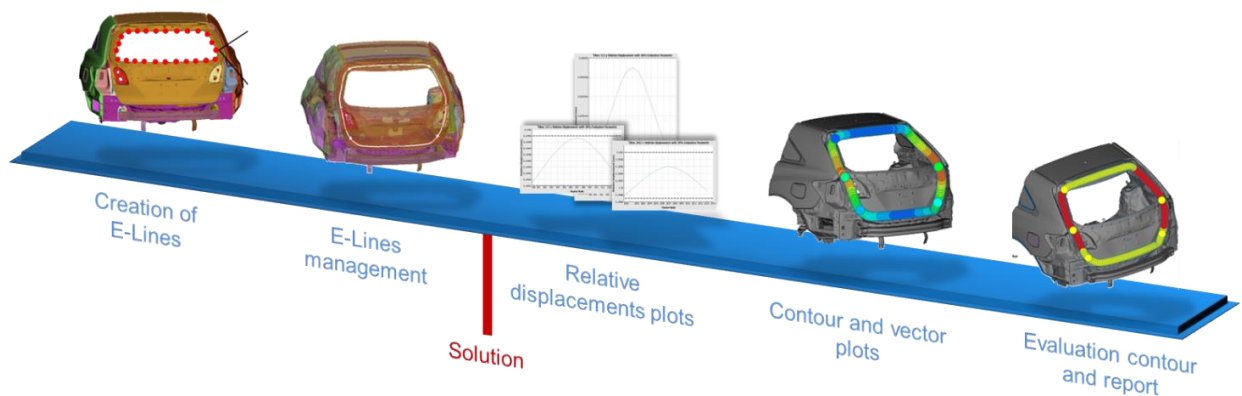# ANSA & META for Squeak and Rattle model set up and analysis with the E-LINE method

As quality standards in the automotive industry continue to rise, occupant comfort is meticulously studied to produce vehicles that amongst others offer a quiet and durable interior. In this direction the elimination of Squeak and Rattle noises is a goal for which accomplishment a big amount of different tests are undertaken in laboratories. To reduce the costs of these tests, numerical models have been developed to explain and predict vehicle Squeak and Rattle behavior. A simulation method for such numerical analyses is the E-LINE method. The E-LINE method focuses on the calculation and the evaluation of the displacement between two components in the time domain.

The ANSA / META toolbox for the E-LINE method

The BETA CAE Systems software suite offers a complete toolbox for setting up a ready to run model for analysis using the E-LINE method, and evaluating the results. Through it ANSA pre-processor and META post-processor, it is possible to streamline the process and achieve significant benefits in terms of process time reduction and simulation quality.

Creation of E-Lines · E-Lines management · Solution · Relative displacements plots · Contour and vector plots · Evaluation contour and report

Creation of E-Lines

An E-Line in ANSA is a 3D curve that lays between the two components of interest, along which their relative displacement is evaluated under a specific load.
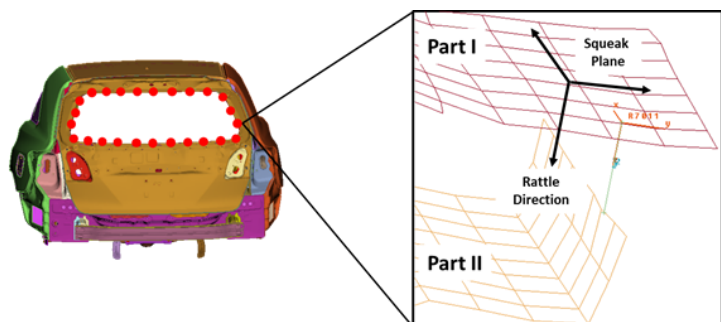

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The ANSA pre-processor offers a functionality to select the areas of interest and build the corresponding E-Lines manually. Moreover, analysts can employ the automated tool to identify and create automatically all possible E-Lines in a complete model.

E-Lines Manager

ANSA has implemented a special tool that offers to the analyst a compact and user friendly interface for the general handling of the E-lines. Specifically, the E-Lines Manager of ANSA, through its interface, can guide the user to not only define easily the needed settings for each E-Line but also offers the ability of a bulk production of the respective FE-Representations. These representations correspond to the available solver keywords.
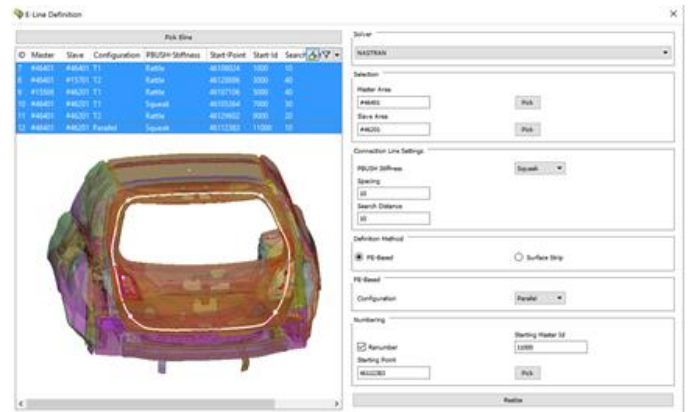
Supported solvers

The model set up through ANSA pre-processor is possible both for NASTRAN and LS-DYNA. Considering NASTRAN, RBE3-CBUSH-RBE3 are being created each one oriented by a COORD_NODES_R local coordinate system. As far as LS-DYNA is concerned, *ELEMENT_BEAM_ELFORM_6 are created each one oriented by a *DEFINE_COORDINATE_NODES_DIR_Z and all of them tied to the master and slave area by a *CONTACT_TIED_NODES_TO_SURFACE.

Post-processing in META

The META post-processor offers the ability through a special tool, the Squeak and Rattle toolbar, to present, in various ways, the results of the solution. 2D plots and histograms of the relative displacement either for a specific pair of nodes or for the whole E-LINE can be created. Moreover, contour and vector plots offer the representation of the results on the 3D model. Finally, reports can be automatically created to inform the analyst if phenomena of Squeak and Rattle exist in the simulation model.

Plot the relative displacement

Using the META Squeak and Rattle toolbar, the analyst can plot massively for all selected E-Lines, the relative displacement between all the corresponding pairs of nodes. As a result, one can have an overview of how a specific phenomenon, either Squeak or Rattle, is developed along the gap between two components
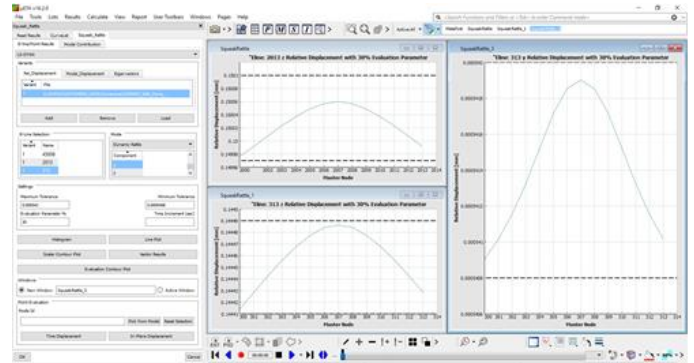

Contour and Vector plots

Another functionality which is really important for Squeak and Rattle analysis is the interaction with the 3D model. Once the user has loaded the geometry of the simulation model in META, the Squeak and Rattle toolbar enables the analyst to select the desired E-Lines and have the geometry in contour or vector plot according to the respective results of relative displacement.
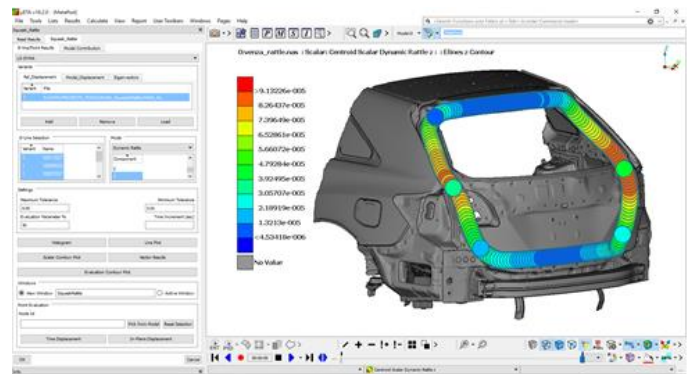
Evaluation contour and report

META Squeak and Rattle toolbar offers the ability to run on a full model analysis and produce a Contour plot having as criteria the existence or not of Squeak or Rattle and simultaneously build automatically a report that contains in tables all the data needed
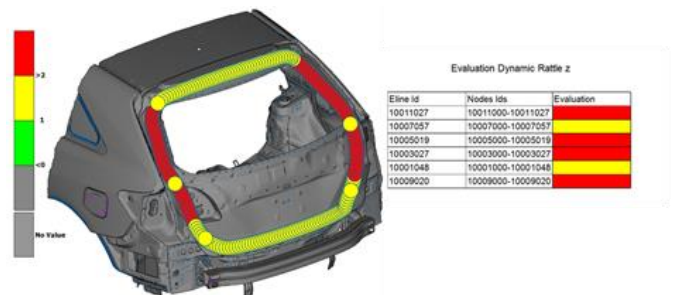
Benefits

The BETA CAE Systems software suite, having incorporated dedicated tools for Squeak and Rattle analyses offers a complete toolset for facilitating and streamlining the S&R CAE processes offering benefits such as:

- Time reduction during pre-processing through the automated identification and creation of E-LINEs.
- The control, manipulation and bulk E-LINE realization of numerous 3D curves is significantly facilitated through the E-LINEs Manager further facilitating the process and saving additional time.
- Model set up is available for both NATRAN and LS-DYNA.
- The capabilities offered by the META post processor for automatic reports creation, direct demonstration of the results on the components of interest, and the instant general overview of the most crucial areas almost eliminates post-processing effort and duration.

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