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November 1957

Test 611: McCormick Farmall 350 Gasoline

Tractor Test & Power Museum

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Department of Agricultural Engineering
Dates of test: April 1, 1957 to April 13, 1957
Manufacturer: INTERNATIONAL HARVESTER
COMPANY, CHICAGO 1, ILLINOIS
Manufacturer's rating: Not Rated

MCCORMICK FARMALL 350

BELT HORSEPOWER TESTS

| Hp | Crank shaft speed rpm | Fuel Consumption | | | Temp. Deg. F. | | | Barometer inches of mercury | | |
|--|-----------------------|------------------|---------------|--------------|----------------|--------------|--------------|-----------------------------|-----|-----|
| | | Gal per hr | Hp-hr per gal | Lb per hp-hr | Cooling medium | Air wet bulb | Air dry bulb | | | |
| TEST B—100% MAXIMUM LOAD—TWO HOURS | | | | | | | | | | |
| 40.71 | 1751 | 3.488 | 11.67 | 0.518 | 165 | 48 | 60 | 28.700 | | |
| TEST C—OPERATING MAXIMUM LOAD—ONE HOUR | | | | | | | | | | |
| 39.31 | 1750 | 3.229 | 12.17 | 0.497 | 160 | 51 | 68 | 29.053 | | |
| TEST D—RATED LOAD—ONE HOUR | | | | | | | | | | |
| 36.21 | 1751 | 3.105 | 11.66 | 0.519 | 153 | 58 | 60 | 28.613 | | |
| TEST E—VARYING LOAD—TWO HOURS (20 minute runs; last line average) | | | | | | | | | | |
| 36.24 | 1751 | 3.090 | 11.73 | 0.516 | 153 | 59 | 62 | ..... |  |  |
| 1.17 | 1925 | 1.195 | 0.98 | 6.179 | 192 | 59 | 62 | ..... |  |  |
| 19.37 | 1871 | 2.183 | 8.87 | 0.681 | 189 | 65 | 67 | ..... |  |  |
| 37.69 | 1675 | 3.125 | 12.06 | 0.501 | 161 | 61 | 63 | ..... |  |  |
| 9.92 | 1906 | 1.647 | 6.02 | 1.004 | 191 | 59 | 61 | ..... |  |  |
| 28.59 | 1842 | 2.728 | 10.48 | 0.577 | 149 | 53 | 58 | ..... |  |  |
| 22.16 | 1828 | 2.328 | 9.52 | 0.635 | 172 | 59 | 62 | 28.665 | | |
| TEST L—OPERATING MAXIMUM TORQUE | | | | | | | | | | |
| % of rated rpm (engine) | 100 | 95 | 90 | 85 | 80 | 75 | 70 | 65 | 60 | 55 |
| % of rated-speed torque | 100 | 102 | 104 | 105 | 108 | 111 | 113 | 115 | 114 | 112 |

DRAWBAR HORSEPOWER TESTS

| Hp | Draw bar pull lbs | Speed miles per hr | Crank shaft speed rpm | Slip of drive wheels % | Fuel Consumption | | | Temp. Deg. F. | | | Barometer inches of mercury |
|---|-------------------|--------------------|-----------------------|------------------------|-------------------------|---------------|--------------|---------------|--------------|--------------|-----------------------------|
| | | | | | Gal per hr | Hp-hr per gal | Lb per hp-hr | Cooling med | Air wet bulb | Air dry bulb | |
| TEST H—RATED LOAD—TEN HOURS—3rd Gear | | | | | | | | | | | |
| 28.76 | 2073 | 5.20 | 1751 | 3.29 | 2.854 | 10.08 | 0.600 | 162 | 36 | 44 | 29.091 |
| TEST F—100% MAXIMUM LOAD | | | | | | | | | | | |
| 37.54 | 2745 | 5.13 | 1747 | 4.44 | 3rd gear | ..... | ..... | 155 | 43 | 54 | 28.980 |
| TEST G—OPERATING MAXIMUM LOAD | | | | | | | | | | | |
| 33.87 | 5439 | 2.34 | 1750 | 10.35 | 1st gear | ..... | ..... | 163 | 50 | 59 | 28.770 |
| 35.56 | 3539 | 3.77 | 1750 | 5.54 | 2nd gear | ..... | ..... | 165 | 46 | 54 | 28.810 |
| 35.79 | 2591 | 5.18 | 1751 | 3.67 | 3rd gear | ..... | ..... | 145 | 44 | 51 | 28.820 |
| 35.76 | 2004 | 6.69 | 1749 | 2.75 | 4th gear | ..... | ..... | 150 | 44 | 51 | 28.820 |
| 31.82 | 715 | 16.69 | 1750 | 0.70 | 5th gear | ..... | ..... | 161 | 52 | 64 | 28.725 |
| 25.81 | 6457 | 1.50 | 1752 | 14.87 | 1st gear TA (prt-thrtl) | ..... | ..... | 136 | 28 | 32 | 29.110 |
| 33.59 | 5167 | 2.44 | 1750 | 9.43 | 2nd gear torc amplifier | ..... | ..... | 160 | 50 | 59 | 28.770 |
| 35.08 | 3861 | 3.41 | 1751 | 6.21 | 3rd gear torc amplifier | ..... | ..... | 160 | 50 | 59 | 28.770 |
| 35.50 | 2998 | 4.44 | 1751 | 4.58 | 4th gear torc amplifier | ..... | ..... | 162 | 46 | 54 | 28.810 |
| 34.24 | 1147 | 11.20 | 1754 | 1.36 | 5th gear torc amplifier | ..... | ..... | 156 | 52 | 64 | 28.725 |
| TEST J—OPERATING MAXIMUM LOAD | | | | | | | | | | | |
| 34.57 | 2602 | 4.98 | 1748 | 7.62 | 3rd gear | ..... | ..... | 167 | 54 | 71 | 28.670 |
| TEST K—OPERATING MAXIMUM LOAD | | | | | | | | | | | |
| 35.04 | 2878 | 4.57 | 1752 | 8.83 | 3rd gear | ..... | ..... | 168 | 38 | 42 | 29.285 |

TIRES, WHEELS AND WEIGHT

| | Tests F, G, & H | Test J | Test K |
|---|-----------------|-------------|-------------|
| Rear wheels | | | |
| Type | Cast Iron | Cast Iron | Cast Iron |
| Liquid ballast | 804 lb each | None | None |
| Added cast iron | 700 lb each | None | None |
| Rear tires | | | |
| No. and size | Two 13.6-38 | Two 13.6-38 | Two 10-38 |
| Ply | 6 | 6 | 4 |
| Air Pressure | 20 lb | 14 lb | 14 lb |
| Front wheels | | | |
| Type | Cast Iron | Cast Iron | Cast Iron |
| Liquid ballast | None | None | None |
| Added cast iron | None | None | None |
| Front tires | | | |
| No. and size | Two 5.50-16 | Two 5.50-16 | Two 5.50-16 |
| Ply | 4 | 4 | 4 |
| Air pressure | 24 lb | 24 lb | 24 lb |
| Height of drawbar | 18½ inches | 19½ inches | 16 inches |
| Static weight | | | |
| Rear end | 6774 lb | 3766 lb | 3620 lb |
| Front end | 1390 lb | 1390 lb | 1380 lb |
| Total weight as tested with operator | 8339 lb | 5331 lb | 5175 lb |

FUEL, OIL, WATER AND TIME Fuel Gasoline Octane No. ASTM 82 Research 88 (rating taken from oil company's typical inspection data) Weight per gallon 6.048 lb Oil SAE 20-20W To motor 1.457 gal Drained from motor 1.148 gal Water used 0.163 gal Total time motor was operated 52 hours.

CHASSIS TYPE Tricycle Serial No. 1006 S Tread width rear 48" to 93" front 8½" to 16¾" Wheel base 92¼" Hydraulic control system direct engine drive Advertised speeds mph first 2.5 second 3.8 third 5.2 fourth 6.6 fifth 16.1 reverse 3.1 (using torque amplifier) first 1.7 second 2.6 third 3.5 fourth 4.5 fifth 10.9 reverse 2.1 Belt pulley diam. 9¾" face 7½" rpm 1081 Belt speed 2759 fpm Belt flat Length 72' Width 7" Thickness 0.216" Maximum slip 0.79% Clutch single plate dry disc operated by foot pedal Seat upholstered seat on conical spring with shock absorber Brakes double disc brakes operated by two foot pedals Equalized by locking pedals together Power take-off direct engine drive with independent clutch Steering hydraulically aided.

ENGINE Make International Type 4 cylinder vertical Serial No. C-175 2362 Crankshaft mounted lengthwise Head I Lubrication pressure Bore and stroke 3¾" x 4¼" Rated rpm 1750 Compression ratio 7.0 to 1 Displacement 175 cu. in. Port diameter valves Inlet 1 23/64" Exhaust 1 7/32" Governor variable speed centrifugal Carburetor size 1¼" Ignition system battery Starting system 6 volt battery Air cleaner oil washed wire screen Muffler was used Oil filter replaceable treated paper element Cooling medium temperature control thermostat and radiator shutter.

REPAIRS AND ADJUSTMENTS No repairs or adjustments.

REMARKS All test results were determined from observed data and without allowances, additions or deductions. Tests B and F were made with carburetor set for 100% maximum belt horsepower and data from these tests were used in determining the horsepower to be developed in tests D and H, respectively. Tests C, D, E, G, H, J, K & L were made with an operating setting of the carburetor (selected by the manufacturer) of 96.1% of maximum belt horsepower.

HORSEPOWER SUMMARY

| | Drawbar | Belt |
|---|---------|-------|
| 1. Sea level (calculated) maximum horsepower (based on 60° F and 29.92" Hg) | 38.53 | 42.44 |
| 2. Observed maximum horsepower (tests F and B) | 37.54 | 40.71 |
| 3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (ASAE and SAE ratings) | 28.90 | 36.07 |

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 611.

L. F. LARSEN
Engineer-in-Charge

L. W. HURLBUT (Chairman)
G. W. STEINBRUEGGE
J. J. SULEK
Board of Tractor
Test Engineers

EXPLANATION OF TEST REPORT

TEST A: The manufacturer's representative operates the tractor for a minimum of 12 hours using light to heavy drawbar loads in each gear.

This serves as a period for limber up, general observation and adjustments. Adjustments that are permissible include valve tappet clearance, breaker point gap, spark plug gaps, clutch and others of a similar nature. No new parts or accessories can be installed without having mention made of it in the report.

No data are recorded during this preliminary run except the time that the engine is operated.

BELT HORSEPOWER TESTS

TEST B: The throttle valve is wide open and the belt load on the dynamometer is adjusted so that the engine is at the rated speed recommended by the manufacturer. Carburetor, ignition timing and manifold adjustments are all set for maximum engine power.

This test is designed to determine maximum belt horsepower of the tractor at rated speed and to measure fuel consumption at the maximum power on the belt.

TEST C: For tractors with carburetors the best fuel economy does not always occur when the engine develops maximum power at rated speed. Test C is intended to allow the manufacturer's representative to select a more economical fuel setting even though there is a slight loss of power. *This more practical carburetor setting is used in all later tests except test F.* The throttle valve is wide open and load adjusted to give rated rpm. Tests B and C are the same for diesel tractors which have an altogether different fuel system.

TEST D: The throttle control lever is set so that the governor will maintain rated engine speed when rated load is applied. Rated load is 85% of 100% maximum, as obtained in test B, corrected to standard conditions.

This rating is somewhat less than the maximum belt horsepower in order that the operator may have a certain amount of reserve.

TEST E:

Varying load serves to show the range of engine speeds when the engine is controlled by the governor during the following varied loads, of 20 minutes each; rated load, no load, $\frac{1}{2}$ rated load, maximum load at wide open throttle valve, $\frac{1}{4}$ and $\frac{3}{4}$ rated load.

The average result of this test shows the average power and fuel consumption. Since the average tractor is subjected to varying loads, these data serve well in predicting fuel consumption and efficiency of a tractor in general use.

TEST L: This torque test is run with wide open throttle. Loads are applied to reduce engine speed in approximately ten 5% increments. Rated speed equals 100%. The corresponding dynamometer torque is recorded as a per cent of torque at rated speed.

DRAWBAR HORSEPOWER TESTS

In all drawbar tests the pull exerted by the tractor is transmitted by a hydraulic pressure cylinder to a recording instru-

ment in the test car. When rubber tires are used, all tests are made on the concrete test course. All crawler type tractors are tested on a dirt test course which is maintained by grading, sprinkling and rolling so that it remains very nearly the same throughout the season. The same tires, wheels and weights are used for all tests except J and K.

TEST F: A drawbar test, the results of which are used to determine the rated drawbar horsepower in test H. The carburetor is set to develop maximum power as in test B. The rated gear recommended by manufacturer as plow gear is used in this test. The drawbar load is adjusted to give rated engine speed.

TEST G: Maximum drawbar horsepower is determined in each gear when the carburetor is set for fuel economy as in test C. The throttle valve is held wide open and the load is applied so that the engine runs at rated engine speed.

When operating in low gear it is not uncommon for the tractor to develop less drawbar horsepower than in rated gear because of excessive wheel slippage. When excessive wheel slippage occurs the load is reduced until slippage approaches 16%. When the load is reduced it is necessary to operate the tractor engine at part throttle and control engine speed by governor action.

TEST H: Intended to test the ability of the tractor to run continuously for 10 hours at rated drawbar horsepower and to determine the fuel consumption during that time. Rated drawbar horsepower is 75% of 100% maximum drawbar horsepower (Test F), corrected to standard conditions.

When operating at rated load the throttle control lever is set to maintain rated engine speed. This rating is less than maximum drawbar horsepower in order that the operator may have a certain amount of reserve.

TEST J: The tractor is operated in rated gear with all added weight removed. This test shows the effect of the removal of added weight on the performance of the tractor when compared with test G.

Removal of wheel weights generally increases wheel slippage and decreases drawbar horsepower.

TEST K: Similar to test J except that the smallest tires and lightest wheels offered by the manufacturer are used.

