Fuel efficiency factors for tractor selection

When considering the addition of a new or used tractor for the farm equipment fleet, consider the operations for which it will be used. A larger tractor is sometimes selected for adequate weight (braking) or hydraulic power capacity required to lift or operate equipment. However, before acquiring a larger or heavier tractor, consider that at least seven percent of tractor power is commonly required to overcome rolling resistance created by the weight of the tractor. Tractor test data can be used to estimate fuel consumption and to aid tractor selection. To evaluate fuel efficiency, it is helpful to understand tractor test procedures, fuel efficiency measurements, and specific values found in tractor test reports.

Test procedures and fuel efficiency

Global manufacturers of tractors support testing through Organization for Economic Cooperation and Development (OECD) test procedures. The tractor test is generally conducted within the country of manufacture. U. S. –produced tractors are tested at the Nebraska Tractor Test Laboratory (NTTL) at the University of Nebraska. Test measurements are made of power and fuel use during power-take-off (PTO) and drawbar load tests as well as sound measurment and hydraulic power and lift capacity. Tests for tractors sold in the United States are available through NTTL either as a full report for the individual tractor or in a summary book with abbreviated test information for tractors currently sold in Nebraska.

PTO tests near the beginning of the report, followed by drawbar tests to measure fuel consumption at reduced loads and engine speeds, are useful to evaluate fuel consumption. PTO tests show PTO power available and fuel use at rated engine speed, standard PTO speed (1000 or 540 rpm), and if greater maximum power is available for at least one hour at a different engine speed. Fuel use and power output is then shown for several reduced (varying) PTO power loads.

Drawbar fuel consumption performance lists maximum drawbar power available along with tractor performance at 75 percent and 50 percent drawbar power loads using the same transmission gear used to develop maximum drawbar power. These values are followed by tractor performance at the same 75 percent and 50 percent power loads, but with the tractor operated in a higher gear selected by the manufacturer and at a reduced engine speed. These latter tests help show fuel economy at lighter loads using appropriate gear and throttle settings.

Fuel use (gal/hr) is listed in PTO tests, but also listed under fuel consumption in drawbar (and also in PTO) tests is 'Hp – hour/gallon'. Hp – hour/gallon is a measure of fuel efficiency with greater numbers indicating higher fuel efficiency.

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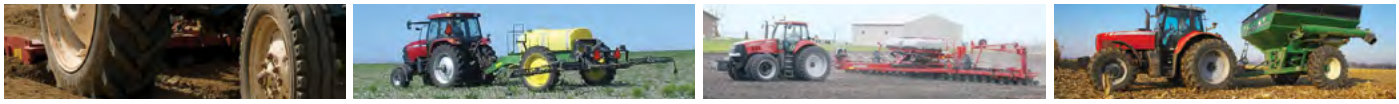

Fuel efficiency values from a tractor test

Although it may seem difficult to believe at first, average tractor use for many row-crop tractors is near to 50% load. This occurs partly because of the need to match tillage and planting equipment to multiples of row spacing, but also because tractors are used for lighter loads at times such as spraying and mowing. Even heavily loaded tillage applications may use only 80 – 90% of power much of the time but allow for excess power in tough spots. With this type of tractor use, and assuming use of a reduced throttle setting and higher gear for reduced loads, the value of Hp – hour/gallon at 50% pull and reduced engine speed (A, figure 1) is a good comparative indicator of fuel economy when comparing tractor tests. A greater number indicates better fuel economy.

If the tractor is to be used over a wide variety of load situations (from near full load to idling and routine chores), the average of fuel use (gal/hr) values in the varying PTO power tests (B, figure 1), multiplied by annual hours of operation, gives an estimate of annual fuel use. If a tractor is expected to be used predominantly at greater or lesser loading conditions, fuel use can be estimated by selecting an appropriate power within the varying PTO tests. For example, values from the tractor shown in figure 1 indicate that at about 60% power (120 hp) the tractor consumes 8.01 gallons/hour. Just as in EPA automotive gas milage, exact fuel consumed depends on use and other factors such as maintenance, adjustment, ballasting, and the environment.

New technology and other factors

Selecting a continuous or infinitely variable transmission to automatically match transmission gear and engine speed at reduced loads has significant potential for fuel savings (see PM 2089M). Adding auto-steering using a global positioning system (GPS) system can reduce swath overlap and result in less fuel and time spent in the field.

A percentage wheel slip indicator aids ballasting for fuel efficiency (PM 2089G). Easy-to-service air and fuel filters along with appropriate dashboard indicators for condition of air filtration and fuel pressure help maintain fuel efficiency (PM 2089L). In addition to fuel economy, other important factors such as dealer service proximity may also impact tractor selection.

Nebraska OECD Tractor Test 1884-Summary 551
John Deere 8130 Diesel
16 Speed

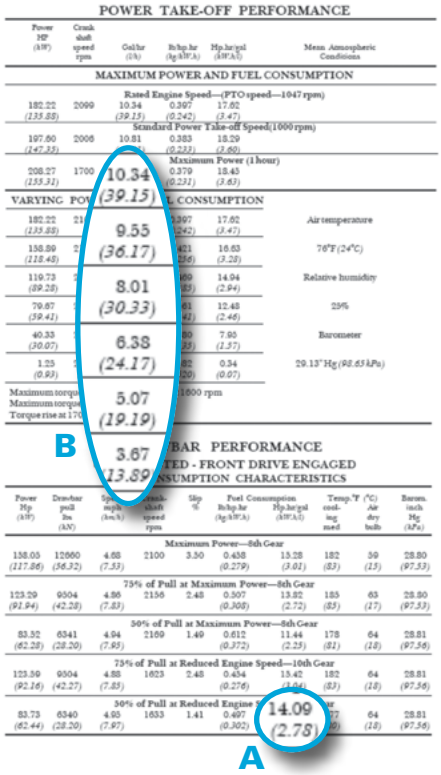

Figure 1. Sample first page of a tractor test report

For further information:

Nebraska Tractor Test Reports.
http://tractortestlab.unl.edu/

Grisso, R., D. Vaughan, J. Perumpral, G. Roberson, R. Pitman, and R. Hoy. Using tractor test data for selecting farm tractors. Virginia Cooperative Extension Publication 442-072.
http://pubs.ext.vt.edu/442/442-072/442-072.pdf

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