

selecting a certain degree of manufacturability, the user will be able to find new improved solutions that are not so different from the current ones, but present improved performance. With all this collected information, the manufacturing process properties can be adjusted and validated, in order to generate new improved solutions that will be saved as a new case in the real case-base. The present study, however, focus on the method in the retrieve step, not getting into details with the manufacturing and validation side of the process.

3. Application Example

As application example of the method we take a hybrid shaft that is made of Steel and Aluminium, which is one of the demonstrators of the CRC 1153. The parametric generation system was implemented using the softwares Autodesk Inventor (2017) and Abaqus CAE (2014). Since the focus here is the performance of the connection zone, only this zone was parametrized. The CAD files with varied parameters were then submitted to a FE analysis, saving all the results in our simulated case-base. The parametric description is a critical step in the process, since it has to cover a large solution space and include the current real geometries.

Parallel, the cases already manufactured were saved in the real case-base, with all manufacturing parameters. With that, the CBR was ready to be started by the user, which may select specific or minimal properties as requirements. In Figure 2, we present the results for a case where the user requirement is the minimization of the maximal stress at the joining zone. Firstly, the geometry with the best solution was found. Next, we use Euclidian distance to find the most similar real geometry. All this information is then forward to the manufacturing side of the process, where the CBR cycle continues.

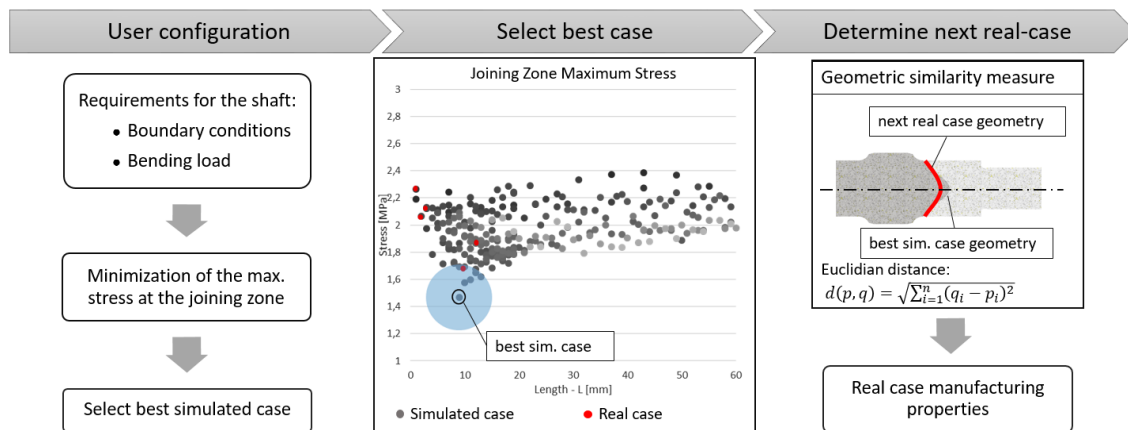


Figure 2: Implementation results until the retrieve phase for the hybrid shaft.

4. Conclusions

The method proposed in this study serve as tool not only for the current development of Tailored Forming, but also for industrial applications. The use of a simulated case-base has a positive impact on the initial research, since it measures the influence of each parameter on the design. The use of a real case-base in conjunction with the simulated one works as an efficient tool for the machine learning process. The proposed retrieve model is able to provide relevant knowledge for the next step of CBR, performed by the manufacturing side of the process. Thereby, the presented model can be here defined as a learning tool of the manufacturing restrictions, bringing new possibilities for the development of new technologies.

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