Research on Dynamic Soil Compaction – Development Tools for Innovative Systems

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SUMMARY AND OUTLOOK

Life Science

Within the project ECOmpact so far three main fields of research to the scientific study of dynamic soil compaction could be developed and improved in an interactive process with use of synergy potentials for proofing and validation. For numerical modeling ABAQUS with implicit and explicit solver was used during the whole project for design and dynamic simulations of high-quality compactors. For high energy inputs and large deformations numerical couplings such as the ACLE method could be used combined with the implementation of material laws which are appropriate for compaction. In tests with real devices, such as the 72 ton Polygan Roller (BW 332 DEEP IMPACT) and the Rapid Impact Compactor, next to soil-mechanical also device side measurements were utilized and adapted. Non-contact measuring with the PIV method have been adapted and developed for high-speed measurements of soil compaction and of interactions between the small scaled compactor models and the ground. Thus, it was possible to lay the foundations for proofing and linking approaches of optimization, further development and new development of innovative heavy compaction equipment. Focuses of further activities are on a continuation and deepening of the developed approaches like Coupled Eulerian Lagrange (CEL) or Arbitrary Lagrangian Eulerian (ALE) [2]. Our simulations will be intensified and extended by tests on our own roller models. As an alternative to experimental setups with disturbing measuring sensors in the ground (eg accelerometers, pressure sensors), non-contact measuring methods such as PIV method (Particle Image Velocimetry) can provide accurate results. The PIV method is particularly used in fluid mechanics and in long-term studies, but can also be used to assess the displacement field of dynamic soil compaction by a pairwise comparison of discrete image areas [3]. Our test station offers by using a 2 m wide sample holder and a high speed camera (1,000 fps at a resolution of 1,280 x 1,024), extensive possibilities and very good correlations for highly dynamic measurements on stationary and moving small scaled compactor models.

REFERENCES