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## Test 1673: John Deere 8970 Powersync Diesel 12 and 24 Speed

Nebraska Tractor Test Lab

University of Nebraska-Lincoln, [tractortestlab@unl.edu](mailto:tractortestlab@unl.edu)

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# NEBRASKA OECD TRACTOR TEST 1673—SUMMARY 141

## JOHN DEERE 8970 POWRSYNC DIESEL

### 24 SPEED ALSO 12 SPEED

**Location of Test:** Tractor Testing Laboratory,  
University of Nebraska, Lincoln, Nebraska 68583-0832

**Dates of Test:** October 26 to December 1, 1993

**Manufacturer:** John Deere Tractor Works, P.O.  
Box 270, Waterloo, Iowa 50704

#### POWER TAKE-OFF PERFORMANCE

Power HP (kW)	Crank shaft speed rpm	Gal./hr (l/h)	lb./hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Mean Atmospheric Conditions
<b>MAXIMUM POWER AND FUEL CONSUMPTION</b>					
<b>Rated Engine Speed—(PTO speed—1109 rpm)</b>					
354.45 (264.31)	2100	20.73 (78.46)	0.409 (0.249)	17.10 (3.37)	
<b>Maximum Power (2 Hours)</b>					
393.39 (293.35)	1900	21.53 (81.52)	0.383 (0.233)	18.27 (3.60)	
<b>Standard Power Take-off Speed (1003 rpm)</b>					
393.39 (293.35)	1900	21.53 (81.52)	0.383 (0.233)	18.27 (3.60)	

#### VARYING POWER AND FUEL CONSUMPTION

354.45 (264.31)	2100	20.73 (78.46)	0.409 (0.249)	17.10 (3.37)	Air temperature
305.58 (227.87)	2130	18.19 (68.85)	0.416 (0.253)	16.80 (3.31)	
231.90 (172.93)	2157	14.97 (56.67)	0.451 (0.275)	15.49 (3.05)	Relative humidity
157.81 (117.68)	2189	11.24 (42.54)	0.498 (0.303)	14.04 (2.77)	
79.67 (59.41)	2233	7.81 (29.55)	0.685 (0.417)	10.21 (2.01)	Barometer
1.70 (1.27)	2253	4.50 (17.05)	18.552 (11.285)	0.38 (0.07)	

Maximum Torque 1302 lb.-ft. (1766 Nm) at 1400 rpm

Maximum Torque Rise 46.8%

Torque rise at 1000 engine rpm 30%

#### DRAWBAR PERFORMANCE

##### FUEL CONSUMPTION CHARACTERISTICS

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption lb./hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Temp. °F (°C)	Air cool- ing med	Barom. inch Hg (kPa)
<b>Maximum Power—12th (C3) Gear</b>									
313.92 (234.09)	18697 (83.17)	6.30 (10.13)	2101	2.60	0.447 (0.272)	15.65 (3.08)	181 (83)	50 (10)	28.83 (97.63)
<b>75% of Pull at Maximum Power—12th (C3) Gear</b>									
242.78 (181.04)	14032 (62.42)	6.49 (10.44)	2151	1.96	0.477 (0.290)	14.66 (2.89)	NA NA	56 (13)	28.74 (97.32)
<b>50% of Pull at Maximum Power—12th (C3) Gear</b>									
165.51 (123.42)	9361 (41.64)	6.63 (10.67)	2187	1.41	0.546 (0.332)	12.82 (2.52)	NA NA	56 (13)	28.74 (97.32)
<b>75% of Pull at Reduced Engine Speed—16th (C5) Gear</b>									
242.34 (180.71)	14034 (62.43)	6.48 (10.42)	1569	1.87	0.418 (0.254)	16.75 (3.30)	NA NA	56 (13)	28.74 (97.32)
<b>50% of Pull at Reduced Engine Speed—16th (C5) Gear</b>									
165.46 (123.39)	9382 (41.73)	6.61 (10.64)	1594	1.50	0.453 (0.276)	15.41 (3.04)	NA NA	56 (13)	28.74 (97.32)

**FUEL OIL and TIME:** Fuel No. 2 Diesel Cetane No. 53.9 Specific gravity converted to 60°/60° F (15°/15°C) 0.8400 Fuel weight 6.994 lbs/gal (0.838 kg/l) Oil SAE 15W-40 API service classification SG/CET motor 7.848 gal (29.709 l) Drained from motor 7.169 gal (27.137 l) Transmission and hydraulic lubricant and final drive lubricant John Deere Hy-Gard fluid Total time engine was operated 55.0 hours.

**ENGINE:** Make Cummins Diesel Type six cylinder vertical with turbocharger and intercooler Serial No. \*30339839\* Crankshaft lengthwise Rated engine speed 2100 Bore and stroke (as specified) 5.50" × 6.00" (139.7 mm × 152.4 mm) Compression ratio 14.0 to 1 Displacement 855 cu in (14011 ml) Starting system 12 volt Lubrication pressure Air cleaner two paper elements and aspirator Oil filter one full flow cartridge Oil cooler engine coolant heat exchanger for crankcase oil, radiator for hydraulic and transmission oil Fuel filter one paper cartridge Muffler vertical Cooling medium temperature control one thermostat and variable speed fan

**ENGINE OPERATING PARAMETERS:** Fuel rate: 142.4-150.8 lb/h (64.6-68.4 kg/h) High idle: 2210-2310 rpm Turbo boost nominal 21.1-26.0 psi (145-179 kPa) as measured 20.5 psi (141 kPa)

**CHASSIS:** Type four wheel drive with duals Serial No. \*RW8970H001193\* Tread width rear 68.4" (1738 mm) to 143.9" (3655 mm) front 68.4" (1738 mm) to 143.9" (3655 mm) Wheel base 133.9" (3400 mm) Hydraulic control system direct engine drive Transmission selective gear fixed ratio with partial (2) range operator controlled powershift Nominal travel speeds mph (km/h) first 2.09 (3.36) second 2.50 (4.03) third 2.69 (4.33) fourth 3.23 (5.19) fifth 3.68 (5.92) sixth 4.41 (7.10) seventh 4.45 (7.16) eighth 4.90 (7.90) ninth 5.34 (8.59) tenth 5.73 (9.22) eleventh 5.88 (9.47) twelfth 6.32 (10.17) thirteenth 6.87 (11.06) fourteenth 7.57 (12.19) fifteenth 7.84 (12.62) sixteenth 8.65 (13.92) seventeenth 9.40 (15.13) eighteenth 10.37 (16.69) nineteenth 10.46 (16.83) twentieth 12.54 (20.18) twenty-first 13.47 (21.67) twenty-second 16.15 (25.99) twenty-third 18.43 (29.66) twenty-fourth 22.10 (35.56) reverse 2.50 (4.03), 3.00 (4.83), 5.34 (8.59), 5.88 (9.47), 6.40 (10.30), 7.06 (11.36) Clutch multiple wet disc hydraulically actuated by foot pedal Brakes wet multiple disc hydraulically actuated by foot pedal Steering hydrostatic and articulated Power take-off 1000 rpm at 1895 engine rpm Unladen tractor mass 33655 lb (15266 kg)

## DRAWBAR PERFORMANCE AT 2100 RPM MAXIMUM POWER IN SELECTED GEARS

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Temp. °F (°C) cool- ing med	Air dry bulb	Barom. inch Hg (kPa)
4th (A4) Gear									
280.03 (208.82)	34302 (152.58)	3.06 (4.93)	2146	9.08	0.494 (0.300)	14.17 (2.79)	182 (83)	42 (6)	29.02 (98.27)
5th (A5) Gear									
302.46 (225.54)	31971 (142.21)	3.55 (5.71)	2101	5.66	0.466 (0.283)	15.02 (2.96)	182 (83)	43 (6)	29.02 (98.27)
6th (A6) Gear									
307.79 (229.52)	26591 (118.28)	4.34 (6.99)	2099	3.67	0.460 (0.280)	15.20 (2.99)	182 (83)	45 (7)	29.02 (98.27)
7th (B1) Gear									
312.24 (232.84)	26732 (118.91)	4.38 (7.05)	2100	3.67	0.456 (0.278)	15.33 (3.02)	182 (83)	47 (8)	29.02 (98.27)
8th (C1) Gear									
311.83 (232.53)	24118 (107.28)	4.85 (7.80)	2099	3.31	0.453 (0.276)	15.43 (3.04)	181 (83)	47 (8)	28.87 (97.77)
9th (B2) Gear									
307.93 (229.62)	21815 (97.04)	5.29 (8.52)	2100	2.96	0.456 (0.277)	15.35 (3.02)	181 (83)	46 (8)	28.88 (97.80)
10th (B3) Gear									
313.57 (233.83)	20650 (91.85)	5.69 (9.16)	2100	2.87	0.450 (0.274)	15.55 (3.06)	182 (83)	48 (9)	28.86 (97.73)
11th (C2) Gear									
310.24 (231.35)	19891 (88.48)	5.85 (9.41)	2100	2.69	0.452 (0.275)	15.48 (3.05)	180 (82)	49 (9)	28.85 (97.70)
12th (C3) Gear									
313.92 (234.09)	18697 (83.17)	6.30 (10.13)	2101	2.60	0.447 (0.272)	15.65 (3.08)	181 (83)	50 (10)	28.83 (97.63)
13th (B4) Gear									
310.64 (231.65)	16990 (75.57)	6.86 (11.03)	2099	2.33	0.453 (0.276)	15.43 (3.04)	178 (81)	51 (11)	28.81 (97.56)
14th (C4) Gear									
310.11 (231.25)	15346 (68.26)	7.58 (12.20)	2099	2.05	0.453 (0.275)	15.44 (3.04)	178 (81)	52 (11)	28.79 (97.49)
15th (B5) Gear									
311.42 (232.23)	14867 (66.13)	7.86 (12.64)	2100	1.96	0.455 (0.277)	15.36 (3.02)	181 (83)	53 (12)	28.77 (97.43)
16th (C5) Gear									
312.11 (232.74)	13501 (60.06)	8.67 (13.95)	2099	1.87	0.455 (0.277)	15.38 (3.03)	180 (82)	54 (12)	28.76 (97.39)

### LUGGING ABILITY IN 12th (C3) Gear

Crankshaft Speed rpm	2101	1887	1680	1469	1265	1064
Pull—lbs (kN)	18697 (83.17)	23128 (102.88)	24773 (110.20)	27020 (120.19)	26856 (119.46)	25501 (113.43)
Increase in Pull %	0	24	32	45	44	36
Power—Hp (kW)	313.92 (234.10)	346.19 (258.15)	328.95 (245.30)	312.10 (232.73)	266.93 (199.05)	213.90 (159.50)
Speed—Mph (km/h)	6.30 (10.13)	5.61 (9.03)	4.98 (8.01)	4.33 (6.97)	3.73 (6.00)	3.15 (5.06)
Slip %	2.60	3.23	3.58	3.93	3.93	3.76

### TRACTOR SOUND LEVEL WITH CAB

	dB(A)
At 75% load in 8th (C1) Gear	74.0
Bystander in 24th (D6) Gear	84.5

**REPAIRS AND ADJUSTMENTS:** No repairs or adjustments

**NOTE:** This tractor is equipped with an electronic control that limits the engine power to 400 Hp (298 kW) when the following operating conditions are met: travel speed less than 4.1 mph (6.6 km/h) and high drawbar loads over a time period of more than 30 seconds.

**REMARKS:** All test results were determined from observed data obtained in accordance with official OECD, SAE and Nebraska test procedures. For the maximum power tests, the fuel temperature at the injection pump inlet was maintained at 120° F (49°C). The pull in 4th (A4) gear was limited to avoid tractor bouncing. The performance results on this summary were taken from OECD tests conducted under the Code II Restricted Standard Test Code procedure.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. **1673**, Summary 141, Jan. 5, 1994.

LOUIS I. LEVITICUS

Engineer-in-Charge

L.L. BASHFORD

R.D. GRISSO

K. VON BARGEN

Board of Tractor Test Engineers

## DRAWBAR PERFORMANCE AT 1900 RPM

### MAXIMUM POWER IN SELECTED GEARS

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Temp.°F (°C) cool- ing med	Air dry bulb	Barom. inch Hg (kPa)
4th (A4) Gear									
278.87 (207.95)	34226 (152.24)	3.06 (4.92)	2145	9.32	0.501 (0.305)	13.96 (2.75)	182 (83)	42 (6)	29.02 (98.27)
5th (A5) Gear									
298.71 (222.75)	32698 (145.45)	3.43 (5.51)	2050	6.75	0.471 (0.287)	14.85 (2.92)	182 (83)	43 (6)	29.02 (98.27)
6th (A6) Gear									
303.81 (226.55)	29192 (129.85)	3.90 (6.28)	1903	4.46	0.444 (0.270)	15.74 (3.10)	183 (84)	44 (7)	29.02 (98.27)
7th (B1) Gear									
306.21 (228.34)	29219 (129.97)	3.93 (6.32)	1901	4.54	0.440 (0.268)	15.88 (3.13)	182 (83)	46 (8)	29.02 (98.27)
8th (C1) Gear									
340.74 (254.09)	29556 (131.47)	4.32 (6.96)	1896	4.54	0.432 (0.263)	16.19 (3.19)	179 (82)	47 (8)	28.87 (97.77)
9th (B2) Gear									
339.84 (253.42)	26861 (119.48)	4.74 (7.64)	1900	3.93	0.435 (0.265)	16.08 (3.17)	NA NA	46 (8)	28.88 (97.80)
10th (B3) Gear									
344.73 (257.06)	25345 (112.74)	5.10 (8.21)	1898	3.67	0.427 (0.259)	16.40 (3.23)	182 (83)	48 (9)	28.86 (97.73)
11th (C2) Gear									
340.35 (253.80)	24303 (108.11)	5.25 (8.45)	1900	3.49	0.432 (0.263)	16.20 (3.19)	180 (82)	49 (9)	28.84 (97.66)
12th (C3) Gear									
348.12 (259.59)	23120 (102.84)	5.65 (9.09)	1899	3.31	0.425 (0.258)	16.46 (3.24)	NA NA	56 (13)	28.74 (97.33)
13th (B4) Gear									
343.42 (256.08)	20878 (92.87)	6.17 (9.93)	1899	2.87	0.426 (0.259)	16.43 (3.24)	180 (82)	51 (11)	28.80 (97.53)
14th (C4) Gear									
343.77 (256.35)	18928 (84.20)	6.81 (10.96)	1897	2.69	0.429 (0.261)	16.31 (3.21)	179 (82)	52 (11)	28.78 (97.46)
15th (B5) Gear									
347.59 (259.20)	18411 (81.89)	7.08 (11.39)	1902	2.51	0.428 (0.260)	16.34 (3.22)	180 (82)	53 (12)	28.77 (97.43)
16th (C5) Gear									
346.14 (258.12)	16703 (74.30)	7.77 (12.51)	1890	2.33	0.426 (0.259)	16.43 (3.24)	180 (82)	54 (12)	28.75 (97.36)
17th (B6) Gear									
342.86 (255.67)	15114 (67.23)	8.51 (13.69)	1898	2.14	0.428 (0.261)	16.33 (3.22)	184 (84)	55 (13)	28.74 (97.33)

#### TIRES, BALLAST AND WEIGHT

**Rear Tires** —No., size, ply & psi (kPa)

**Front Tires** —No., size, ply & psi (kPa)

#### Height of Drawbar

**Static Weight with Operator**—Rear  
—Front  
—Total

#### Tested Without Ballast

Four 20.8R42; \*\*, 13 (90)

Four 20.8R42; \*\*, 13 (90)

21.0 in (535 mm)

13360 lb (6060 kg)

20460 lb (9280 kg)

33820 lb (15340 kg)

### THREE POINT HITCH PERFORMANCE (OECD Static Test)

CATEGORY: Three point lift system not available

Quick Attach: None

Maximum Force Exerted Through Whole Range: — — —

- |   |          |             |
|---|----------|-------------|
| i) Opening pressure of relief valve:        | NA       |             |
| Sustained pressure with pump stalled:       | 2530 psi | (174 bar)   |
| ii) Pump delivery rate at minimum pressure: | 44.5 GPM | (168 l/min) |
| iii) Pump delivery rate at maximum          |          |             |
| hydraulic power:                            | 42.8 GPM | (162 l/min) |
| Delivery pressure:                          | 1840 psi | (127 bar)   |
| Power:                                      | 45.9 HP  | (34.2 kW)   |



**JOHN DEERE 8970 POWRSYNC DIESEL**

**Agricultural Research Division  
Institute of Agriculture and Natural Resources  
University of Nebraska-Lincoln  
Darrell Nelson, Dean and Director**