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WHEEL SLIP IN TRACTOR OPERATION

By F. R. STANLEY, Branch Tractor Sales Manager, Ford Motor Co. of Australia

How many farmers, when purchasing tractors, take the trouble to check up on the degree of wheel slippage that occurs when the tractor is under normal working conditions? I venture to say that the percentage who even inquire about wheel slippage will be particularly small, yet it is a very important factor in tractor operation.

Wheel slippage is the degree of tractional loss in a wheel over a measured distance and it is vitally important that this should be kept as low as possible otherwise too much horsepower will be lost before it reaches the drawbar and consequently the actual pulling power of the tractor will be much lower than would be expected for the size and power of the engine incorporated in the machine.

Slippage in wheeled tractors can vary from approximately 5% to 20% or even higher according to the working conditions, the size of the tractor tyres and the overall balance of the machine concerned. You will notice that some tractors have a very high wheel slippage ration and this may be due to the engine being so powerful that, despite the fitting of oversized or dual rear tyres and heavy wheel weights, the developed power is so high that the machine is unbalanced and excessive slippage occurs as a result of the wide gulf between the power of the engine and the weight of the machine.

Most tractor owners have heard of the Nebraska Test but probably very few know much about it or how it originated. The test originated in the State of Nebraska, U.S.A. in 1919, where it became a State law. In those days there was no fixed standard for the horsepower rating of tractors and some unscrupulous manufacturers built tractors and endowed them with fictitious horsepower ratings to boost the sales.

It was to counteract these practices that tests were conducted at the University of Nebraska to give a definite standard for comparison of performances of different makes of machines. Here in Australia similar tests have been carried out for many years by the Department of Supply and Development, Fishermans Bend, Victoria, from whom booklets may be obtained free of charge, giving the results of current tests. These figures make interesting reading as they give not only the developed and rated horsepower figures for various types of tractors for belt and drawbar, fuel consumption but also the percentage of wheel slip, the importance of which has been mentioned above.

A “rule of thumb” method of calculating wheel slip percentages is to tie a piece of cloth on one of the spokes of the rear wheel and then to drive the tractor, unloaded, until the wheel has made exactly 30 revolutions. The distance which the tractor has travelled is marked and then the same course is covered with the tractor under load.

The number of revolutions to complete the course under load are carefully counted and the number of revolutions with the tractor made unloaded subtracted from the number of revolutions made under load. For instance the tractor under load may take 34 revolutions of the wheel to cover the same distance it covered in 30 revolutions with the wheel when unloaded. If we subtract 30 from 34 we have a wheel slippage of 4 revolutions in 34. To express this as a percentage we multiply the 4 by 100 and divide it by the number of revolutions made under load (34) and our answer is 11.8%.

*These tests are now being conducted at Werrinbee Research Station, Victoria, by the State Dept. of Agriculture.
HYDRAULICS REDUCE WHEEL SLIP

The tendency in modern agricultural engineering is to fit as many of the implements as possible directly to the tractor. These may be fitted in front, amidships or immediately behind the machine but in each case they are raised and lowered by hydraulics. The type most commonly used is some form of three-point linkage with the implements following immediately behind the rear wheels. This method is most popular because it tends to reduce wheel slippage to an absolute minimum. Because the implements are attached only a few inches behind the rear wheels of the tractor, they exert a downward drag on the wheels which minimises wheel slip and allows the tractor to travel in a higher gear than it would with a trailing type of implement of the same design. In other words less horsepower is required to do the same job if we can eliminate the waste of power caused by wheel slip.

Quite apart from the saving in horsepower, the tractor-mounted implements are more convenient to handle, in that depth adjustment is usually by "fingertip" control, the tractor and implements are more readily manoeuvrable and tractor-mounted implements practically eliminate headlands.

I have often been asked why it is that a crawler tractor which naturally has a much lower slippage percentage than a wheeled tractor, will have a drawbar horsepower rating which is lower than that in a wheeled tractor with a similar engine of equal horsepower. The reason for this is that, due to the many driving parts of the crawler, there are frictional losses which result in a lower drawbar horsepower. However, due to the much lower percentage of wheel slip, the crawler will often pull more than its wheeled counterpart under similar conditions.

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