

## **SOLID ELEMENT BASED FATIGUE ANALYSIS OF WELD JOINTS: BETWEEN THE POLES OF EFFORT AND ACCURACY**

**<sup>1</sup>Klaus Hofwimmer\*, <sup>2</sup>Michael Tryfonidis, <sup>3</sup>Halvar Schmidt, <sup>3</sup>Thomas Bruder**

<sup>1</sup>Engineering Center Steyr GmbH & Co KG, Austria

<sup>2</sup>BETA CAE Systems SA, Greece

<sup>3</sup>BMW Group, Germany

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### ABSTRACT –

Typically, in the automotive industry, the numerical fatigue life analysis of seam welds is based on shell models. Determining the local stiffness and the fatigue life of weld details with those models is a challenging task; especially for closely spaced welds as well as for the connection of metal sheets to thick walled or solid components.

Modelling weld details with solid elements allows for a meaningful description with respect to the load path and the stiffness. Applying a relatively coarse mesh for seam welds leads to an advantage for the fatigue assessment process compared to the detailed modelling required for the well-known “notch stress” approach with a reference radius  $r_{\text{ref}} = 0,05 \text{ mm}$  at the weld’s root and toe.

For industrial applications the approach proposed reduces modelling and computation effort. The related mesh generation and post-processing techniques are presented. Exemplarily, improvements in the description of local stiffness are illustrated on typical weld details. In addition, the accuracy of numerical fatigue analyses is assessed based on the results of fatigue tests.