Contribution 104 in session “Innovation-driven developments in harvesters and forwarders“

A CONCEPT STUDY OF A FOUR-WHEELED FORESTRY MACHINE WITH ACTIVE PENDULUM AXELS OPERATING ON SOFT AND ROUGH SOIL

Authors: Ismoilov Abbos; Sellgren Ulf; Andersson Kjell;

KTH, Sweden, ismoilov@kth.se

Keywords: chassis levelling, forest machine, ground damage, hydraulic suspension system, multibody dynamic simulation, off-road, rough terrain

Forestry machines, such as forwarders, must be able to and handle high loads and to operate in rough terrain. Present forwarders are almost exclusively machines with six- or eight-wheeled with pairs of wheels mounted on bogies. Consequently, they have very limited chassis damping and levelling capabilities. The traditional forestry machines chassis design is unfavorable from an active levelling control standpoint. The abilities of machines with conceptually different suspension and traction unit solutions to overcome discrete obstacles differ in several aspects. One way to address the challenge to overcome large obstacles and to travel on steep slopes is to implement an active chassis suspension solution that is able to regulate the machines height and to level the chassis and thus also the load and the operator cabin. This paper focuses on a new four-wheeled forwarder concept that is equipped with two pendulum axels and an actively controlled hydraulic suspension system mounted on each wheel axle. Multi-objective concept performance is studied with analytical methods and dynamic multi-body simulations. The purpose of the analytical study is to determine the power requirement for the the hydraulic actuation system. A full-scale virtual prototype model is developed in MSC ADAMS to investigate the dynamic stability and the ability to traverse uneven terrain at relatively high speed. Finally, analytical and simulation results are presented and analyzed with respect to the overall pros and cons of the studied concept.