7-1-1968

# Test 981: Ursus C-335 (Diesel)

Nebraska Tractor Test Lab
*University of Nebraska-Lincoln*, tractortestlab@unl.edu

# NEBRASKA TRACTOR TEST 981 – URSUS C-335 DIESEL

## POWER TAKE-OFF PERFORMANCE

| Hp | Crank-shaft speed rpm | Fuel Consumption: Gal per hr | Fuel Consumption: Lb per hp-hr | Fuel Consumption: Hp-hr per gal | Temperature Degrees F: Cooling medium | Temperature Degrees F: Air wet bulb | Temperature Degrees F: Air dry bulb | Barometer inches of Mercury |
|---|---|---|---|---|---|---|---|---|
| **MAXIMUM POWER AND FUEL CONSUMPTION** | | | | | | | | |
| **Rated Engine Speed—Two Hours** | | | | | | | | |
| 29.30 | 2200 | 2.133 | 0.509 | 13.74 | 202 | 62 | 75 | 29.188 |
| **Standard Power Take-off Speed (540 rpm)—One Hour** | | | | | | | | |
| 29.78 | 2159 | 2.269 | 0.532 | 13.12 | 208 | 62 | 75 | 29.205 |
| **VARYING POWER AND FUEL CONSUMPTION—TWO HOURS** | | | | | | | | |
| 25.58 | 2259 | 1.796 | 0.490 | 14.24 | 187 | 62 | 74 | ..... |
| 0.00 | 2419 | 0.584 | ..... | ..... | 164 | 62 | 75 | ..... |
| 13.31 | 2351 | 1.091 | 0.573 | 12.20 | 170 | 63 | 75 | ..... |
| 30.08 | 2201 | 2.182 | 0.507 | 13.79 | 194 | 63 | 76 | ..... |
| 6.78 | 2391 | 0.838 | 0.863 | 8.11 | 167 | 63 | 75 | ..... |
| 19.56 | 2303 | 1.430 | 0.511 | 13.68 | 175 | 63 | 76 | ..... |
| **Av 15.89** | **2320** | **1.320** | **0.580** | **12.04** | **176** | **63** | **75** | **29.245** |

## DRAWBAR PERFORMANCE

| Hp | Draw-bar pull lbs | Speed miles per hr | Crank-shaft speed rpm | Slip of drivers % | Fuel Consumption: Gal per hr | Fuel Consumption: Lb per hp-hr | Fuel Consumption: Hp-hr per gal | Temp Degrees F: Cool-ing med | Temp Degrees F: Air wet bulb | Temp Degrees F: Air dry bulb | Barom-eter inches of Mercury |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST** | | | | | | | | | | | |
| **Maximum Available Power—Two Hours—4th Gear** | | | | | | | | | | | |
| 26.11 | 2282 | 4.29 | 2210 | 6.88 | 2.215 | 0.592 | 11.79 | 190 | 69 | 81 | 29.055 |
| **75% of Pull at Maximum Power—Ten Hours—4th Gear** | | | | | | | | | | | |
| 21.21 | 1780 | 4.47 | 2262 | 5.26 | 1.758 | 0.579 | 12.06 | 171 | 71 | 82 | 28.850 |
| **50% of Pull at Maximum Power—Two Hours—4th Gear** | | | | | | | | | | | |
| 15.30 | 1233 | 4.65 | 2317 | 3.67 | 1.285 | 0.587 | 11.91 | 175 | 69 | 87 | 29.055 |
| **MAXIMUM POWER WITH BALLAST** | | | | | | | | | | | |
| 20.38 | 3929 | 1.95 | 2251 | 13.48 | 2nd Gear ..... | | | 185 | 72 | 84 | 28.920 |
| 25.21 | 2964 | 3.19 | 2197 | 9.19 | 3rd Gear ..... | | | 193 | 67 | 81 | 29.050 |
| 26.49 | 2321 | 4.28 | 2200 | 6.72 | 4th Gear ..... | | | 195 | 67 | 81 | 29.050 |
| 25.73 | 1124 | 8.58 | 2201 | 3.44 | 5th Gear ..... | | | 178 | 67 | 81 | 29.050 |
| 9.95 | 266 | 14.03 | 2193 | 0.88 | 6th Gear ..... | | | 175 | 64 | 81 | 29.200 |
| **MAXIMUM PULL WITHOUT BALLAST** | | | | | | | | | | | |
| 15.84 | 3020 | 1.97 | 2295 | 13.60 | 2nd Gear ..... | | | 183 | 74 | 90 | 28.800 |

**VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—4th Gear**

| | | | | | | |
|---|---|---|---|---|---|---|
| Pounds pull | 2321 | 2437 | 2499 | 2484 | 2453 | 2433 |
| Horsepower | 26.49 | 24.81 | 22.58 | 19.68 | 16.58 | 13.81 |
| Crankshaft speed, rpm | 2200 | 1970 | 1751 | 1538 | 1311 | 1099 |
| Miles per hour | 4.28 | 3.82 | 3.39 | 2.97 | 2.53 | 2.13 |
| Slip of drivers, % | 6.72 | 7.25 | 7.66 | 7.66 | 7.56 | 7.04 |

| TIRES, BALLAST and WEIGHT | | With Ballast | Without Ballast |
|---|---|---|---|
| **Rear tires** | —No, size, ply & psi | Two 11.00-28; 6; 18 | Two 11.00-28; 6; 12 |
| Ballast | —Liquid | 265 lb each | None |
| | Cast iron | 340 lb each | None |
| **Front tires** | —No, size, ply & psi | Two 6.00-16; 4; 28 | Two 6.00-16; 4; 20 |
| Ballast | —Liquid | None | None |
| | Cast iron | 65 lb each | None |
| **Height of drawbar** | | 24 inches | 24½ inches |
| **Static weight with operator**—Rear | | 3880 lb | 2670 lb |
| Front | | 1560 lb | 1430 lb |
| Total | | 5440 lb | 4100 lb |

**Department of Agricultural Engineering**

**Dates of Test:** July 1 to July 18, 1968

**Manufacturer:** ZAKLADY MECHANICZNE "URSUS," URSUS K/WARSZAWA POLAND

**FUEL, OIL and TIME** **Fuel** No 2 Diesel **Cetane No** 52.4 (rating taken from oil company's typical inspection data) **Specific gravity converted to 60°/60°** 0.8387 **Weight per gallon** 6.984 lb **Oil** SAE 30 **API service classification** DS **To motor** 1.584 gal **Drained from motor** 1.512 gal **Transmission and final-drive lubricant** SAE 30 for drive assembly SAE 80 for reduction gears **Total time engine was operated** 45½ hours.

**ENGINE** **Make** ZM "Ursus" **Type** 2 cylinder vertical **Serial No** 114086 **Crankshaft mounted** lengthwise **Rated rpm** 2200 **Bore and stroke** 4.016" x 4.724" **Compression ratio** 17 to 1 **Displacement** 119.56 cu in **Cranking system** 12 volt electric (two 6-volt batteries) **Lubrication** pressure **Air cleaner** oil washed wire mesh **Oil filter** centrifugal type **Oil cooler** not used **Fuel filter** sediment bowl and screen, double filter with replaceable felt cartridge and replaceable paper cartridge **Muffler** was used **Cooling medium temperature control** thermostat.

**CHASSIS** **Type** Standard **Serial No** 000111 **Tread width** rear 49.3" to 72.9" front 49.3" to 69.0" **Wheel base** 75.6" **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 27.6" Vertical distance above roadway 28.9" Horizontal distance from center of rear wheel tread 0" to the right/left **Hydraulic control system** direct engine drive which can be disconnected **Transmission** selective gear fixed ratio **Advertised speeds mph** first 1.16 second 2.26 third 3.60 fourth 4.70 fifth 9.10 sixth 13.95 reverse 0.975 and 3.96 **Clutch** single plate dry disc operated by foot pedal **Brakes** expanding double shoe operated by two independent foot pedals **Steering** no power assistance **Turning radius** (on concrete surface with brake applied) right 116" left 116" (on concrete surface without brake) right 130" left 130" **Turning space diameter** (on concrete surface with brake applied) right 243" left 243" (on concrete surface without brake) right 271" left 271" **Belt pulley** 1375 rpm at 2200 engine rpm **Belt speed** 3090 fpm diam 8.67" face 5.71" **Power take-off** 550 rpm at 2200 engine rpm.

**REPAIRS and ADJUSTMENTS** Fan belt tension was adjusted following the PTO runs.

**REMARKS** All test results were determined from observed data obtained in accordance with the SAE and ASAE test code. First gear was not run as it was necessary to limit the pull in second gear because of the stability formula and to avoid excessive slippage.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 981.

L. F. LARSEN
Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman
J. J. SULEK
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, ½ of the 85% torque; maximum power, ¼ and ¾ 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.

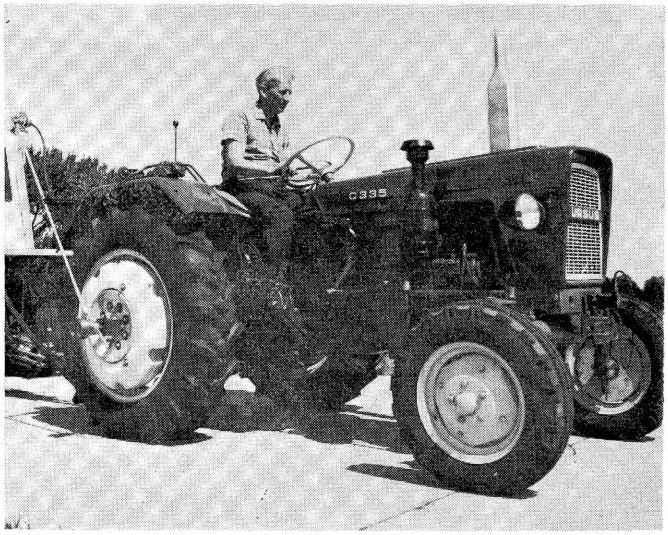
**Varying Power and Fuel Consumption With Ballast.** The varying power runs are made to show the effect of speed-control devices (engine, governor, automatic transmission, etc.) on horsepower, speed and fuel consumption. These runs are made around the entire test course which has two 180 degree turns 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.**



**URSUS C-335 DIESEL**