NAFEMS UK Regional Conference 2018 - Abstract Submission

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Name	Dr. Peter Delves
Job Title	Solution Consultant
Company	Dassult Systemes
Please identify the event for which your submitting?	NAFEMS UK Conference 2018
Will you be the presenting author?	Yes
Presentation Title	Comparison and Validation of Non-Linear Flexible Rear Beam Axle in a Multi Body Systems Model
Relevant Themes / Keywords	Multi Body Systems, Flexible Bodies

Abstract (plain text)	Combining of Multi Body Systems (MBS) and Finite Element (FE) models is a very powerful tool in the pursuit of more accurate dynamic simulations. New techniques are being developed to integrate non-linear flexible bodies into MBS simulation without the need for costly time consuming co-simulation. This is of particular interest in the automotive industry as it aids them in developing vehicles right first time whist reducing prototyping costs, allowing them to keep the edge in an ultra-competitive market. To demonstrate this Linear and non-linear flexible bodies are generated for a rear twist beam axel on a car using Simpack's own internal FE beam generator SIMBEAM. It allows arbitrary three-dimensional beam structure to be produced through a reduced FE element approach. A benchmark MBS vehicle model with a totally ridged rear beam axle was created and was then copied, replacing the rear beam axle with the linear and non-linear flexible bodies. Several different driving scenarios where ran on the three models which loaded and unloaded the beam axle. This allowed direct comparison of the behavior between the flexible body models and the ridged model. The loads and forces applied to the non-linear model where extracted so that a validation of the FE element in the MBS model can be performed using a traditional FE environment. To do this an identical model of the rear beam axle was produced in Abaqus with appropriate constraints and boundary conditions. The forces and loadings extracted from the MBS model where then applied to this model to analyses the stresses and displacements produced. These stresses and displacements where then compared with the results from the MBS model. The MBS study showed that including flexible bodies in the model introduces compliance of the axle into the model as the body flexes and vibrates. This meant that during the scenarios more transient behavior was observed compared to the ridged model as the body settled. Comparing the stresses and displacements between the MBS and FE models showed close correlation, demonstrating the accuracy of the FE tool within the MBS software. This exhibits the effectiveness that reduced FE approaches used within MBS software have on dynamic simulations and demonstrations that they are powerful tool to couple FE and MBS simulations.
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