University of Nebraska - Lincoln Digital Commons@University of Nebraska - Lincoln

Nebraska Tractor Tests

Tractor Test and Power Museum, The Lester F. Larsen

1-1-1969

Test 1014: John Deere 4520 Power Shift

Follow this and additional works at: http://digitalcommons.unl.edu/tractormuseumlit



Part of the Applied Mechanics Commons

"Test 1014: John Deere 4520 Power Shift" (1969). Nebraska Tractor Tests. Paper 430. http://digitalcommons.unl.edu/tractormuseumlit/430

This Article is brought to you for free and open access by the Tractor Test and Power Museum, The Lester F. Larsen at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Nebraska Tractor Tests by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

NEBRASKA TRACTOR TEST 1014 - JOHN DEERE 4520 POWER SHIFT DIESEL

POWER TAKE-OFF PERFORMANCE

		Crank-	Fuel C	onsumpt	ion			Tempe	rature I	Degrees	F	
	Нр	shaft speed rpm	Gal per hr	I.l pe hp-	г	Hp-h per gal	Co	oolin g ediu m	Air wet bulb	Ai: dry bul	y	Barometer inches of Mercury
		MAX	IMUM	POWE	R AN	ND FU	JEL (CONS	UMPT	TION		
				ted Eng		•						
1	22.36 	2200	8.113	0.4.		15.08		184	65		75	28.775
	15 44		ard Pow	er Tak								00 755
	15.44	1905	7.381			15.64		187	66		75	28.775
	VAR	YING P	OWER	AND 1	FUEI	CON	ISUM	PTIC	N-T	WO F	IOU	RS
l	06.97	2264	7.372	0.4	76	14.5		182	67		76	
0.00		2418	2.640					183	66	75		
55.19		2336	4.993	0.63				167	66	75		
	24.03	2200	8.210	0.457				187	66	76		
	28.12	2368	3.847	0.9	100	7.3		165	66			
	81.48 65.97	2295 2313	6.182 5.541	0.53		13.18		169 176	66 66		75 75	28.778
AV (00.97	2010							_			40.770
			DRA	WBA	R P	ERF	ORN	MAN	CE			
	Draw	- Speed	Crank-	Slip	Tuel C	onsum	otion		Temp	Degre	ecs l	Barom.
Ηр	bar	miles	shaft	of	Gal			Hp∙hr	Cool-	Air	Air	eter
	pull lbs	per hr	speed rp m	drivers %	per h r	hp		per gal	ing med	wet bulb	dry bult	
VAR	YING I	DRAWB	AR PO	VER A	ND I	FUEL	CON	SUMI	PTION	WIT	гн і	BALLAST
		Max	imum A	vailabl	le P o	wer-7	wo I	Iours-	-4th G	ear		
107.7	6 8427	4.80	2202	6.62	8.04	2 0.8	516	13.40	191	61	77	28.820
		75% of	Pull at	Maxin	num :	Power	-Ten	Hou.	rs—4th	Gear		
89.3	6 6673	5.02	2269	5.09	7.10	4 0.5	49	12.58	183	66	83	28.782
		50% of	Pull at	Maxim	num J	Power-	-Two	Hou	rs-4th	Gear		
60.5	1 4342	5.23	2322	3.43	5.73	7 0.6	555	10.55	175	63	78	28.943
			MAXIN	IUM P	OWE	R W	ITH	BALL	AST			
82.33			2290	14.71	2nd	Gear			178	67	80	28.770
109.5	1 11587	3.54	2200	10.18	3rd	Gear			190	66	82	28.770
111.4	1 8714	4.79	2203	6.54	4th	Gear			198	61	77	28.820
09.74	4 6490		2201	5.05	5th	Gear			193	69	86	28.770
108.52			2206	3.84	6mh	Gear			186	68	84	28.770
08.16	3730	10.87	2201	2.93	7th	Gear			180	69	90	28.770
		N	IAXIM	UM PU	LL I	WITH	OUT	BAL	LAST			
90.22	9761	3.47	2281	14.95	3rd	Gear			189	63	72	28.560
VAR	YING I	RAWBA	R PUL	L AND	TRA	AVEL	SPEE	ED W	тн в	ALLA	ST-	4th Gear
Poun	ds Pull		-	8714	93	95	10079	9 1	0001	96	89	9135
Horsepower				111.41		62	100.09	9 8	87.58	73.	11	57.66
Crankshaft speed rpm 2203					78	1755		1535	13	18	1098	
Miles per hour				4.79		26	3.72		3.28	2.	83	2.37
Slip (of drive	rs, %		6.54	7.	68	8.28	3	8.13	7.	83	7.53
TIRI	ES, BAI	LAST a	nd WE	IGHT		V	Vith 1	Ballas	t	Wi	thou	t Ballast
	,										****	· Duxiust

TIRES, BALLAST	and WEIGHT	With Ballast	Without Ballast			
Rear tires Ballast	—No, size, ply & psi —Liquid Cast iron	Two 20.8-38; 10; 20 1360 lb each 528 lb each	Two 20.8-38; 10; 14 None None			
Front tires Ballast	No, size, ply & psiLiquidCast iron	Two 10.00-16; 6; 28 None 23 lb each	Two 10.00-16; 6; 28 None None			
Height of drawb	ar	23 inches	231/2 inches			
Static weight wit	h operator–Rear Front Total	13760 lb 4235 lb 17995 lb	9985 lb 4190 lb 14175 lb			

Department of Agricultural Engineering

Date of Test: June 3 to June 10, 1969

Manufacturer: JOHN DEERE WATERLOO TRACTOR WORKS, WATERLOO, IOWA

FUEL, OIL and TIME Fuel No 2 Diesel Cetane No 52.2 (rating taken from oil company's typical inspection data) Specific gracity converted to 60°/60° 0.8299 Weight per gallon 6.910 lb Oil SAE 30 API service classification MS-DS To motor 3.646 gal Drained from motor 3.055 gal Transmission and final-drive lubricant John Deere special 303 oil Total time engine was operated 45½ hours.

ENGINE Make John Deere diesel Type 6 cylinder vertical with turbo-charger Serial No M25R0235976R Crankshaft mounted lengthwise Rated rpm 2200 Bore and stroke 4½" x 43½" Compression ratio 15.7 to 1 Displacement 404 cu in Cranking system 12 volt electric (two 6 volt batteries) Lubrication pressure Air cleaner precleaner and 2 dry type in parallel with replaceable treated paper elements Oil filter full flow replaceable paper cartridge Oil cooler engine coolant heat exchanger for crankcase oil and radiator for transmission and hydraulic system Fuel filter sediment bowl and screen and replaceable paper primary and secondary filter elements Muffler was used Cooling medium temperature control thermostat.

CHASSIS Type standard Serial No T813-P006692R Tread width rear 70" to 100" front 56" to 84.8" Wheel base 106.5" 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 33.02" Vertical distance above roadway 39.36" Horizontal distance from center of rear wheel tread 0.11" to the left Hydraulic control system direct engine drive Transmission selective gear fixed ratio with operator controlled full range power shifting Advertised speeds mph first 1.72 second 2.46 third 3.83 fourth 4.99 fifth 6.50 sixth 8.45 seventh 10.92 eighth 18.47 reverse 2.11 and 3.02 Clutch multiple disc wet clutches within transmission hydraulically operated Brakes wet disc hydraulically power actuated and operated by two foot pedals which can be locked together Steering hydrostatic power Turning radius (on concrete surface with brake applied) right 151" left 151" (on concrete surface without brake) right 171" left 171" Turning space diameter (on concrete surface with brake applied) right 302" left 302" (on concrete surface without brake) right 342" left 342" Power take-off 998 rpm at 1900 engine rpm.

REPAIRS and **ADJUSTMENTS**: No repairs or adjustments.

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 to avoid excessive wheel slippage. Eighth gear was not run as it exceeded 15 miles per hour.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 1014.

L. F. LARSEN

Engineer-In-Charge

G. W. STEINBRUEGGE, Chairman W. E. SPLINTER 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 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.



JOHN DEERE 4520 POWER SHIFT DIESEL