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HYPACTOR

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Contributors	KL, AE

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1. Executive summary

This report is a deliverable in the EU research project HyPactor. The report looks into the details of numerical modelling for composite pressure vessels. Improved and robust modelling techniques allow for a better assessment of residual performance for the impacted pressure vessels.

Composite pressure vessels are susceptible to damage, which cannot entirely be avoided. Extensive physical testing is both time consuming and expensive. Therefore, the predictive assessment of the reduction of strength is critical. Sophisticated numerical models enable to study the relationships between impact event, created damage and the residual strength — enabling safer and more economic design of pressure vessels.

This report is written as an initial literature overview, characterizing current state of the art in numerical modelling. Various approaches and choices for numerical modelling are laid out in detail. This overview contains 35 references, from sources mostly published after 2010.

In Section 5.1 of the report, some general aspects about impact damage and modelling are reviewed, and recent review papers on these topics are summarized. In Section 5.2, a wide variety of available modelling approaches is laid out, mostly based on aforementioned review papers. A selection of recent research papers is reviewed in Section 5.3, characterizing current state-of-the-art in numerical modelling, both for one-off loading and fatigue loading. Thereafter, general principles are discussed to guide the choice from available models. The obtained information about modelling approaches is summarized in Section 5.4, and conclusions about their feasibility are drawn.