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Test 821: Kramer KL- 400 (Diesel)

Nebraska Tractor Test Lab

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NEBRASKA TRACTOR TEST 821 - KRAMER KL 400 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								
32.66	2300	2.420	0.514	13.50	Air cooled	67	75	28.840
Standard Power Take-off Speed (540 rpm)—One Hour								
31.11	2122	2.258	0.503	13.78	Air cooled	69	78	28.850
VARYING POWER AND FUEL CONUMPTION—TWO HOURS								
28.93	2395	2.115	0.507	13.68	Air cooled	70	80	.....
0.00	2470	0.805	.....	.....	Air cooled	69	79	.....
14.70	2437	1.406	0.663	10.46	Air cooled	70	80	.....
32.85	2300	2.448	0.517	13.42	Air cooled	70	81	.....
7.40	2454	1.073	1.005	6.90	Air cooled	70	81	.....
21.89	2418	1.726	0.547	12.68	Air cooled	70	81	.....
Av 17.63	2412	1.596	0.628	11.05	Air cooled	70	80	28.850

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	Cooling med	Air wet bulb	Air dry bulb	
VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours—7th Gear											
27.35	2247	4.56	2296	6.14	2.359	0.598	11.59	Air cooled	67	79	28.955
75% of Pull at Maximum Power—Ten Hours—7th Gear											
22.57	1748	4.84	2401	4.78	1.980	0.608	11.40	Air cooled	64	74	29.002
50% of Pull at Maximum Power—Two Hours—7th Gear											
15.57	1180	4.95	2423	3.55	1.586	0.706	9.82	Air cooled	66	73	28.938
MAXIMUM POWER WITH BALLAST											
20.23	4182	1.81	2397	14.89	3rd Gear	.....	Air cooled	69	82	28.920	
26.83	4021	2.50	2300	12.59	4th Gear	.....	Air cooled	69	77	28.825	
27.34	3665	2.80	2298	10.74	5th Gear	.....	Air cooled	69	77	28.825	
28.36	2598	4.09	2305	6.99	6th Gear	.....	Air cooled	69	77	28.825	
28.36	2326	4.57	2299	6.14	7th Gear	.....	Air cooled	69	77	28.825	
28.02	1609	6.53	2298	4.05	8th Gear	.....	Air cooled	69	77	28.825	
28.55	1288	8.31	2300	3.83	9th Gear	.....	Air cooled	69	77	28.825	
27.56	873	11.84	2298	2.05	10th Gear	.....	Air cooled	69	77	28.825	
MAXIMUM POWER WITHOUT BALLAST											
27.76	2292	4.54	2301	6.79	7th Gear	.....	Air cooled	62	75	28.990	
VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—7th Gear											
Pounds pull		2326	2331	2463	2545	2541	2516	2312			
Horsepower		28.36	25.59	24.05	21.39	18.31	15.08	11.09			
Miles per hour		4.57	4.12	3.66	3.15	2.70	2.25	1.80			
Slip of drivers, %		6.14	6.25	6.78	7.10	6.88	7.20	6.78			

TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 12.4-28; 6; 12	Two 12.4-28; 6; 12
Ballast	—Liquid	350 lb each	None
	—Cast iron	None	None
Front tires	—No, size, ply & psi	Two 6.00-16; 4; 28	Two 6.00-16; 4; 28
Ballast	—Liquid	45 lb each	None
	—Cast iron	None	None
Height of drawbar		20 inches	20 inches
Static weight	—Rear	3420 lb	2720 lb
	—Front	1425 lb	1330 lb
Total weight with operator		5020 lb	4225 lb

Department of Agricultural Engineering

Dates of Test: June 5 to June 14, 1962

Manufacturer: KRAMER-WERKE, UBERLIN-

GEN BODENSEE, WEST GERMANY

Manufacturer's Power Rating: 32 Maximum observed PTO Hp

FUEL, OIL and TIME Fuel No 2 diesel Cetane No 53.2 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.8328 Weight per gallon 6.935 lb Oil SAE 30 API service classification DS To motor 2.042 gal Drained from motor 1.374 gal Transmission and final-drive lubricant SAE 90 Gear lube Total time engine was operated 47 hours.

ENGINE Make Deutz diesel Type 3 cylinder air cooled Serial No F3L712 Crankshaft mounted lengthwise Rated rpm 2300 Bore and stroke 3.74" x 4.72" Compression ratio 17.8 to 1 Displacement 155.5 cu in Cranking system 12 volt electric Lubrication pressure Air cleaner oil washed wire mesh Oil filter one replaceable paper element and auto edge type Oil cooler in air intake for crankcase oil Fuel filter one replaceable paper element and sediment bowl Muffler was used Cooling medium temperature control air cooled.

CHASSIS Type standard Serial No U73069 Tread width rear 54½" to 75" front 53¾" to 84½" Wheel base 77" 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 27" Vertical distance above roadway 29.5" Horizontal distance from center of rear wheel tread 0" to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio Advertised speeds mph first 0.9 second 1.3 third 2.1 fourth 2.9 fifth 3.1 sixth 4.4 seventh 4.9 eighth 6.8 ninth 8.6 tenth 12.1 reverse 2.7 and 3.8 Clutch single disc dry type operated by foot pedal Brakes internal expanding shoe Steering no power assistance Turning radius (on concrete surface with brake applied) right 107.8" left 106.2" (on concrete surface without brake) right 210.6" left 200.7" Turning space diameter (on concrete surface with brake applied) right 222.5" left 219.4" (on concrete surface without brake) right 428" left 408" Belt pulley 1410 rpm at 2300 engine rpm diam 7.9" face 4.75" Belt speed 2913 fpm Power take-off 540 rpm at 2122 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 and second gears were not run as it was necessary to limit the pull in third gear to avoid excessive wheel slippage.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 821.

L. F. LARSEN
Engineer-in-Charge

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

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-

mission, 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.



Kramer KL 400 Diesel