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Test 1517: Ford TW-35 Diesel 16-Speed

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NEBRASKA TRACTOR TEST 1517—FORD TW-35 DIESEL 16 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption gal/hr (l/h)	lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Temperature °F (°C) Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg (kPa)
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours (PTO Speed—1147 rpm)								
170.30 (127.00)	2200	10.335 (39.119)	0.425 (0.258)	16.48 (3.246)	191 (88.3)	55 (13.0)	75 (23.9)	28.59 (96.54)
Standard Power Take-off Speed (1000 rpm)—One Hour								
166.67 (124.28)	1919	9.575 (36.243)	0.402 (0.244)	17.41 (3.429)	190 (87.6)	56 (13.5)	75 (23.7)	28.66 (96.78)
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
148.39 (110.65)	2255	9.247 (35.001)	0.436 (0.265)	16.05 (3.161)	186 (85.6)	58 (14.2)	75 (23.9)	....
0.00 (0.00)	2388	2.560 (9.692)	....	....	181 (82.8)	57 (13.6)	74 (23.1)	....
76.66 (57.17)	2331	5.854 (22.160)	0.534 (0.325)	13.10 (2.580)	184 (84.2)	56 (13.3)	74 (23.1)	....
170.72 (127.31)	2200	10.357 (39.206)	0.424 (0.258)	16.48 (3.247)	191 (88.1)	58 (14.4)	76 (24.2)	....
38.79 (28.92)	2357	4.194 (15.877)	0.756 (0.460)	9.25 (1.822)	182 (83.1)	59 (14.7)	76 (24.2)	....
112.80 (84.11)	2286	7.428 (28.118)	0.461 (0.280)	15.18 (2.991)	185 (85.0)	58 (14.4)	74 (23.3)	....
Av 91.23	**2303**	**6.607**	**0.507**	**13.81**	**185**	**57**	**75**	**28.70**
Av (68.03)		***(25.009)***	***(0.308)***	***(2.720)***	***(84.8)***	***(14.1)***	***(23.6)***	***(96.92)***

DRAWBAR PERFORMANCE WITH BIAS PLY TIRES

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr (l/h)	lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Temp. °F (°C) Cooling med	Air wet bulb	Air dry bulb	Barom. inch Hg (kPa)
Maximum Available Power—Two Hours 8th (5L) Gear											
145.43 (108.45)	10258 (45.63)	5.32 (8.56)	2198	6.15	10.164 (38.476)	0.489 (0.297)	14.31 (2.819)	193 (89.2)	52 (11.1)	57 (13.6)	28.61 (96.59)
75% of Pull at Maximum Power—Ten Hours 8th (5L) Gear											
115.86 (86.39)	7833 (34.84)	5.55 (8.93)	2260	4.68	8.332 (31.539)	0.503 (0.306)	13.91 (2.739)	191 (88.4)	53 (11.9)	58 (14.5)	28.63 (96.67)
50% of Pull at Maximum Power—Two Hours 8th (5L) Gear											
80.26 (59.85)	5223 (23.23)	5.76 (9.27)	2313	3.36	6.590 (24.947)	0.574 (0.349)	12.18 (2.399)	191 (88.3)	51 (10.6)	53 (11.7)	28.95 (97.74)
50% of Pull at Reduced Engine Speed—Two Hours 11th (6L) Gear											
80.26 (59.85)	5221 (23.22)	5.77 (9.28)	1495	3.07	5.504 (20.835)	0.480 (0.292)	14.58 (2.873)	191 (88.3)	52 (11.1)	55 (12.5)	28.89 (97.56)
MAXIMUM POWER IN SELECTED GEARS											
115.93 (86.45)	17054 (75.86)	2.55 (4.10)	2262	14.82			3rd (2L) Gear	192 (88.9)	39 (3.9)	42 (5.6)	29.05 (98.10)
138.16 (103.03)	16226 (72.18)	3.19 (5.14)	2200	12.84			4th (3L) Gear	192 (88.9)	41 (5.0)	44 (6.7)	29.05 (98.10)
138.73 (103.45)	15805 (70.30)	3.29 (5.30)	2200	12.09			5th (2H) Gear	191 (88.3)	43 (6.1)	46 (7.8)	29.05 (98.10)
143.93 (107.33)	12503 (55.61)	4.32 (6.95)	2199	8.29			6th (3H) Gear	195 (90.3)	45 (7.2)	48 (8.9)	29.04 (98.06)
143.16 (106.75)	11904 (52.95)	4.51 (7.26)	2199	7.69			7th (4L) Gear	194 (90.0)	47 (8.3)	52 (11.1)	29.04 (98.06)
147.49 (109.98)	10444 (46.46)	5.30 (8.52)	2199	6.62			8th (5L) Gear	195 (90.3)	50 (10.0)	55 (12.8)	29.01 (97.96)
143.44 (106.96)	9065 (40.32)	5.93 (9.55)	2200	5.68			9th (4H) Gear	194 (90.0)	48 (8.9)	53 (11.7)	29.04 (98.06)
145.82 (108.74)	7878 (35.04)	6.94 (11.17)	2200	4.96			10th (5H) Gear	192 (88.9)	48 (8.9)	54 (12.2)	29.03 (98.03)
145.80 (108.73)	6499 (28.91)	8.41 (13.54)	2200	3.74			11th (6L) Gear	192 (88.9)	49 (9.4)	55 (12.8)	29.02 (98.00)

Department of Agricultural Engineering

Dates of Test: April 26 to May 8, 1984

Manufacturer: FORD MOTOR COMPANY, 2500 Maple Road, Troy, Michigan 48084

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 46.0 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60° *(15°/15°)*** 0.8401 **Fuel weight** 6.995 lbs/gal *(0.838 kg/l)* **Oil SAE** 30 **API service classification** SE, SF, CC, CD **To motor** 4.307 gal *(16.304 l)* **Drained from motor** 3.653 gal *(13.829 l)* **Transmission and final drive lubricant** Ford 134 fluid **Total time engine was operated** 45.0 hours.

ENGINE: Make Ford Diesel **Type** six cylinder vertical with turbocharger and air to air intercooler **Serial No.** *M726721* **Crankshaft** lengthwise **Rated rpm** 2200 **Bore and stroke** 4.4" x 4.4" *(112 mm x 112 mm)* **Compression ratio** 15.6 to 1 **Displacement** 401 cu in *(6572 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** two paper elements with aspirator **Oil filter** two full flow cartridges **Oil cooler** engine coolant heat exchanger for crankcase oil, radiator for hydraulic and transmission oil **Fuel filter** one paper element and sediment bowl **Muffler** vertical **Cooling medium temperature control** two thermostats and variable speed fan.

CHASSIS: Type standard with duals **Serial No.** *C713308* **Tread width** rear 64" *(1626 mm)* to 120" *(3048 mm)* front 63" *(1600 mm)* to 87" *(2210 mm)* **Wheel base** 110.5" *(2806 mm)* **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 31.9" *(810 mm)* Vertical distance above roadway 43.6" *(1107 mm)* Horizontal distance from center of rear wheel tread 0.2" *(5 mm)* to the left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio with partial (2) range operator controlled powershift **Advertised speeds mph *(km/h)*** first 1.8 *(2.9)* second 2.4 *(3.8)* third 2.8 *(4.5)* fourth 3.5 *(5.7)* fifth 3.6 *(5.8)* sixth 4.6 *(7.4)* seventh 4.7 *(7.6)* eighth 5.5 *(8.8)* ninth 6.1 *(9.8)* tenth 7.1 *(11.4)* eleventh 8.5 *(13.7)* twelfth 10.7 *(17.2)* thirteenth 10.9 *(17.5)* fourteenth 13.7 *(22.1)* fifteenth 14.3 *(22.9)* sixteenth 18.3 *(29.5)* reverse 2.0 *(3.2)*, 2.5 *(4.1)*, 5.9 *(9.5)*, 7.6 *(12.3)* **Clutch** single dry disc operated by foot pedal **Brakes** power assisted, double wet disc operated hydraulically by two foot pedals which can be locked together **Steering** hydrostatic **Turning radius** (on concrete surface with brake applied) right 159.6" *(4.05 m)* left 159.6" *(4.05 m)* (on concrete surface without brake) right 174" *(4.42 m)* left 174" *(4.42 m)* **Turning space diameter** (on concrete surface with brake applied) right 324" *(8.23 m)* left 324" *(8.23 m)* (on concrete surface without brake) right 360" *(9.14 m)* left 360" *(9.14 m)* **Power take-off** 1000 rpm at 1919 engine rpm.

LUGGING ABILITY IN 8th (5L) GEAR

Crankshaft Speed rpm	2199	1975	1761	1541	1312	1091
Pull—lbs *(kN)*	10444 *(46.46)*	11389 *(51.05)*	12168 *(54.54)*	12035 *(53.94)*	11217 *(50.28)*	9283 *(41.61)*
Increase in Pull %	0	9	17	15	7	–11
Power—Hp *(kW)*	147.49 *(109.98)*	143.70 *(107.16)*	135.67 *(101.17)*	117.50 *(87.62)*	93.87 *(70.00)*	65.53 *(48.86)*
Speed—Mph *(km/h)*	5.30 *(8.52)*	4.73 *(7.61)*	4.18 *(6.73)*	3.66 *(5.89)*	3.14 *(5.05)*	2.65 *(4.26)*
Slip %	6.62	7.23	7.84	7.69	7.23	5.99

TRACTOR SOUND LEVEL WITH CAB	Radial Ply dB(A)	Bias Ply dB(A)
Maximum Available Power—Two Hours	81.5	82.5
75% of Pull at Maximum Power—Ten Hours		81.0
50% of Pull at Maximum Power—Two Hours		81.0
50% of Pull at Reduced Engine Speed—Two Hours		80.0
Bystander in 16th (8H) gear		91.5

DRAWBAR PERFORMANCE WITH RADIAL PLY TIRES

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temp. °F *(°C)* Cool-ing med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 8th (5L) Gear											
151.54 *(113.00)*	10241 *(45.55)*	5.55 *(8.93)*	2200	2.62	10.100 *(38.233)*	0.466 *(0.284)*	15.00 *(2.956)*	195 *(90.3)*	44 *(6.4)*	48 *(8.6)*	29.07 *(98.15)*
MAXIMUM POWER IN SELECTED GEARS											
137.32 *(102.40)*	18615 *(82.80)*	2.77 *(4.45)*	2240	7.11	3rd (2L) Gear			193 *(89.2)*	47 *(8.3)*	50 *(10.0)*	28.95 *(97.76)*
149.31 *(111.34)*	15945 *(70.93)*	3.51 *(5.65)*	2200	4.57	4th (3L) Gear			191 *(88.3)*	47 *(8.3)*	50 *(10.0)*	28.96 *(97.79)*
149.03 *(111.13)*	15535 *(69.10)*	3.60 *(5.79)*	2199	4.49	5th (2H) Gear			192 *(88.6)*	47 *(8.3)*	50 *(10.0)*	28.97 *(97.83)*
149.64 *(111.59)*	12237 *(54.43)*	4.59 *(7.38)*	2200	3.25	6th (3H) Gear			194 *(90.0)*	46 *(7.8)*	49 *(9.4)*	28.98 *(97.86)*
152.09 *(113.41)*	11970 *(53.24)*	4.76 *(7.67)*	2200	3.17	7th (4L) Gear			194 *(89.7)*	46 *(7.8)*	49 *(9.4)*	28.99 *(97.89)*
154.40 *(115.14)*	10443 *(46.45)*	5.54 *(8.92)*	2199	2.66	8th (5L) Gear			196 *(90.8)*	46 *(7.8)*	48 *(8.9)*	29.00 *(97.93)*
151.06 *(112.65)*	9182 *(40.84)*	6.17 *(9.93)*	2199	2.40	9th (4H) Gear			194 *(89.7)*	46 *(7.8)*	49 *(9.4)*	29.00 *(97.93)*
150.52 *(112.24)*	7867 *(34.99)*	7.18 *(11.55)*	2200	1.98	10th (5H) Gear			192 *(88.6)*	46 *(7.8)*	48 *(8.9)*	29.00 *(97.93)*
151.41 *(112.91)*	6566 *(29.21)*	8.65 *(13.92)*	2199	1.80	11th (6L) Gear			194 *(89.7)*	45 *(7.2)*	48 *(8.9)*	29.00 *(97.93)*

TIRES, BALLAST AND WEIGHT		Bias Ply Tires: With Ballast	Bias Ply Tires: Without Ballast	Radial Ply Tires: With Ballast	Radial Ply Tires: Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Four 20.8-38; 10; 16 *(110)*	Four 20.8-38; 10; 16 *(110)*	Four 20.8R38; 10; 16 *(110)*	Four 20.8R38; 10; 16 *(110)*
Ballast	—Liquid (each inner)	1415 lb *(642 kg)*	None	1305 lb *(592 kg)*	None
	—Cast Iron (each inner)	570 lb *(259 kg)*	None	600 lb *(272 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 14L-16.1SL; 8; 36 *(250)*	Two 14L-16.1SL; 8; 36 *(250)*	Two 14L-16.1SL; 8; 36 *(250)*	Two 14L-16.1SL; 8; 36 *(250)*
Ballast	—Liquid (each)	None	None	None	None
	—Cast Iron (each)	60 lb *(27 kg)*	None	65 lb *(29 kg)*	None
Height of Drawbar		24.5 in *(620 mm)*	24.5 in *(620 mm)*	22.5 in *(570 mm)*	22.5 in *(570 mm)*
Static Weight with Operator—Rear		15540 lb *(7049 kg)*	11570 lb *(5248 kg)*	15540 lb *(7049 kg)*	11730 lb *(5321 kg)*
—Front		4730 lb *(2145 kg)*	4610 lb *(2091 kg)*	4740 lb *(2150 kg)*	4610 lb *(2091 kg)*
—Total		20270 lb *(9194 kg)*	16180 lb *(7339 kg)*	20280 lb *(9199 kg)*	16340 lb *(7412 kg)*

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test codes and the technically equivalent ISO test codes or official Nebraska test procedure. For the maximum power tests, the fuel temperature at the injection pump was maintained at 174°F *(78.9°C)*. Nine gears were chosen between stability limit and 10 mph *(16.1 km/h)*.

We, the undersigned, certify that this is a true and correct report of official Tractor Test **1517,** July 12, 1984.

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD
Board of Tractor Test Engineers

Ford TW-35 Diesel

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