

TRACTOR POWER

FOR
POWER-TAKE-OFF
DRIVEN PUMPS

Cooperative Extension Service
MICHIGAN STATE UNIVERSITY
East Lansing

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Tractor Power for Power-Take-Off Driven Pumps

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The introduction of the power-take-off driven irrigation pump has made it necessary for farm equipment and irrigation equipment dealers to have at their disposal information on the amount of dependable power that can be supplied by the farm tractor. It is generally recognized that 85 percent of the maximum belt horsepower output is a reasonable loading for continuous belt duty.

Irrigation pumping powered through the PTO shaft, however, represents a more constant type of loading. This load requires a continuous, heavy-duty power output from the tractor for a period from several hours to many days. This constant power demand makes it desirable to recommend that the design power requirements of the pump for a particular irrigation system not exceed 75 percent of the available maximum belt horsepower output.

This maximum of 75 percent would apply only where the tractor engine is in good mechanical condition. A lower percentage should be used for older tractors, possibly dropping to 50 percent or lower for tractor motors in only fair mechanical condition.

While the data in Table 1 deal specifically with tractor power available for operation of PTO driven irrigation pumps, it will be reasonably applicable to PTO driven hammer mills and other stationary PTO driven equipment.

SPEED INCREASERS

The American Society of Agricultural Engineers and the Society of Automotive Engineers have standardized specifications for power-take-off shaft revolution per minute (rpm) and location. The standardized power-take-off speed is 540 ± 10 rpm. Irrigation pumps commonly operate at three to four times this speed, making it necessary for the pump manufacturer to supply some type of speed increaser

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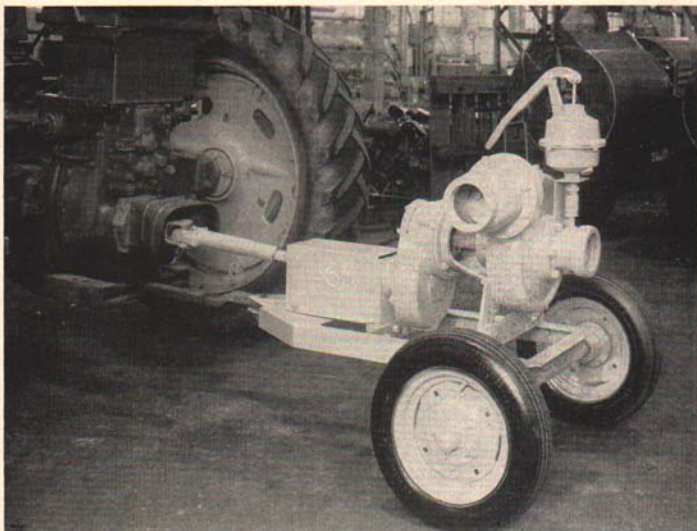


Fig. 1. Trailer mounted PTO driven pump with spur gear type speed increaser.



Fig. 2. Trailer mounted PTO driven pump with bevel gear type speed increaser.

between the tractor PTO shaft and the pump impeller shaft. The pump and speed increaser are commonly mounted either on a two-wheel trailer unit hitched to the tractor drawbar (Fig. 1), or directly on the tractor (Fig. 3). The desired increase in speed is usually obtained through the use of spur gears, bevel gears or V-belts.

The speed increaser in Fig. 1 is the spur gear type. The impeller shaft of the pump should be approximately parallel to the PTO shaft, with spur gears providing the desired increase in rpm.

The unit shown in Fig. 2 is the bevel gear type. The pump impeller shaft is approximately at right angles to the PTO shaft, with bevel gears providing the change of direction and increase in rpm.

The third type employs V-belts and sheaves alone or in combination with gears to obtain the required pump speed.

In some instances, the pump may be attached directly to the tractor, using V-belts or the PTO shaft and gears for the power transfer (Fig. 3).

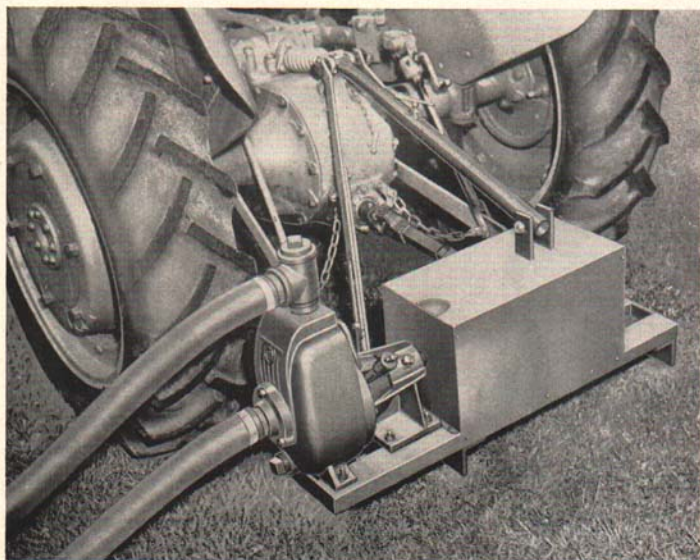


Fig. 3. Drawbar mounted PTO driven pump with bevel gear type speed increaser.

PTO SHAFT ALIGNMENT

Most tractor manufacturers adhere rather closely to ASAE and SAE standards for locating the power-take-off shaft outlet and drawbar on their tractors. It is the responsibility of the pump manufacturer to provide a trailer hitch and power-take-off shaft that will safely and adequately connect the pump to the tractor.

Reasonable care should be exercised to be sure that the power-take-off shaft is properly aligned. To eliminate as nearly as possible the variable speed of rotation and the resulting vibration, shock, and universal joint wear, the universal joint-yokes on the telescoping portion of the PTO shaft should be in the same plane. Correct alignment is shown in Fig. 4a; incorrect alignment in Fig. 4b.

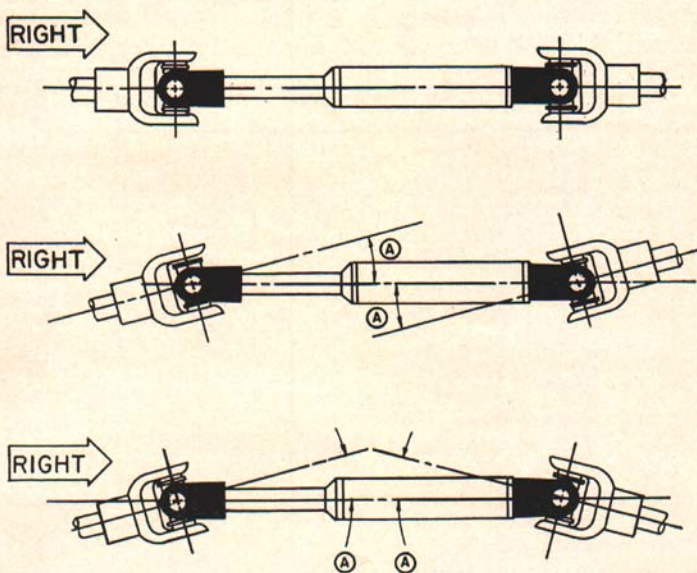


Fig. 4a. Correct PTO shaft alignment.

TRACTOR POWER AVAILABLE THROUGH THE PTO SHAFT

The designer of PTO-operated irrigation systems has the problem of determining the size of pump which will match the power of a

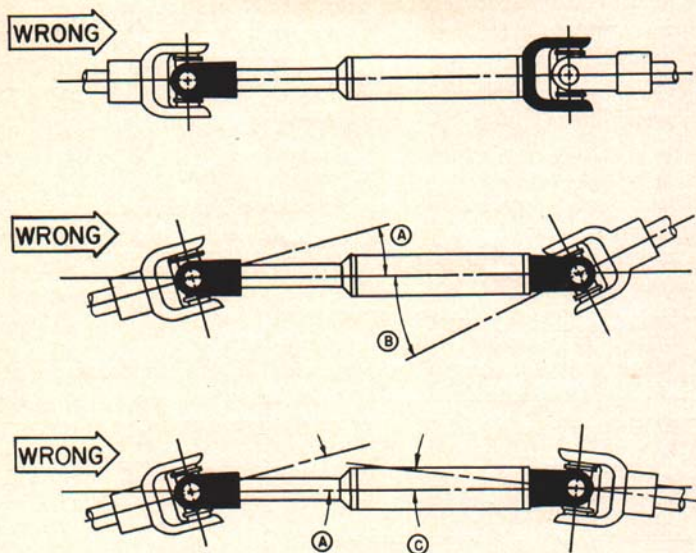


Fig. 46. Incorrect PTO shaft alignment.

particular farm tractor. He must, therefore, know how much horsepower is available through the PTO shaft for the operation of the pump. Tractor manufacturers usually recommend a "rated" loading of 85 percent of maximum belt horsepower and 75 percent of the maximum drawbar horsepower for continuous operation.

The farm tractor's normal day-in and day-out work load is decidedly variable, however, and usually averages far less than the "rated" load. Also, since there is some power loss through the power-take-off shaft and speed increaser, it is desirable to limit the PTO power delivered to irrigation pumps to 75 percent of maximum belt horsepower output. A lower percentage of maximum horsepower should be used with older tractors, depending on their mechanical condition and the date of their last complete overhaul.

A tabulation of most farm tractors on the market since 1940 has been made in Table 1. The maximum recommended horsepower available to the pump has been entered as 75 percent of the maximum sea level calculated belt horsepower, as determined by the Nebraska

Tractor Test unless otherwise indicated. Where the tractor engine must operate at less than rated engine rpm in order to obtain the standard PTO shaft speed, the horsepower available for power-take-off pumping has been adjusted according to engine torque characteristics, as provided by tractor manufacturers.

SAFETY

As a safety precaution, the power-take-off shaft connecting the tractor and pump should be completely shielded. Shielding should be provided by the pump supplier. Non-removable shielding, free to rotate with the PTO shaft but which stops when a slight force is applied, usually provides adequate safety protection. V-belts and sheaves should also be shielded.

Since irrigation pumps are frequently left unattended for long periods of time, it is desirable to install cutout switches to stop the engine in case of low oil pressure or high operating temperature.

TABLE 1—LIST OF RECENT AND CURRENT FARM TRACTOR MODELS listing available horsepower for operating PTO-Driven Irrigation Pumps

Model	Fuel	Power take-off RPM	Maximum recommended H. P. to pump ¹
ALLIS-CHALMERS			
B.....	Distillate.....	560	12.2
B.....	Gasoline.....	560	17.2
C.....	Distillate.....	560(1400) ²	15.2
C.....	Gasoline.....	560(1400) ²	17.9
CA.....	Gasoline.....	538	20.0
WC, WF.....	Distillate.....	534	20.3
WC, WF.....	Gasoline.....	534	23.6
WD.....	Tractor fuel....	548	20.7
WD.....	Gasoline.....	548	26.9
WD-45.....	Tractor fuel....	548	25.5
WD-45.....	Gasoline.....	548	34.0
WD-45.....	L-P gas.....	548	33.9
WD-45.....	Diesel.....	548	34.1
HD-5.....	Diesel.....	539	37.7

¹Maximum Recommended Horsepower to be used in operating pto-driven irrigation pump is 75 percent of maximum calculated sea level belt horsepower as shown in Nebraska Tractor Tests, unless otherwise indicated.

²Motor RPM at which stated pto speed is obtained.

³Manufacturer's maximum recommended horsepower to be used in operating pto-driven irrigation pump.

⁴More than one pto speed available. One listed is nearest to ASAE and SAE standards.

TABLE 1—Continued

Model	Fuel	Power take-off RPM	Maximum recommended H. P. to pump
ALLIS-CHALMERS: Cont'd.			
HD-7.....	Diesel.....	584	53.3
HD-9.....	Diesel.....	430	63.4
HD-10.....	Diesel.....	431 ^a	76.2
HD-15.....	Diesel.....	430	92.9
BROCKWAY			
49G.....	Gasoline.....	536(1650) ^a	26.3 ^a
49D.....	Diesel.....	536(1650) ^a	23.8 ^a
J. I. CASE			
VA Series.....	Tractor fuel.....	525	14.0
VA Series.....	Gasoline.....	525	16.7
VC.....	Gasoline.....	556	19.5
S Series (before '53).....	Distillate.....	541	17.8
S Series (after '52).....	Tractor fuel.....	541	19.6
S Series.....	Gasoline.....	541	24.8
D Series (before '44).....	Distillate.....	536	28.1
D Series (after '43).....	Distillate.....	540	28.1
D Series (before '44).....	Gasoline.....	536	29.0
D Series ('44-'53 incl.).....	Gasoline.....	540	29.0
D Series (after '53).....	Gasoline.....	540	35.3 ^a
L.....	Distillate.....	550	37.1
LA.....	Tractor fuel.....	550	37.9
LA.....	Gasoline.....	550	46.3
LA.....	L-P gas.....	550	46.4
400.....	Gasoline.....	540	41.1
400.....	Diesel.....	540	38.2
500.....	Diesel.....	540	48.6
CATERPILLAR			
R-2.....	Distillate.....	548	26.3 ^a
R-2.....	Gasoline.....	548	26.5 ^a
D-2 (before '49).....	Diesel.....	548	27.5 ^a
D-2 ('49-'54 incl.).....	Diesel.....	548	32.9 ^a
D-2 (after '54).....	Diesel.....	545	36.6 ^a
R-4.....	Distillate.....	545 ^a	32.6 ^a
R-4.....	Gasoline.....	545 ^a	34.9 ^a
D-4 (before '49).....	Diesel.....	545 ^a	35.6 ^a
D-4 ('49-'54 incl.).....	Diesel.....	545 ^a	46.5 ^a
D-4 (after '54).....	Diesel.....	550	45.9 ^a
D-6 (before '49).....	Diesel.....	536	68.7 ^a
D-6 ('49-'54 incl.).....	Diesel.....	550	68.5 ^a
D-6 (after '54).....	Diesel.....	543	72.3 ^a
D-7 (before '55).....	Diesel.....	1000	79.0 ^a

TABLE 1—Continued

Model	Fuel	Power take-off RPM	Maximum recommended H. P. to pump ¹
CATERPILLAR: Cont'd.			
D-7 (after '54).....	Diesel.....	446	96.3 ^a
D-8 (before '49).....	Diesel.....	1000	111.4 ^a
D-8 ('49-'53 incl.).....	Diesel.....	1000	125.8 ^a
D-8 (after '53).....	Diesel.....	524	149.6 ^a
COCKSHUTT			
20.....	Gasoline.....	563	22.8
30.....	Distillate.....	580	16.9 ^a
30.....	Gasoline.....	580	24.7
30.....	L-P gas.....	580	24.2 ^a
30D.....	Diesel.....	580	19.2 ^a
40.....	Distillate.....	530	26.6 ^a
40.....	Gasoline.....	530	34.2
40.....	L-P gas.....	530	34.8 ^a
40D.....	Diesel.....	530	28.9 ^a
50.....	Gasoline.....	530	43.4
50D.....	Diesel.....	530	39.9
CORBITT			
K-50.....	Kerosene.....	640	21.8 ^a
G-50.....	Gasoline.....	640	27.2
D-50.....	Diesel.....	640	26.9 ^a
JOHN DEERE			
LA.....	Gasoline.....	540	11.4
H.....	Gasoline.....	546	11.4
M.....	Gasoline.....	550	16.1
MT.....	Gasoline.....	550	16.2
MC.....	Gasoline.....	550	16.7
B ('41 and '42).....	Distillate.....	554	15.4
B ('43-'45 incl.).....	Distillate.....	528	15.4
B ('46).....	Distillate.....	564	15.4
B ('47).....	Tractor fuel....	564	18.2
B (after '47).....	Tractor fuel....	541	18.2
B (before '48).....	Gasoline.....	564	21.5
B (after '47).....	Gasoline.....	541	21.5
A (before '48).....	Distillate.....	546	23.2
A (after '47).....	Distillate.....	542	23.2
A (before '48).....	Gasoline.....	546	29.6
A (after '47).....	Gasoline.....	542	29.6
AR ('42-'46 incl.).....	Distillate.....	546	23.2
AR (after '46).....	Distillate.....	536	23.2
AR.....	Gasoline.....	536	29.3
G (before '47).....	Distillate.....	532	27.7
G (after '46).....	Tractor fuel....	532	29.9

TABLE 1—Continued

Model	Fuel	Power take-off RPM	Maximum recommended H. P. to pump
JOHN DEERE: Cont'd.			
D.....	Distillate.....	526	33.6
R.....	Diesel.....	536	38.2
40.....	Gasoline.....	560	18.9
40-C.....	Gasoline.....	560	18.7
40-S.....	Tractor fuel....	560	15.7
40-S.....	Gasoline.....	560	18.6
40-U.....	Gasoline.....	560	18.6 ^a
50.....	Tractor fuel....	541	19.3
50.....	Gasoline.....	541	23.2
50.....	L-P gas.....	541	24.2
60.....	Tractor fuel....	542	24.9
60.....	Gasoline.....	542	31.2
60.....	L-P gas.....	542	31.7
70.....	Tractor fuel....	532	33.7
70.....	Gasoline.....	532	37.8
70.....	L-P gas.....	532	39.0
70.....	Diesel.....	532	38.6
80.....	Diesel.....	536	50.7
DODGE POWER WAGON			
T-137.....	Gasoline.....	563	32.4
FARMERS UNION CENTRAL EXCHANGE			
Co-Op No. 3S.....	Gasoline.....	548	35.7 ^a
Co-Op No. 3LF.....	L-P gas.....	548	36.2 ^a
FERGUSON			
Pony.....	Gasoline.....	540	9.1
TE-20.....	Gasoline.....	545(1500) ^a	17.4 ^a
TO-20.....	Gasoline.....	545(1500) ^a	17.4 ^a
TO-30.....	Gasoline.....	545(1500) ^a	19.9 ^a
TO-35.....	Gasoline.....	536(1493) ^a	21.0 ^a
FORD			
9N.....	Gasoline.....	545(1500) ^a	14.4 ^a
2N.....	Gasoline.....	545(1500) ^a	14.4 ^a
8N (before '48).....	Gasoline.....	545(1500) ^a	13.0 ^a
8N ('48 and '49).....	Gasoline.....	545(1500) ^a	16.0 ^a
8N (after '49).....	Gasoline.....	545(1500) ^a	16.5 ^a
8NAN.....	Tractor fuel....	545(1500) ^a	13.9 ^a
NAA.....	Gasoline.....	545(1500) ^a	19.6 ^a
640,740.....	Gasoline.....	536(1500) ^a	19.6 ^a
650,660.....	Gasoline.....	545(1750) ^a	22.0 ^a

TABLE 1—Continued

Model	Fuel	Power take-off RPM	Maximum recommended H. P. to pump ¹
FORD: Cont'd.			
800, 900 series.....	Gasoline.....	545(1750) ²	31.0 ³
Major.....	Diesel.....	542(1200) ²	24.0 ³
FRIDAY			
048.....	Gasoline.....	540(1200) ²	25.0 ³
GIBSON			
EF.....	Gasoline.....	603	9.5 ³
H.....	Gasoline.....	741	19.5
I.....	Gasoline.....	741	32.3
HARRIS FOUR WHEEL DRIVE			
PH40 (F6W-C).....	Gasoline.....	545(1800) ²	34.0 ³
PH53 (F8W-C).....	Gasoline.....	642	39.0
FDW-C (G.M.).....	Diesel.....	642(2000) ²	34.3
FDW-C (Continental).....	Diesel.....	642(2000) ²	33.5
INTERCONTINENTAL			
C-26.....	Gasoline.....	550	23.4
D-26, DE.....	Diesel.....	550	23.1
DF.....	Diesel.....	550	26.9
INTERNATIONAL HARVESTER			
Cub.....	Gasoline.....	1600	7.3
A, Super A.....	Distillate.....	541	12.8
A, Super A.....	Gasoline.....	541	14.3
Super A-1.....	Gasoline.....	541	16.5 ³
B, BN.....	Distillate.....	541	12.5
B, BN.....	Gasoline.....	541	14.4
C.....	Gasoline.....	539	16.6
Super C.....	Gasoline.....	539	18.3
H.....	Distillate.....	540	18.3
H.....	Gasoline.....	540	20.9
Super H.....	Gasoline.....	540	26.0
M.....	Distillate.....	537	27.5
M.....	Gasoline.....	537	29.4
MD (before '51).....	Diesel.....	537	27.4
MD (after '50).....	Diesel.....	537	30.0
Super M.....	Gasoline.....	537	36.4
Super M.....	L-P gas.....	537	36.6
Super MD.....	Diesel.....	537	36.2
W-4.....	Distillate.....	540	18.7
W-4.....	Gasoline.....	540	20.9

TABLE 1—Continued

Model	Fuel	Power take-off RPM	Maximum recommended H. P. to pump ¹
INTERNATIONAL: Cont'd.			
Super W-4.....	Gasoline.....	540	26.0
W-6.....	Distillate.....	537	27.5
W-6.....	Gasoline.....	537	29.1
WD-6 (before '51).....	Diesel.....	537	27.3
WD-6 (after '50).....	Diesel.....	537	29.5
Super W-6.....	Gasoline.....	537	36.6
Super W-6.....	L-P gas.....	537	36.8
Super WD-6.....	Diesel.....	537	36.4
W-9.....	Distillate.....	538	36.8
W-9.....	Gasoline.....	538	39.3
WD-9 (before '50).....	Diesel.....	538	36.9
WD-9 (after '49).....	Diesel.....	538	39.9
Super WD-9.....	Diesel.....	538	50.4
100.....	Gasoline.....	541	15.8
200.....	Gasoline.....	539	19.0
300.....	Gasoline.....	541	29.9
300-U.....	Gasoline.....	541	32.1
400.....	Gasoline.....	534	39.5
400.....	Diesel.....	534	36.3
W-400.....	Gasoline.....	534	40.2
W-400.....	Diesel.....	534	36.4
T-6.....	Distillate.....	540 ^a	27.5
T-6.....	Gasoline.....	540 ^a	29.2
TD-6 (before '51).....	Diesel.....	540 ^a	27.2
TD-6 (after '50).....	Diesel.....	540 ^a	30.2
T-9.....	Gasoline.....	535 ^a	36.5
TD-9 (before '51).....	Diesel.....	535 ^a	34.4
TD-9 (after '50).....	Diesel.....	535 ^a	36.7
TD-14.....	Diesel.....	691	48.0
TD-14A.....	Diesel.....	716 ^a	56.5
TD-18.....	Diesel.....	614	63.5
TD-18A.....	Diesel.....	691 ^a	76.5
LOVE			
C-51.....	Gasoline.....	550 ^a	37.1 ³
CF-51.....	Gasoline.....	550 ^a	38.5 ³
MASSEY-HARRIS			
Pony 11.....	Gasoline.....	540	9.1
Pacer 16.....	Gasoline.....	540	14.4
20K, 82.....	Distillate.....	551	17.3 ³
20, 81.....	Gasoline.....	551	21.3

TABLE 1—Continued

Model	Fuel	Power take-off RPM	Maximum recommended H. P. to pump ¹
MASSEY-HARRIS: Cont'd.			
Colt 21 (before '55).....	Gasoline.....	551	20.3 ^a
Colt 21 (after '54).....	Gasoline.....	661	20.3 ^a
22K.....	Distillate.....	551	17.3 ^a
22.....	Gasoline.....	551	23.7
102 Jr.....	Distillate.....	551	20.6 ^a
101 Jr.....	Gasoline.....	551	24.2
Mustang 23K (before '55).....	Tractor fuel....	551	17.3 ^a
Mustang 23K (after '54).....	Tractor fuel....	661	17.3 ^a
Mustang 23 (before '55).....	Gasoline.....	551	23.3 ^a
Mustang 23 (after '54).....	Gasoline.....	661	23.3 ^a
30K.....	Distillate.....	534	19.5 ^a
30.....	Gasoline.....	551	26.5
33K.....	Tractor fuel....	551	22.5 ^a
33.....	Gasoline.....	551	30.3
33D.....	Diesel.....	551	25.5 ^a
102 Sr.....	Distillate.....	587(1600) ^a	28.1 ^a
101 Sr.....	Gasoline.....	551	35.9
44K.....	Tractor fuel....	534	29.6
44.....	Gasoline.....	534	35.3
44 L-P.....	L-P gas.....	534	33.8 ^a
44D.....	Diesel.....	534	32.3
44-6.....	Gasoline.....	551	30.8 ^a
44K Special.....	Tractor fuel....	534	28.5 ^a
44 Special.....	Gasoline.....	534	37.7
44 L-P Special.....	L-P gas.....	534	33.8 ^a
44D Special (APE pump).....	Diesel.....	534	31.4 ^a
44D Special (PSB pump).....	Diesel.....	534	32.6 ^a
203.....	Distillate.....	543	39.0 ^a
203G.....	Gasoline.....	543	46.5 ^a
55K.....	Tractor fuel....	521	40.9 ^a
55 (before '51).....	Gasoline.....	521	46.0
55 (after '50).....	Gasoline.....	521	51.2
55 L-P.....	L-P gas.....	521	47.3 ^a
55D.....	Diesel.....	521	45.2
MERCER (FARMMASTER)			
30-CK.....	Gasoline.....	580	22.4
30-BD.....	Diesel.....	580	18.9

TABLE 1—Continued

Model	Fuel	Power take-off RPM	Maximum recommended H. P. to pump ¹
MINNEAPOLIS-MOLINE			
V.....	Gasoline.....	540	9.0 ^a
RT Series (before '51).....	Gasoline.....	560	18.0
RT Series (after '50).....	Gasoline.....	600	20.9
BF Series.....	Gasoline.....	562	20.7
BG Series.....	Gasoline.....	559	20.7 ^a
ZT Series.....	Gasoline.....	615	24.7
ZA Series.....	Gasoline.....	615	28.1
ZB Series.....	Gasoline.....	615	28.5 ^a
ZB Series.....	L-P Gas.....	615	28.5 ^a
UT Series.....	Distillate.....	575	27.8
UT Series.....	Gasoline.....	575	34.0
UT Series.....	L-P Gas.....	575	36.6
UT Series.....	Diesel.....	585	34.5 ^a
UB Series.....	Tractor fuel....	585	29.6
UB Series.....	Gasoline.....	585	37.8
UB Series.....	L-P gas.....	585	39.9
UB Series.....	Diesel.....	585	34.5 ^a
GT Series (before '50).....	Gasoline.....	526	43.2
GT Series (after '49).....	Gasoline.....	585	44.6
GT Series.....	L-P gas.....	585	43.2 ^a
GT Series.....	Diesel.....	585	48.0 ^a
GB Series.....	Tractor fuel....	585	42.0 ^a
GB Series.....	Gasoline.....	585	51.4
GB Series.....	L-P gas.....	585	56.2
GB Series.....	Diesel.....	585	48.9
OLIVER			
60-HC.....	Gasoline.....	533	14.6
66-HC.....	Gasoline.....	533	19.5
66-D.....	Diesel.....	533	19.8
70-KD.....	Distillate.....	538	21.6
70-HC.....	Gasoline.....	538	25.0
77-HC.....	Gasoline.....	533	29.1
77-LP.....	L-P Gas.....	533	28.6
77-D.....	Diesel.....	533	27.9
80-KD.....	Distillate.....	577	31.0
80-HC.....	Gasoline.....	577	31.8
88-HC.....	Gasoline.....	533	33.5
88-D.....	Diesel.....	533	33.9
90-KD.....	Distillate.....	530	37.5 ^a
99-HC.....	Gasoline.....	530	47.9
Super 55-HC.....	Gasoline.....	545	26.9

TABLE 1—Concluded

Model	Fuel	Power take-off RPM	Maximum recommended H. P. to pump ₁
OLIVER: Cont'd.			
Super 55-D.....	Diesel.....	545	25.6
Super 66-HC.....	Gasoline.....	533	26.7
Super 66-D.....	Diesel.....	533	26.6
Super 77-HC.....	Gasoline.....	533	34.6
Super 77-D.....	Diesel.....	533	34.5
Super 88-HC.....	Gasoline.....	533	43.6
Super 88-D.....	Diesel.....	533	41.7
Super 99-HC.....	Gasoline.....	532	48.8 ^a
Super 99-D.....	Diesel.....	532	48.8
Super 99-GMD.....	Diesel.....	532	62.6
HG (before '49).....	Gasoline.....	551	15.4
HG, OC-3 (after '48).....	Gasoline.....	551	19.8
OC-6.....	Gasoline.....	533	23.9 ^a
OC-6.....	Diesel.....	533	23.7 ^a
AG-6.....	Gasoline.....	603	30.1 ^a
AD.....	Diesel.....	603	32.0 ^a
BD.....	Diesel.....	608	36.1
OC-12.....	Gasoline.....	590 ^a	45.2
OC-12.....	Diesel.....	590 ^a	44.2
DG.....	Gasoline.....	550	53.6
DD.....	Diesel.....	512	55.8
OC-18.....	Diesel.....	1500	111.8 ^a
SHEPPARD			
SD-2.....	Diesel.....	550	20.0 ^a
SD-3.....	Diesel.....	550	30.0 ^a
SD-4.....	Diesel.....	532	50.0 ^a
SILVER KING			
370, 371, 450, 470, 471.....	Gasoline.....	545(1330) ^b	25.9
TERRATRAC (American Tractor)			
GT-25.....	Gasoline.....	616	19.4 ^a
GT-30.....	Gasoline.....	616	23.6
GT-34.....	Gasoline.....	616	25.5 ^a
DT-34.....	Diesel.....	616	23.3 ^a
WILLYS FARM JEEP			
Jeep (before '53).....	Gasoline.....	2000	22.3
Jeep (after '52).....	Gasoline.....	2400	27.9