APDL macros were programmed to integrate this capability directly into ANSYS Workbench.

All the necessary CMS steps covering generation, use and expansion passes are automated by the macros.

"Named-Selection" and "Joints" are used to feed the macros with the relevant information.

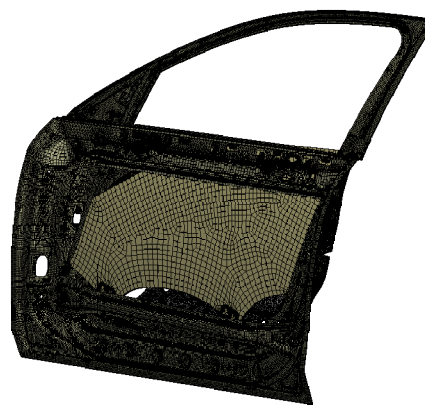
The expanded results of the parts, which were initially separated, will be merged automatically for a direct post processing in ANSYS Workbench.

The so called super element created during the generation pass is also reusable for subsequent dynamic load cases.

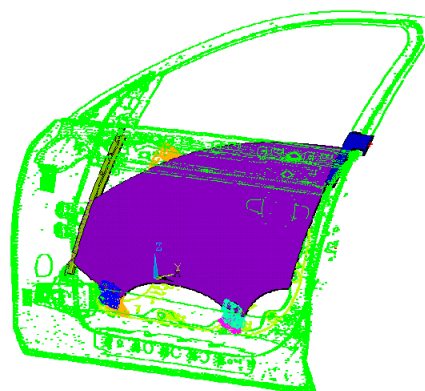
Benefit for the customer

The CMS integration in ANSYS Workbench has brought the following advantages to the customer:

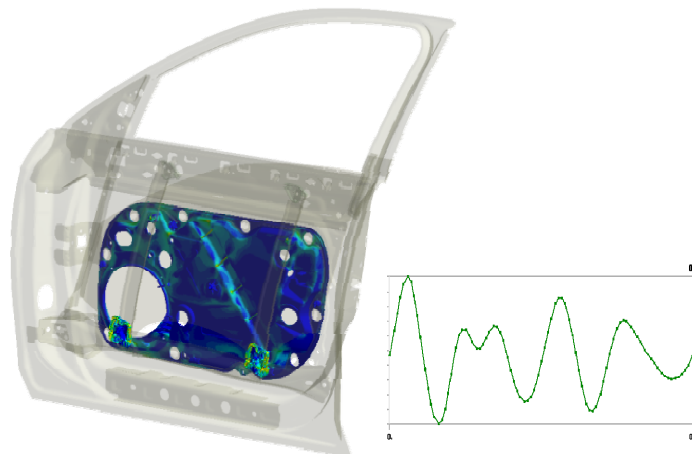
- Reduce Pre-Processing time since the model used for the door slam analysis is almost identical to the existing model for static loads.
- Minimal learning curve for experienced Workbench user.
- Seamless workflow for static and dynamic simulations in one platform.



Preprocessed FE-Model in ANSYS Workbench



Reduced FE model generated in the background after CMS generation and use pass



Transient results evaluation in ANSYS Workbench after CMS expansion pass