

## MK6 WAGON STRUCTURE FRONTAL IMPACT ANALYSIS

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**Summary:** Crashworthiness, being the ability of a structure to protect its occupants during an impact, can be applied beyond the scope of aircraft and road vehicles. This work introduces an approach to crashworthiness applied to railway vessels, namely the MK6 wagon structure, where a single simulation can give information about, not only the plastic effects present in the structure upon impact, but also one of its response vibration modes. A frontal impact simulation was set up, as per the BS EN 12663-2:2010 standard. A finite element model developed by the consortium was used. The simulation setup was made in HyperMesh, using an explicit solver. Two versions for the simulation were made, the first with a linear material definition, and the second with a nonlinear elastoplastic one. It is shown in the work that both versions of the frontal impact simulation yield the same frequency information, proving that the simulation can be performed in the nonlinear regime without undermining the statistical quality of the results related to the vibration analysis. This highlights how the proposed methodology uses a single simulation to perform structural and vibration analyses simultaneously, as opposed to the usual modal analysis, performed in the linear regime.

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