Stress Reaction Model of Machine Soil Interaction

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Abstract:
To create a stress-reaction model of the influence of forest machines it is necessary to know the machine's ground pressure. Therefore a new method has been developed and evaluated to measure the variation of ground pressure. Rows of different force transducers were installed directly into the surface of the tires. By the measured area (5.3 cm²) a pressure can be calculated while the machine is driving on different inhomogeneous soils. To evaluate the stress on soils in normal work, the dynamic ground pressure of different machines like skidders, forwarders and harvesters were logged continuously during motion, analyzed and graphically visualized in the study. To analyze the reaction of the soil a sample area was created. By using a self-driven wheel construction at an excavator the machine driving on the soil was be simulated based on the previous measured ground pressure data. Additional variations like different machine weights, wheels, surfaces, types of soil, tire pressure and number of crossings where simulated, too. Thereafter the reaction of the soil was measured by using a self-developed laser for transact measurement, gas chromatograph for analyzing the CO2-concentrationin the soil and deflectometer for measuring of the soil compaction. Therefore, the correlation between the stress on the soil created by the forest machine and the reaction of the soil can be explained more precise, and references can be derived from the results. The presentation shows the actual results of this study.

Keywords: soil compaction, stress-reaction model, forest machines