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Test 809: Nuffield 460 (Diesel)

Nebraska Tractor Test Lab

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NEBRASKA TRACTOR TEST 809 - NUFFIELD 460 DIESEL

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

POWER TAKE-OFF PERFORMANCE

Hp	Crank- shaft speed rpm	Fuel Consumption		Hp-hr per gal	Temperature Degrees F			Barometer inches of Mercury
		Gal per hr	Lb per hp-hr		Cooling medium	Air wet bulb	Air dry bulb	
*	MAXIMUM POWER AND FUEL CONSUMPTION							
Rated Engine Speed—Two Hours								
54.90	2000	3.583	0.454	15.32	196	57	75	28.738
Standard Power Take-off Speed (540 rpm)—One Hour								
42.73	1430	2.676	0.436	15.97	196	57	75	28.733
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS								
49.35	2115	3.184	0.449	15.50	185	57	75	.....
0.00	2164	0.880	.....	.....	171	55	72	.....
24.91	2135	1.924	0.537	12.95	168	56	73	.....
55.29	1999	3.632	0.457	15.22	193	56	73	.....
12.51	2144	1.381	0.767	9.06	175	55	71	.....
37.09	2119	2.476	0.464	14.98	180	55	71	.....
Av 29.86	2113	2.246	0.523	13.29	179	56	73	28.745

DRAWBAR PERFORMANCE

Hp	Draw- bar pull lbs	Speed miles per hr	Crank- shaft speed rpm	Slip of drivers %	Fuel Consumption			Temp Degrees F			Barometer 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—3rd Gear											
49.72	3588	5.20	2001	5.64	3.644	0.510	13.64	184	46	50	28.843
75% of Pull at Maximum Power—Ten Hours—3rd Gear											
40.29	2705	5.59	2114	3.93	2.909	0.502	13.85	183	46	53	28.808
50% of Pull at Maximum Power—Two Hours—3rd Gear											
27.55	1815	5.69	2131	2.89	2.254	0.569	12.22	178	35	36	28.898
MAXIMUM POWER WITH BALLAST											
41.49	6986	2.23	2112	14.96	1st Gear .....	.....	180	46	50	28.860	
49.16	5150	3.58	1999	8.84	2nd Gear .....	.....	183	47	52	28.830	
50.86	3654	5.22	2009	5.57	3rd Gear .....	.....	184	46	49	28.850	
50.22	2413	7.80	2001	3.78	4th Gear .....	.....	181	47	52	28.830	
MAXIMUM POWER WITHOUT BALLAST											
50.72	3813	4.99	2001	9.70	3rd Gear .....	.....	184	41	43	29.085	
VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—3rd Gear											
Pounds pull			3654	3751	3859	3986	4044	3912			
Horsepower			50.86	46.97	42.68	38.37	33.33	26.55			
Miles per hour			5.22	4.70	4.15	3.61	3.09	2.55			
Slip of drivers, %			5.57	5.91	6.18	6.31	6.58	6.18			

Department of Agricultural Engineering
Dates of Test: March 17 to March 26, 1962
Manufacturer: MORRIS MOTORS LTD. (Div.
of the British Motor Corp.), BIRMINGHAM,
ENGLAND
Manufacturer's Power Rating: 55 PTO Horse-
power and 50 Drawbar Horsepower

FUEL, OIL and TIME Fuel No 2 Diesel
Cetane No 54 (rating taken from oil company's
typical inspection data) Specific gravity converted
to 60°/60° 0.8352 Weight per gallon 6.954 lb
Oil SAE 10W-30 API service classification MS,
DM To motor 2.473 gal Drained from motor
1.890 gal Transmission and final-drive lubricant
SAE 90 Type transmission oil Total time engine
was operated 50½ hours.

ENGINE Make B.M.C. Diesel Type 4 cylinder
vertical Serial No 38-TA-BL-D1330 Crankshaft
mounted lengthwise Rated rpm 2000 Bore and
stroke 3.937" x 4.724" Compression ratio 16.5 to
1 Displacement 230 cu in Cranking system 12
volt electric (two 6 volt batteries) Lubrication
pressure Air cleaner oil washed wire mesh Oil
filter replaceable micronic paper element Fuel
filter replaceable laminated paper element Muf-
fler was used Cooling medium temperature control
thermostat and shutters.

CHASSIS Type standard Serial No 34-T25394
Tread width rear 53" to 77" front 53" to 71"
Wheel base 78" Center of gravity (without oper-
ator or ballast, with minimum tread, with fuel
tank filled and tractor serviced for operation)
Horizontal distance forward from center-line of
rear wheels 26½" Vertical distance above road-
way 35½" Horizontal distance from center of
rear wheel tread 0" to the right/left Hydraulic
control system direct engine drive which can be
disconnected except during PTO operation

Transmission selective gear fixed ratio Adver-
tised speeds mph first 2.26 second 3.60 third 5.05
fourth 7.45 fifth 17.30 reverse 3.96 Clutch single
plate dry disc operated by foot pedal Brakes
internal expanding shoe operated by two foot
pedals and a hand lever Steering no power assist-
ance Turning radius (on concrete surface with
brake applied) right 126" left 126" (on concrete
surface without brake) right 140" left 140" Turn-
ing space diameter (on concrete surface with
brake applied) right 260" left 260" (on concrete
surface without brake) right 288" left 288" Belt
pulley 1149 rpm at 1400 engine rpm diam 10¼"
face 6½" Belt speed 3160 fpm Power take-off
540 rpm at 1430 engine rpm.

REPAIRS and ADJUSTMENTS During pre-
liminary PTO run the fuel injection pump was
replaced.

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

Fifth 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 809.

L. F. LARSEN
Engineer-in-Charge

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

TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 12-38; 6; 20	Two 12-38; 6; 14
Ballast	—Liquid	632 lb each	None
	—Cast iron	1024 lb each	None
Front tires	—No, size, ply & psi	Two 7.50-18; 6; 20	Two 7.50-18; 6; 20
Ballast	—Liquid	57 lb each	None
	—Cast iron	135 lb each	None
Height of drawbar		20 inches	20½ inches
Static weight	—Rear	6754 lb	3442 lb
	—Front	2456 lb	2072 lb
Total weight with operator		9385 lb	5689 lb

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, $\frac{1}{2}$ 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 trans-

missions, 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 Power Without Ballast. All added ballast is removed from the tractor. The maximum drawbar power of the tractor is determined by the same procedure used for getting maximum power with ballast. The gear (or travel speed) is the same as that used in the 10-hour test.

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.



Nuffield 460 Diesel