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Test 983: International Farmall 544 (Diesel)

Nebraska Tractor Test Lab

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NEBRASKA TRACTOR TEST 983 - INTERNATIONAL FARMALL 544 DIESEL

POWER TAKE-OFF PERFORMANCE

| Hp | Crank- shaft speed rpm | Fuel Consumption | | Temperature Degrees F | | | | Barometer inches of Mercury | |
|--------------------------------------------------|---------------------------------|------------------|--------------------|-----------------------|-------------------|--------------------|--------------------|-----------------------------------|--------|
| | | Gal per hr | Lb per hp-hr | Hp-hr per gal | Cooling medium | Air wet bulb | Air dry bulb | | |
| MAXIMUM POWER AND FUEL CONSUMPTION | | | | | | | | | |
| Rated Engine Speed—Two Hours | | | | | | | | | |
| 52.95 | 2200 | 3.313 | 0.436 | 15.98 | 182 | 61 | 75 | 29.030 | |
| Standard Power Take-off Speed (540 rpm)—One Hour | | | | | | | | | |
| 49.66 | 1987 | 3.042 | 0.427 | 16.32 | 183 | 61 | 75 | 29.040 | |
| VARYING POWER AND FUEL CONSUMPTION—Two Hours | | | | | | | | | |
| 47.84 | 2337 | 3.298 | 0.481 | 14.51 | 180 | 61 | 75 | ..... |  |
| 0.00 | 2437 | 1.157 | ..... | ..... | 176 | 61 | 74 | ..... |  |
| 24.45 | 2388 | 2.103 | 0.600 | 11.63 | 180 | 61 | 75 | ..... |  |
| 52.45 | 2201 | 3.290 | 0.438 | 15.94 | 179 | 61 | 74 | ..... |  |
| 12.34 | 2411 | 1.647 | 0.931 | 7.49 | 178 | 60 | 73 | ..... |  |
| 36.27 | 2364 | 2.628 | 0.505 | 13.80 | 180 | 60 | 74 | ..... |  |
| Av | 28.89 | 2356 | 2.354 | 0.568 | 12.27 | 179 | 61 | 74 | 29.043 |

DRAWBAR PERFORMANCE

| Hp | Draw-bar pull lbs | Speed miles per hr | Crank- shaft speed rpm | Slip of drivers % | Fuel Consumption | | | Temp Degrees F | | | Barom- eter inches of Mercury |
|----|-------------------------|-----------------------------|---------------------------------|----------------------------|------------------|--------------------|---------------------|---------------------|--------------------|--------------------|----------------------------------------|
| | | | | | Gal per hr | Lb per hp-hr | Hp-hr per gal | Cool- ing med | Air wet bulb | Air dry bulb | |

VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST

| | | | | | | | | | | | | |
|-----------------------------------------------------------------|------|------|------|------|-------|-------|-------|-----|----|----|--------|--|
| Maximum Available Power—Two Hours—7th Gear (3rd DD) | | | | | | | | | | | | |
| 44.56 | 3577 | 4.67 | 2198 | 5.73 | 3.316 | 0.519 | 13.44 | 187 | 62 | 77 | 28.975 | |
| 75% of Pull at Maximum Power—Ten Hours—7th Gear (3rd DD) | | | | | | | | | | | | |
| 37.34 | 2742 | 5.11 | 2356 | 3.83 | 2.919 | 0.545 | 12.79 | 188 | 63 | 77 | 28.836 | |
| 50% of Pull at Maximum Power—Two Hours—7th Gear (3rd DD) | | | | | | | | | | | | |
| 25.55 | 1841 | 5.20 | 2379 | 2.90 | 2.382 | 0.650 | 10.73 | 184 | 60 | 73 | 29.005 | |

MAXIMUM POWER WITH BALLAST

| | | | | | | | | | | |
|-------|------|-------|------|-------|-------------------|-----|----|----|--------|--|
| 41.46 | 6528 | 2.38 | 2246 | 14.72 | 3rd Gear (2nd-TA) | 190 | 59 | 71 | 29.060 | |
| 43.42 | 5424 | 3.00 | 2199 | 10.15 | 4th Gear (3rd-TA) | 194 | 59 | 71 | 29.060 | |
| 45.33 | 4550 | 3.74 | 2201 | 7.87 | 5th Gear (2nd-DD) | 193 | 59 | 71 | 29.060 | |
| 44.22 | 3739 | 4.44 | 2199 | 6.26 | 6th Gear (4th-TA) | 194 | 59 | 73 | 29.045 | |
| 45.44 | 3653 | 4.66 | 2201 | 5.86 | 7th Gear (3rd-DD) | 194 | 59 | 73 | 29.045 | |
| 45.16 | 2517 | 6.73 | 2198 | 4.05 | 8th Gear (4th-DD) | 190 | 60 | 74 | 29.035 | |
| 41.78 | 1321 | 11.86 | 2198 | 2.09 | 9th Gear (5th-TA) | 190 | 59 | 74 | 29.030 | |

MAXIMUM PULL WITHOUT BALLAST

| | | | | | | | | | | |
|-------|------|------|------|-------|-------------------|-----|----|----|--------|--|
| 38.48 | 5852 | 2.47 | 2327 | 14.97 | 3rd Gear (2nd-TA) | 179 | 58 | 65 | 28.780 | |
|-------|------|------|------|-------|-------------------|-----|----|----|--------|--|

VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST 7th Gear (3rd DD)

| | | | | | | | |
|-----------------------|-------|-------|-------|-------|-------|-------|-------|
| Pounds pull | 3653 | 3826 | 3911 | 4124 | 4085 | 3928 | ..... |
| Horsepower | 45.44 | 42.62 | 38.55 | 35.50 | 29.93 | 24.20 | ..... |
| Crankshaft speed, rpm | 2201 | 1979 | 1757 | 1542 | 1312 | 1098 | ..... |
| Miles per hour | 4.66 | 4.18 | 3.70 | 3.23 | 2.75 | 2.31 | ..... |
| Slip of drivers, % | 5.86 | 6.26 | 6.65 | 7.29 | 6.91 | 6.65 | ..... |

TIRES, BALLAST and WEIGHT

| | | With Ballast | Without Ballast |
|----------------------------------|----------------------|--------------------|--------------------|
| Rear tires | —No, size, ply & psi | Two 13.6-38; 6; 18 | Two 13.6-38; 6; 14 |
| | Ballast | 620 lb each | None |
| Front tires | —Liquid | None | None |
| | Cast iron | None | None |
| Front tires | —No, size, ply & psi | Two 6.00-16; 6; 48 | Two 6.00-16; 6; 48 |
| | Ballast | None | None |
| Height of drawbar | —Liquid | None | None |
| | Cast iron | None | None |
| Static weight with operator—Rear | | 17 inches | 17 inches |
| | Front | 6285 lb | 5045 lb |
| Total | | 2185 lb | 2150 lb |
| | | 8470 lb | 7195 lb |

Department of Agricultural Engineering

Dates of Test: SEPTEMBER 7 to SEPTEMBER 20, 1968

Manufacturer: INTERNATIONAL HARVESTER COMPANY, CHICAGO, ILLINOIS

FUEL, OIL and TIME Fuel No 2 Diesel Cetane 54.3 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.8378 Weight per gallon 6.976 lb Oil SAE 30 API service classification MS, DG, DM, DS To motor 2.290 gal Drained from motor 1.664 gal Transmission and final-drive lubricant IH Hy-Tran Fluid Total time engine was operated 46 hours.

ENGINE Make International Diesel Type 4 cylinder vertical Serial No 440142 Crankshaft mounted lengthwise Rated rpm 2200 Bore and stroke 3.875 x 5.06 Compression ratio 16 to 1 Displacement 238.6 cu in Cranking system 12 volt electric (two 6 volt batteries) Lubrication pressure Air cleaner two stage dry type with replaceable element, automatic dust unloader and pre-cleaner Oil filter screw-on replaceable cartridge Oil cooler radiator for transmission and hydraulic oil Fuel filter one primary and one final replaceable screw-on paper cartridge Muffler was used Cooling medium temperature control thermostat.

CHASSIS Type Standard Serial No 102935 Tread width rear 54" to 96" front 57" to 88" Wheel base 94" Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 29" Vertical distance above roadway 34" Horizontal distance from center of rear wheel tread 0" to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio with partial range operator controlled power shifting Advertised speeds mph first 1.75 second 2.50 third 2.75 fourth 3.25 fifth 4.00 sixth 4.75 seventh 5.00 eighth 7.00 ninth 12.25 tenth 18.00 reverse 2.00 and 2.75 Clutch single plate dry disc operated by foot pedal Brakes dry double disc mechanically operated by two foot pedals which can be locked together Steering hydrostatic power Turning radius (on concrete surface with brake applied) right 126" left 127" (on concrete surface without brake) right 147" left 148" Turning space diameter (on concrete surface with brake applied) right 266" left 267" (on concrete surface without brake) right 306" left 307" Belt pulley 1159 rpm at 2200 engine rpm diam 11" face 7 1/2" Belt speed 3338 fpm Power take-off 543 rpm at 2000 engine rpm.

REPAIRS and ADJUSTMENTS No repairs or adjustments.

REMARKS All test results were determined from observed data obtained in accordance with the SAE and ASAE test code.

First and second gears were not run as it was necessary to limit the pull in third gear to avoid excessive wheel slippage. Tenth gear was not run as it exceeded 15 mph.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 983.

L. F. LARSEN

Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman

W. E. SPLINTER

D. E. LANE

Board of Tractor Test Engineers

The University of Nebraska Agricultural Experiment Station
E. F. Frolik, Dean; H. W. Ottoson, Director; Lincoln, Nebraska

EXPLANATION OF TEST REPORT

GENERAL CONDITIONS

Each tractor is a production model equipped for common usage. Power consuming accessories can be disconnected only when it is convenient for the operator to do so in practice. Additional weight can be added as ballast if the manufacturer regularly supplies it for sale. The static tire loads and the inflation pressures must conform to recommendations in the Tire Standards published by the Society of Automotive Engineers.

PREPARATION FOR PERFORMANCE RUNS

The engine crankcase is drained and refilled with a measured amount of new oil conforming to specifications in the operators manual. The fuel used and the maintenance operations must also conform to the published information delivered with the tractor. The tractor is then limbered-up for 12 hours on drawbar work in accordance with the manufacturer's published recommendations. The manufacturer's representative is present to make appropriate decisions regarding mechanical adjustments.

The tractor is equipped with approximately the amount of added ballast that is used during maximum drawbar tests. The tire tread-bar height must be at least 65% of new tread height prior to the maximum power run.

BELT OR POWER TAKE-OFF PERFORMANCE

Maximum Power and Fuel Consumption. The manufacturer's representative makes carburetor, fuel pump, ignition and governor control settings which remain unchanged throughout all subsequent runs. The governor and the manually operated governor control lever is set to provide the high-idle speed specified by the manufacturer for maximum power. Maximum power is measured by connecting the belt pulley or the power take-off to a dynamometer. The dynamometer load is then gradually increased until the engine is operating at the rated speed specified by the manufacturer for maximum power. The corresponding fuel consumption is measured.

Varying Power and Fuel Consumption. Six different horsepower levels are used to show corresponding fuel consumption rates and how the governor causes the engine to react to the following changes in dynamometer load: 85% of the dynamometer torque at maximum power; minimum dynamometer torque, $\frac{1}{2}$ of the 85% torque; maximum power, $\frac{1}{4}$ and $\frac{3}{4}$ of the 85% torque. Since a tractor is generally subjected to varying loads the average of the results in this test serve well for predicting the fuel consumption of a tractor in general usage.

DRAWBAR PERFORMANCE

All engine adjustments are the same as those used in the belt or power take-off tests. If the manufacturer specifies a different rated crankshaft speed for drawbar operations, then the position of the manually operated governor control is changed to provide the high-idle speed specified by the manufacturer in the operating instructions.

Varying Power and Fuel Consumption With Ballast. The varying power runs are made to show the effect of

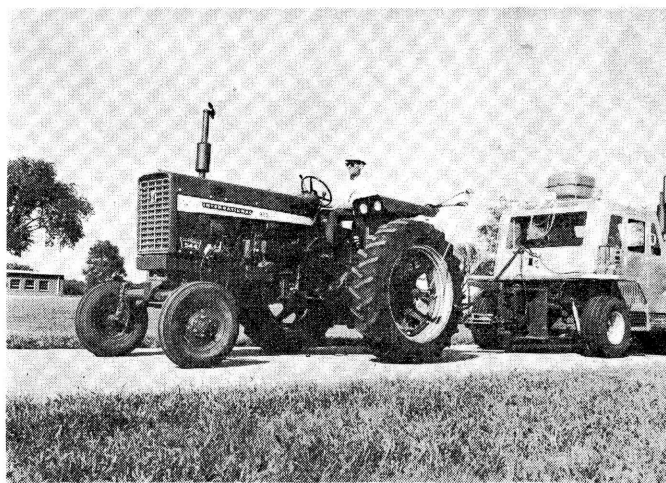
speed-control devices (engine, governor, automatic transmission, etc.) on horsepower, speed and fuel consumption. These runs are made around the entire test course which has two 180 degree turns with a minimum radius of 50 feet. The drawbar pull is set at 3 different levels as follows: (1) as near to the pull at maximum power as possible and still have the tractor maintain the travel speed at maximum horsepower on the straight sections of the test course; (2) 75% of the pull at maximum power; and (3) 50% of the pull at maximum power. Prior to 1958, fuel consumption data (10 hour test) were shown only for the pull obtained at maximum power for tractors having torque converters and at 75% of the pull obtained at maximum power for gear-type tractors.

Maximum Power with Ballast. Maximum power is measured on straight level sections of the test course. Data are shown for not more than 12 different gears or travel speeds. Some gears or travel speeds may be omitted because of high slippage of the traction members or because the travel speed may exceed the safe-limit for the test course. The maximum safe speed for the Nebraska Test Course has been set at 15 miles per hour. The slippage limits have been set at 15% and 7% for pneumatic tires and steel tracks or lugs, respectively. Higher slippage gives widely varying results.

Maximum Pull without Ballast. All added ballast is removed from the tractor. The drawbar pull is determined at slip limits of 15% for pneumatic tires or 7% for steel tracks or lugs. The tractor is operated at the fastest possible travel speed.

Varying Power and Travel Speed with Ballast. Travel speeds corresponding to drawbar pulls beyond the maximum power range are obtained to show the "lugging ability" of the tractor. The run starts with the pull at maximum power; then additional drawbar pull is applied to cause decreasing speeds. The run is ended by one of three conditions: (1) maximum pull is obtained, (2) the maximum slippage limit is reached, or (3) some other operating limit is reached.

For additional information about the Nebraska Tractor Tests write to the Department of Agricultural Engineering, University of Nebraska, Lincoln, Nebraska.



INTERNATIONAL FARMALL 544 DIESEL