EXTENSION OF ANSYS-AUTODYN™ FOR THE SIMULATION OF NUCLEAR AND CONVENTIONAL BLAST WAVES

A. Klomfass[1], J. Van-Keuk[1] & K. Simon[2]

[1] Fraunhofer Ernst-Mach-Institut, Eckerstr.4, 79104 Freiburg i.Br., Germany;
[2] Bundeswehr Research Institute for Protective Technologies - NBC-Protection (WIS), Humboldtstr.100, 29633 Munster

The assessment of the effects of nuclear blast waves on military equipment depends to a great extent on numerical simulations and investigations in specialized blast simulation facilities, such as the LBS 501 of the WTD 52, [1]. Such facilities can generate blast waves with large positive durations in the order of several hundreds of milliseconds at amplitudes of up to and above 100 kPa. The demanded numerical simulation methods must feature 3D fluid-structure coupling capabilities and permit the predictive modeling of both the blastwaves in the simulation facilities and in free field. Efficient and precise simulation models for the LBS 501 and for free field blast waves have been developed for the APOLLO CFD Code of Fraunhofer EMI during the recent decade, [2-3]. In order to make these models available for a broader community of experts, the same models have recently been implemented into the ANSYS-AUTODYN software through specific user-subroutines. This extended version of AUTODYN allows the simulation of the flow field in the LBS 501 (or other simulators) through the application of a special boundary condition, which models the numerous jets released from the pressure reservoirs of the blast wave generator system. Another newly developed user-subroutine enables a Friedlander blast wave to be fed into a computational domain through the domain boundaries. With this extension it becomes possible to simulate the blast loading (nuclear as well as conventional) of an object in free field, when the center of detonation is far off the computational domain. In the paper, we present the theoretical basis of the models, their implementation in AUTODYN and validation though comparison with experimental and theoretical data.

References

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