

Assessment of PhD Thesis

„INVESTIGATION METHOD OF LARGE-VOLUME TIRE WITH MOBILE TEST RIG“

Mr. Karol Centkowski

The definition of the goal

While tractors were improved in the initial stage of their development primarily for pulling work, they has now become the versatile mobile work machine. The structural changes of farms and agricultural production reflects mainly by the demand for larger working widths by the soil-processing. Therefore the main observation in recent years is significant increase of engine performance. Although tillage has remained one of the main tasks of the tractor, more time for the transportation of equipment and goods is needed in practice more often than before.

The high travel speed caused a change in the vehicle dynamics behavior. In many cases, conventional tractors were designed for speeds over 60 km/h. The limits of steerability were faced at these high speeds in particularly with coupled on three-point linkage implements. This caused new considerations in terms of active safety, which was realized by suspension of front and rear axles. The main problem of tractors with high speeds is the vibration behavior, that affects negatively the driving safety (wheel loads) and ride comfort (driver seat acceleration). The overall goal of this research is the development of methods for the determination of dynamic tire characteristics in mobile working machines which significantly influence the vehicle dynamics.

Content of the thesis

To achieve defined objectives, the dissertation is split in eight classic, very fine and detailed chapters. The demonstrated approach reveals a very well-structured work. The well-defined problem and precisely defined objectives in chapter one are followed by detailed description of the fundamentals required for evaluation of tire test methods, and assessment of results in terms of their application in the vehicle dynamics.

In chapter two the state of the art is very detailed described with extensive examples from literature and patent researches that are relevant for various sub-areas mentioned in the thesis.

In the third chapter is described the self-developed, built and calibrated 6-component wheel force and torque measuring rotating device. Its all functional properties are very extensively discussed too.

In the fourth chapter Mr. Centkowski describes in detail the structure of the developed and implemented mobile tire test rig. The careful analysis takes into account the dynamic behavior by the analysis in vertical and horizontal plane, and the integration of the 6-component measuring device.

In chapter five, which is a focus of this work, Mr. Centkowski describes the experimental studies to investigate dynamic properties of a rotating tire on a real road. The main focus lays on evaluation of measuring data used for determination of tire parameters such as the vertical spring stiffness and the damping ratio of a tire under different boundary conditions.

Mr. Centkowski represents obtained experimental results in chapter six in convincing and self-critical way. As one of the essential is focus on evaluation of test data. Mr. Centkowski managed to get clear statements about measuring method of the examined parameters and their influence on dynamics of the tire for mobile machines.

A discussion about the obtained results located in Chapter 7 and concluding summary in Chapter 8 are followed by an extensive bibliography that finalize the work.

Rating

Mr. Centkowski concludes within his dissertation an existing knowledge gap in the field of experimental determination of dynamics tire parameters from mobile working machines. By this work he has provided a significant contribution to the improvement of simulation outcomes with respect to the driving safety and driving comfort in mobile working machines. Mr. Centkowski has shown the scientific potential of a mobile tire test rig including its commercial implementation in detailed and convincing way. Particularly positive is the high level of expertise with the Mr. Centkowski created the theoretical and the experimental part of his dissertation.

Overall, I rate the present work with

“very well”

I recommend the faculty to continue the examination procedures

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