

Development of a tractor-pulled motion resistance test rig for traction studies on towed narrow wheels.

ABSTRACT

This work presents the development of a test rig (tractor pulled) for measurement of motion resistance of towed narrow wheels with a view to obtaining new design information to enhance the use of narrow wheels as traction members for low cost agricultural machines affordable by the low income earners or rural populace whose occupation is predominantly farming. The narrow wheels that can be used on the developed test rig are pneumatic bicycle wheels of different sizes, rigid bicycle wheel, motorcycle wheel and lugged-rigid wheel for a planting machine. The towing force which is equal to the motion resistance will be measured by the Mecmesin Basic Force Gauge (BFG) with a maximum capacity of 2.5 kN installed on the test rig. The gauge is connected to a notebook with a Dataplot program to record the towing force and import the measured force per unit time to the spread sheet for further analyses. The test rig comprises two parts, one part holding the wheel and the second part hitched to the tractor, in between the two is the BFG to measure the towing force and it is RS-232 interfaced to notebook PC. The test rig is designed for field use on different terrains to make comparison and obtain enough data to assist in the design and development of narrow wheel agricultural machinery. The effect of the different wheel sizes, axle loads and inflation pressures on the motion resistance of the test wheels can be investigated easily using the developed test rig.

Keyword: Motion resistance; Traction; Wheels; Basic force gauge; Data acquisition; Tire design parameters