CADFEM Consulting

Gurson Material Identification from a Tensile Test

Parametric Identification of damage parameters of LS-DYNA Gurson Material Model

Your contact person:

Karthik Chittepu M.Sc.
Tel: +91 (0) 40 64543579
consulting@cadfem.in

Task

In this era of complex and detailed Finite Element (FE) simulation, model validation or parameter identification has gained great importance in order to improve the FE model. Parameter identification is a process of obtaining a set of parameters by fitting the simulation response(s) to the experimental data.

The damage parameters (EN, FC, FF0, F0, SN, FN) of the LS-DYNA Gurson material model (*MAT_120) affect the behavior of the material model. Identification of these parameters is a highly iterative process and is very complicated. Therefore, a parameter identification process was adapted to update Gurson parameters to fit the simulation data to experimental/test data.

Solution

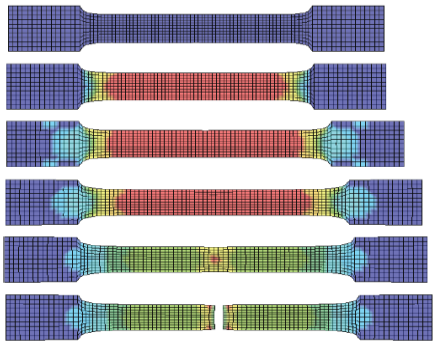
A tensile test simulation is carried out in LS-DYNA. One end of the tensile specimen is fixed and velocity is applied on other end. Forces and displacements are extracted using LS-PrePost to compute stress-strain curve. From this curve, the failure strain is analytically calculated.

The whole process is fully automated using a customized script. To identify the damage parameters, the computed stress-strain curve has to be fitted to the test data. To simplify the process, area under plasticity region and the failure strain of the simulated stress-strain curve is fitted to the test data.

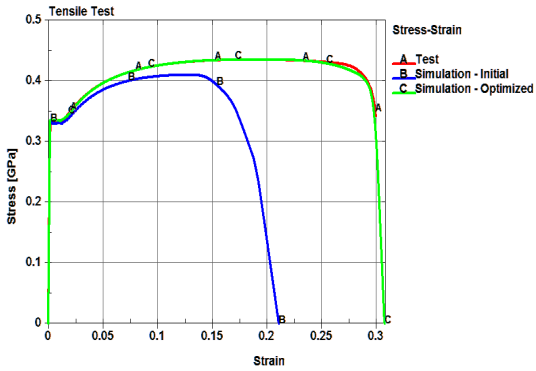
After setting up the initial model, a sensitivity analysis is carried out to understand the most important design parameters. Subsequently, optimization is carried out for the most important design parameters in order to identify the values of the damage parameters. Sensitivity analysis and optimization are carried out using optiSLang, the industrially approved software solution.

Customer Benefits

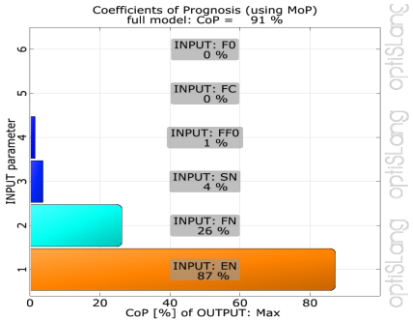
- Ability to estimate the unknown parameters by fitting the simulation results to the experimental data
- Fully automated process to obtain results in shorter time
- Economical by obtaining optimal design
- Obtain accurate and efficient FEA results
- Ability to simulate the testing conditions



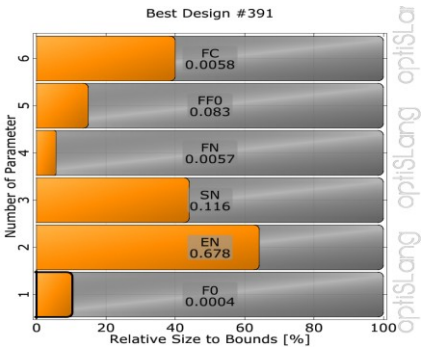
Tensile Test



Stress-Strain Curve



Sensitivity Analysis



Optimized Parameter

Figures Courtesy of Tata Motors Limited

optiSLang

CADFEM