A dark blue NIO car is shown from the side, parked on a snowy surface. In the background, there are snow-capped mountains under a hazy sky. The car is partially obscured by a white text box.

NIO China

## Spotwelds Post-Processing Toolbar

An innovative solution to improve the efficiency of the spotweld assessment with META.

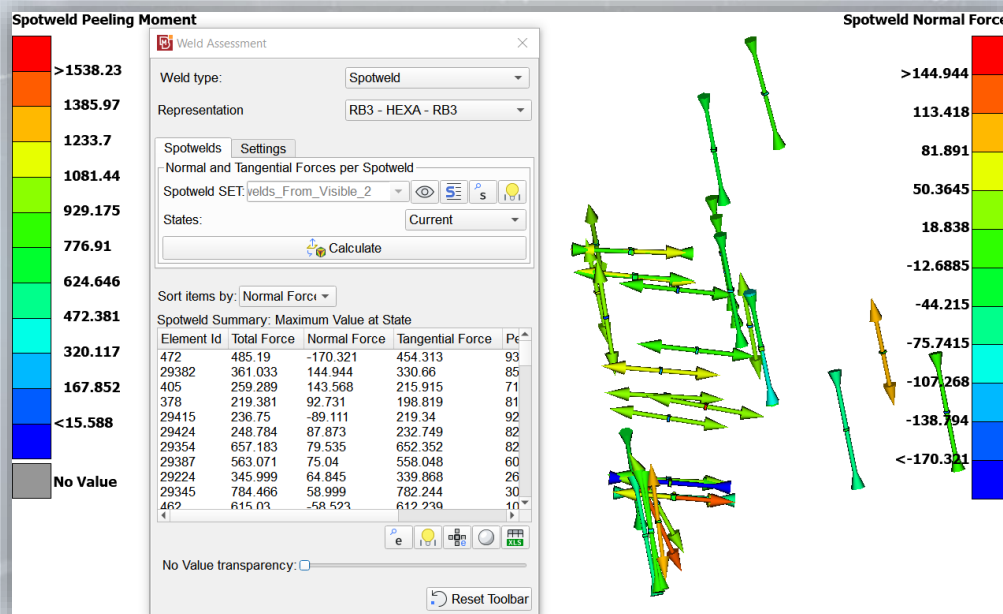
In modern industrial manufacturing, especially in the automotive industry, the strength assessment of welded joints is crucial to the safety of the whole vehicle. However, the traditional method of processing welded joint simulation results is time-consuming and inefficient, severely limiting vehicle development progress.

To face this challenge, NIO and BETA have worked closely and developed a comprehensive solution to automate the post-processing of the spotweld results. The solution offers a user-friendly interface and various visualizations and calculations of results. With the aid of the weld assessment tool, users can easily complete the strength analysis of spotwelds requiring intense training.

“Weld assessment post-processing tool can support us to quickly evaluate the strength of the joints (e.g. spotwelds, SPR, FDS) in the virtual development stage of the whole vehicle;

Compared to Section Force's tool, the evaluation of all the joints in the whole vehicle can be completed in half a day instead of 2-3 days.”

Qingyu Li  
NIO China



## Challenge

Evaluating the strength of point-to-point connections, such as spotwelds of a complete vehicle, is time-consuming and resource-demanding. Traditional methods require tremendous effort to process and calculate the required forces. Some of the challenges are:

- The identification and creation of local coordinate systems of spotweld is taxing.
- The material properties entry is repetitive and error-prone
- The calculation of safety factors is not efficient, and the result lacks visibility
- The spotweld forces are manually calculated.

## Approach

Faced with these challenges, BETA responded quickly and clarified NIO's requirements by providing a prototype of the tool. Through iterative updating, the tool's functionalities were continuously fixed and adjusted according to the client's preferences to ensure it was fully compliant with expectations.

In the end, we delivered a clean and intuitive GUI that is easy to use with the following benefits:

- Automatically identifies spotweld locations and quickly creates local coordinate systems in batches.

- Automatically calculates the axial, radial, and shear forces on the spotwelds.
- Defines the material properties of spotwelds massively.
- Generates the safety factor contour plot of each spotweld.

META's robust and versatile API support makes all of this possible, simplifying the process of creating customized tools.

## Results

This automated post-processing tool provides a practical and efficient solution for enhancing vehicle design development. Automating the evaluation of welded joint simulation results significantly reduces the time and effort required for data analysis. The tool simplifies workflows, generates clear safety factor contour plots, and enables rapid strength assessments. These capabilities streamline the design process and contribute to a more efficient and reliable evaluation of critical components, supporting informed decision-making and improving overall development efficiency.

For more about BETA CAE Systems, visit [www.beta-cae.com](http://www.beta-cae.com)