1-1-1958

Test 642: Ford Model 641

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

The Experiment Station
University of Nebraska College of Agriculture
W. V. Lambert, Director, Lincoln, Nebraska

Department of Agricultural Engineering
Dates of test: March 20 to 31, 1958
Manufacturer: FORD MOTOR COMPANY, BIRMINGHAM, MICHIGAN
Manufacturer's rating: Not Rated

NEBRASKA TRACTOR TEST NO. 642

FORD 641

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 POWER —TWO HOURS								
33.65	2000	3.378	9.96	0.606	160	53	73	28.915
TEST C—OPERATING MAXIMUM POWER—ONE HOUR								
32.19	2000	2.899	11.10	0.544	153	53	72	28.908
TEST D—RATED POWER—ONE HOUR								
30.08	2210	2.906	10.35	0.583	148	53	72	28.915
TEST E—VARYING POWER—TWO HOURS (20 minute runs; last line average)								
30.06	2210	2.908	10.34	0.584	151	54	73	.....
2.29	2307	1.307	1.75	3.445	124	52	70	.....
15.54	2274	2.073	7.50	0.805	127	52	70	.....
32.07	2007	2.927	10.96	0.551	151	52	71	.....
7.88	2304	1.675	4.70	1.283	124	52	70	.....
22.98	2247	2.535	9.07	0.666	136	52	71	.....
18.47	2225	2.237	8.26	0.731	135	52	71	28.908

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 POWER—TEN HOURS—5th Gear											
25.23	1779	4.90	2241	4.49	2.393	9.71	0.622	143	39	48	29.039
TEST F—100% MAXIMUM POWER											
29.82	2606	4.29	1999	6.26	5th Gear			144	46	54	28.870
TEST G—OPERATING MAXIMUM POWER											
23.55	4101	2.15	2003	13.55	1st Gear (part throttle)			130	38	43	28.915
27.13	3798	2.68	2000	11.46	2nd Gear.....			128	38	43	28.915
28.11	3054	3.45	2002	8.45	3rd Gear.....			128	39	45	28.900
27.44	2508	4.10	2000	6.84	4th Gear.....			128	39	45	28.870
28.08	2462	4.28	2002	6.63	5th Gear.....			128	39	45	28.870
27.25	1913	5.34	2000	5.18	6th Gear.....			130	40	46	28.860
27.22	1605	6.36	1996	4.41	7th Gear.....			127	40	46	28.860
27.27	1565	6.53	1997	4.13	8th Gear.....			134	40	46	28.860
26.33	1108	8.91	2000	3.00	9th Gear.....			132	40	46	28.860
25.07	967	9.72	2003	2.60	10th Gear.....			130	40	46	28.860
24.18	656	13.82	2012	1.07	11th Gear.....			136	43	50	28.866
14.68	356	15.46	1497	0.60	12th Gear.....			128	40	46	28.860
TEST J—OPERATING MAXIMUM POWER											
24.86	2360	3.95	2001	15.06	5th Gear (part throttle)			149	55	59	28.825

TEST K—SPEED-PULL CHARACTERISTIC

Pounds Pull	1779	2462	2400	2450	2500	2500	2650	2550
Horsepower	23.23	28.08	25.0	22.2	20.0	17.3	14.8	11.6
Miles Per Hour	4.90	4.28	3.9	3.4	3.0	2.6	2.1	1.7

TIRES, WHEELS AND WEIGHT

	Tests F, G, H & K	Test J
Rear wheels		
Type	Pressed Steel	Pressed Steel
Liquid ballast	408 lb each	None
Added cast iron	708 lb each	None
Rear tires		
No. and size	Two 12.4-28	Two 12.4-28
Ply	4	4
Air pressure	14 lb	12 lb
Front wheels		
Type	Pressed Steel	Pressed Steel
Liquid ballast	None	None
Added cast iron	None	None
Front tires		
No. and size	Two 5.50-16	Two 5.50-16
Ply	4	4
Air pressure	28 lb	28 lb
Height of drawbar	17 inches	18½ inches
Static weight		
Rear end	4128 lb	1896 lb
Front end	1220 lb	1220 lb
Total weight as tested with operator	5523 lb	3291 lb

FUEL, OIL, WATER and TIME Fuel Gasoline **Octane No.** ASTM 83 **Research** 89.7 (rating taken from oil company's typical inspection data) **Weight per gallon** 6.036 lb **Oil** SAE 10W **To motor** 1.533 gal **Drained from motor** 1.000 gal **Water used** 0.204 gal **Total time motor was operated** 46 hours.

CHASSIS Type Standard **Serial No.** 641S-8635 **Tread width rear** 52" to 76" **front** 52" to 80" **Wheel base** 74.5" **Hydraulic control system** direct engine drive **Advertised speeds mph** first 2.54 second 3.09 third 3.80 fourth 4.47 fifth 4.61 sixth 5.77 seventh 6.72 eighth 7.03 ninth 9.38 tenth 10.18 eleventh 14.04 twelfth 16.01 (at 1500 RPM) reverse first 2.65 second 3.98 third 6.04 **Belt pulley diam.** 9" **face** 6.50" **rpm** 1360 **Belt speed** 3199 fpm **Belt** flat **Length** 71' **Width** 6" **Thickness** 0.215" **Maximum slip** 0.58% **Clutch** single plate dry disc operated by foot pedal **Seat** pressed steel cushioned by rubber in torsion **Brakes** internal expanding shoes operated by two foot pedals on right side of tractor **Equalized** by foot action **Power take-off** conventional type **Steering** aided by hydraulic power steering.

ENGINE Make Ford **Type** 4-cylinder vertical **Serial No.** 641S-8635 **Crankshaft mounted** lengthwise **Head** I **Lubrication** pressure **Bore and stroke** 3.4375" x 3.60" **Rated rpm** 2000 **Compression ratio** 7.50 to 1 **Displacement** 134 cu. in **Valves port diameter Inlet** 1.46" **Exhaust** 1.26" **Governor** variable speed centrifugal **Carburetor size** 1" **Ignition system** battery **Starting system** 6-volt battery **Air cleaner** oil washed wire mesh **Muffler** was used **Oil filter** full flow with replaceable paper element **Cooling medium temperature control** thermostat.

REPAIRS AND ADJUSTMENTS No repairs or 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, and K were made with an operating setting of the carburetor (selected by the manufacturer) of 95.6% of maximum belt horsepower.

HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60° F and 29.92" Hg)	30.73	35.25
2. Observed maximum horsepower (tests F and B)	29.82	33.65
3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (ASAE and SAE ratings)	23.05	29.96

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 642.

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 permissable 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 manual throttle control lever is set so that the throttle valve is held 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 manual throttle control lever is set the same as for tests B and C allowing the governor to control engine speed at part throttle. Load is applied until 85% of maximum corrected horsepower found in test B is obtained.

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, ½ rated load, maximum load at wide open throttle valve, ¼ and ¾ 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.

DRAWBAR HORSEPOWER TESTS

In all drawbar tests the pull exerted by the tractor is transmitted by a hydraulic pressure cylinder to a recording instrument in the test car. When rubber tires are used, all tests are made on the concrete test course. The same tires, wheels and weights are used for all tests except J. All crawler type tractors are tested on an earthen test course which is maintained by grading, sprinkling and rolling so that it remains very nearly the same for each test.

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 the 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 manual throttle control lever is set so that 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 15%. When the load is reduced it is necessary to operate the tratcor 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 horsepower the manual throttle control lever is set the same as in tests F and G allowing the governor to maintain engine speed at part throttle. 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: This is intended to show the pull, horsepower, and travel speed of the tractor at rated horsepower (taken from test H); maximum horsepower (taken from test G); and at least four other conditions obtained by reducing travel speed in 10% increments by overload.