NATIONAL SWEDISH TESTING INSTITUTE
FOR AGRICULTURAL MACHINERY

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TEST BULLETIN: OECD No. 241

Date of approval: 22nd August, 1968

REPORT ON TEST IN ACCORDANCE WITH OECD TEST CODE FOR AGRICULTURAL TRACTOR

BM/Volvo T-800 diesel tractor

Manufactured by:

AB Bolinder-Munktell of the Volvo-group, Eskilstuna, Sweden

TEST BULLETIN: OECD No. 241

BM-Volvo T-800 diesel tractor



Manufactured by: AB Bolinder-Munktell of the Volvo-group, Eskilstuna, Sweden

This Bulletin is based on engineering tests in accordance with the OECD Tractor Code. It does not contain an evaluation of the performance of the tractor on practical farm work.

Specification of tractor

Manufacturer:	AB Bolinder-Munktell, Eskilstuna, Sweden
Submitted for test by:	The manufacturer
Selected by:	National Testing Institute for Agricultural Machinery
Place of running in:	AB Bolinder-Munktell, Eskilstuna
Duration of running in:	125 hrs, p.t.o. 105 hours, transmission 20 hours

Tractor

Make:	AB Bolinder-Munktell of the Volvo-group
Type:	Diesel
Model:	BM/Volvo T-800
Serial No.:	1572

Engine

Make:	Volvo
Type:	Direct injection diesel engine
Model:	D 50 A-050
Serial No.:	11571
Cylinders	
Number:	6
Disposition:	Vertical, in line
Bore/stroke:	95.25 mm/120 mm
Capacity:	5130 cm^3
Compressionratio:	17 : 1
Arrangement of valves:	Overhead
Cylinder liners:	Wet, replaceable, centrifugally cast cylinder liners
Fuel system	
Type of fuel feed:	Bosch mechanical feed pump, type FP/KE 22AD202/2
Type, make and model of fuel filters:	Twin bowl, series flow filter, Bosch FJ/DN 5N5/3 Replaceable paper filter elements
Capacity of fuel tank:	143 litres
Type, make and model of injection pump:	In line pump, Bosch PES 6 A 85 C 320 RS 2188. Serial No.: 70731999
Manufacturers production setting:	47—49 cu.mm/stroke at 1000 r/m pump speed (test bench figures)
Type, make and model of injectors:	Bosch, DLLA 150 S 720 with nozzleholders KBL 103 S 21/13

Manufacturers production setting:	Opening pressure 140 kp/cm²
Governor	
Make:	Bosch
Type:	Mechanical, incorporated in fuel injection pump
Range of speed:	Governed range of engine speed 600—2500 r/m. Rated engine speed 2300 r/m
Air cleaner	
Make:	Cooper
Type:	Centrifugal air filter with replaceable paper filter element
Lubrication system	
Type:	Forced feed from gear type pump with metal strainer in oil sump
Type and number of filters:	One full flow replaceable paper element filter
Oil capacity:	15 litres including oil filter
Recommended oil change period:	125 hrs
Cooling system	
Type:	Water cooled, impeller assisted with 480 mm dia., belt driven 4-blade fan
Coolant capacity:	18 litres
Means of temperature control:	Thermostats
Pressure details:	0.38—0.45 kp/cm²
Starting system	
Make:	Bosch
Type:	0 001 401 052. Electrical, solenoid engaged starter, 12 V, 4 hp
Aids for cold starting:	Electrically operated excess fuel device
Electrical system	
Voltage:	12 V
Generator:	Motorola alternator type 14 V 26697 21 7 No. 373182, max. current 35 A
Battery:	2 Tudor, type 3 EX 11, lead-acid batteries in series
Capacity and rating:	160 Ah

Transmission

Clutch:	Borg and Beck single plate dry clutch 15 in (381 mm) dia., pedal operated

Gearbox: Own make, sliding gear and constant mesh. 8 forward speeds and 2 reverse

Rear axle and final drive: Crown wheel and pinion, differential and spur gear final drive. Pedal operated differential lock

Oil capacities: Gearbox, rear axle and final drive: 75 litres. Change period: Once a year

Gear	Number of engine revolutions for one revolution of driving wheels	Nominal travelling speed for rated speed of engine km/h
Forward		
1	255.02	2.54
2	168.75	3.84
3	112.82	5.74
4	86.15	7.52
5	63.76	10.16
6	42.19	15.35
7	28.20	22.97
8	21.54	30.00
Reverse		
low	209.25	3.10
high	52.31	12.39

Power take off At rear of tractor. 6 splines, 1 3/8 in (34.9 mm). Height above ground 680 mm. Proportional engine speed: 540 r/m at 1650 r/m engine speed.
Direction of rotation: clockwise viewed from driving end. Proportional ground speed: distance travelled for 1 revolution of p.t.o. 127 mm. Number of p.t.o. revolutions for one revolution of driving wheel 36.9. Direction of rotation: clockwise viewed facing driving end with tractor in forward gear. Independent hand-lever operated multi-disc clutch.

Belt pulley (not fitted for test) Rearmounted and p.t.o. driven. Dimensions: 300/170 mm diameter and width of face. Linear speed 22 m/min and 1410 r/m at rated engine speed 2300 r/m. Engine speed 1650/2300 r/m at standard linear speed 16/22 m/min. Direction of rotation: optional.

Power lift Own make, single acting. Independent pump drive, working pressure 160—165 kp/cm². Oil capacity 14 litres. Vertical lift movement above ground. Max. 330 mm to 920 mm. Min. 55 mm to 685 mm. Category 2 28.4 mm implement linkage.

Drawbar

Swinging drawbar. Height above ground max. 515 mm, min. 200 mm. Vertical adjustment by stretching screws and horizontal adjustment on drawbar frame. Distance from rear axle 875 mm, position relative to p.t.o. 355 mm, lateral adjustment ±375 mm. Pivot position relative to rear wheel centre 40 mm behind.

Hitch

Height above ground 415 mm. Distance from rear axle 560 mm. Position relative to p.t.o. 45 mm behind.

Steering

ZF hydraulic power assisted worm and nut type. Single drop arm and fixed length drag link.

Brakes

Girling double disc type mounted on differential half shafts. Independent or combined pedal operated. Hand-operated parking brake connected to left steering brake.

Wheels

Steering wheels

Two at front. Type: pneumatic, Triple Rib. 7.50-18, 8-ply rating. Maximum permissible weight on each tyre 970 kg at 3.5 kp/cm². Track width 1430 and 1530 mm. Changed by off-set wheel centres.

Driving wheels

Two at rear. Type: pneumatic. 18.4/15-34, 6-ply rating. Maximum permissible weight on each tyre 2220 kg at 1.1 kp/cm² pressure. Track width 1594 and 1794 mm. Wheelbase: 2651 mm.

Seat

Own make. Parallellogram linkage. Suspension by coil spring. Damping by hydraulic shock absorber. Adjustable for driver's weight. Range of adjustment 82 mm fore and 82 mm aft.

Number of grease points

30

Overall dimensions

Overall length,	without ballast weights	4.14 m
	with " "	4.36 m
Overall width,	without ballast weights	2.09 m
	with " "	2.36 m

Overall height 2.65 m

Lighting

	Height above ground of centre cm	Diameter cm	Distance from outside edge of tractor to centre cm
Head lights.....	168	12	36.5
Side lights.....	168	12	18.5
Rear lights.....	161	3×10	20
Reflector.....	59.5	7.6	54.5

Tractor and ballast weights
(Without driver but with tanks full and safety frame)

Weight without ballast:	Front 1200 kg Rear 3060 kg Total 4260 kg
Ballast	Front: Frame and 4 front weights, total 250 kg Rear: 9 weights per wheel, total 1410 kg
Weight with full ballast:	Front 1480 kg Rear 4440 kg Total 5920 kg

Fuels and lubricants used in tests

Laboratory tests

Fuel:	Diesel oil, density 0.812 g/cm³ at 20°C. Cetane number 52
Engine oil:	Shell Rotella SAE 20
Transmission oil:	Transmission oil SAE 90

Track tests

Fuel:	Diesel oil, density 0.812 g/cm³ at 20°C. Cetane number 52
Engine oil:	Shell Rotella SAE 20
Transmission oil:	Transmission oil SAE 90

Compulsory tests

1. Main power take-off performance

Date and location of tests: 18—19 January 1968, Ultuna, Uppsala, Sweden
Type of dynamometer: Eddy current, Zöllner

Horse-power	Speed		Fuel consumption		
hp/metric	Engine r/m	P.t.o. r/m	l/h	g/hph	hph/l
Maximum power — 2 hour test					
97.3	2300	752	23.48	196	4.1
Standard P.t.o. speed (540 r/m)					
76.7	1650	540	17.94	190	4.3
Part loads					
84.2	2365	774	20.16	195	4.2
0.9	3493	816	6.60	—	—
43.5	2441	799	12.90	241	3.4
97.2	2319	759	23.47	196	4.1
22.0	2469	808	9.58	354	2.3
64.4	2411	789	16.32	206	3.9

No load maximum speed 2493 r/m. Equivalent crankshaft torque at maximum power 30.3 kpm

Maximum equivalent crankshaft torque 33.4 kpm at 1530 r/m engine speed

Mean atmospheric conditions:

Temperature	18°C
Pressure	770 mm Hg
Relative humidity	27 %

Maximum temperature:

Coolant	79°C
Engine oil	97°C
Fuel	32°C

2. Drawbar performance on drum dynamometer

Date of tests: 1—18 April 1968

Type of track: Concrete

Height of drawbar above ground: 515 mm

Tests were carried out with radial type tyres.

Results see table on page 12

3. Turning space and turning circle

Details of wheel equipment: As in specification without ballast

Track of wheels: Front 1430 mm

Rear 1594 mm

	With brakes		Without brakes	
	Left-hand	Right-hand	Left-hand	Right-hand
Radius of turning space	4.18 m	4.01 m	4.86 m	4.64 m
Radius of turning circle	4.32 m	4.15 m	5.00 m	4.78 m

4. Location of centre of gravity

Height above ground	987 mm
Distance forward from the vertical plane containing the axis of the rear wheels	740 mm
Distance from the medium plane of the tractor	0 mm

5. Braking

Date of tests: 23—29 November 1967
Type of track: Concrete

Cold brakes

Travelling speed 25 km/h	Tractor without ballast	Tractor with ballast
Deceleration m/s²	6.0	5.8
Stopping distance m	4.1	4.4
Force on pedal kp	22	56

Brake fade characteristics (hot tests)

Deceleration	hot/cold	85 %
Stopping distance	cold/hot	86 %
Force on pedal	cold/hot	92 %

Parking brake (handbrake)

Satisfactory cold and hot
Force on handbrake, 36 kp cold and hot

6. Measurement of ambient noise emitted by the tractor

Date of tests: 24 January 1968
Type of sound level meter: Brüel & Kjær, Type 2203
Type of track: Concrete
Results of test: Gear 8, travelling speed 25.4 km/h, sound level 90 dBA

7. Noise measurements at the driver's ear level

Date of tests: 24 January 1968

Type of sound level meter and octave filter: Brüel & Kjær. Type 2203 with octave filter set type 1613

Type of track: Concrete

Result of test

Gear	Travelling speed km/h	Loudness sones
4	7.41	120

Tractor fitted with safety frame

8. Power lift and hydraulic pump performance

Date of tests: 6 February and 9—10 May 1968

Hydraulic fluid

Type: Hydraulic oil SAE 5W/10W

Viscosity: 15 cst. at 50°C

Type of linkage lock for transport: Hydraulic, opening pressure of the cylinder over pressure relief valve (manufacturer's figure) 180 kp/cm²

	Vertical movement mm	Maximum force exerted through full range kp	Pressure kp/cm²
Linkage giving maximum mechanical advantage			
At lower hitch points (height in down position 190 mm)	458	2185	155
At frame (height in down position 270 mm)	354	1760	160
Linkage giving minimum mechanical advantage			
At lower hitch points (height in down position 195 mm)	550	2075	160
At frame (height in down position 225 mm)	510	1520	155

Pump characteristics

i) Opening pressure of the relief valve 155 kp/cm²

Sustained pressure of the open relief valve 160 kp/cm²

Pump delivery rate at rated engine speed

ii) at minimum pressure 33 l/min

iii) at maximum hydraulic power

delivery	32 l/min
pressure	135 kp/cm²
power	9.6 hp metric

Optional Tests

9. Optional engine test (performance at the engine crankshaft)

Date and location of tests: 21—25 March 1968, Ultuna, Uppsala, Sweden

Type of dynamometer: Eddy current, Zöllner

Horse power metric hp	Engine speed	Fuel consumption		
		l/h	g/hph	hph/l
Maximum power — 2 hour test				
99.9	2300	23.25	189	4.3
Part loads				
87.2	2362	20.15	188	4.3
2.8	2500	6.29	—	—
45.5	2446	12.54	224	3.6
98.9	2279	23.22	191	4.3
22.8	2475	9.12	325	2.5
67.0	2411	16.16	196	4.1

Optimum fuel consumption recorded: 172 g/hph at 68.9 hp — 1700 r/m and 57.3 hp — 1364 r/m

No load, maximum engine speed: 2500 r/m

Crankshaft torque at maximum power: 31.1 kpm

Maximum crankshaft torque: 34.2 kpm at 1400 r/m

Mean atmospheric conditions:

Temperature	19°C
Pressure	746 mm Hg
Relative humidity	44 %

Maximum temperature:

Coolant	73°C
Engine oil	96°C
Fuel	24°C

Repairs, adjustments and remarks during tests: None

Ultuna, Uppsala, 10th July, 1968
National Swedish Testing Institute for Agricultural Machinery

Gear	Horse-power	Draw-bar pull	Speed	Engine speed	Wheel slip	Specific fuel comsumption		Temperature °C			Atmospheric conditions		
								Cool-ant	Fuel	Engine oil	Temper-ature	Rela-tive humid-ity	Pres-sure
	hp/ metric	kp	km/h	r/m	%	g/hph	hph/l				°C	%	mm Hg
i) Maximum power (ballasted)													
1	37.4	4113	2.46	2427	10.9	286	2.8	71	24	87	16	50	751
2	53.6	4113	3.52	2381	13.0	257	3.2	72	25	90	18	50	742
3	80.4	3943	5.51	2297	6.5	236	3.4	73	23	81	18	50	742
4	81.4	3017	7.29	2294	5.0	231	3.5	75	24	94	18	59	745
5	84.0	2255	10.05	2293	3.0	226	3.6	77	27	93	20	59	745
6	83.3	1472	15.28	2281	1.8	225	3.6	76	25	95	18	59	748
7	78.1	912	23.13	2290	1.2	239	3.4	76	26	94	18	59	745
ii) Five hour test at 75 % pull at maximum power													
4	63.9	2264	7.62	2354	3.3	234	3.5	74	26	95	17	73	742
iii*) Five hour test at a pull corresponding to 13 % wheelslip in test i)													
1	57.2	4116	3.75	2367	7.1	243	3.3	73	27	94	18	73	741
iv) Maximum power (unballasted)													
3	67.1	3269	5.54	2379	9.3	235	3.5	72	25	89	18	31	767
4	79.5	3085	6.90	2308	8.0	241	3.4	74	27	92	20	31	767
5	86.5	2343	9.97	2308	4.6	222	3.7	73	27	90	20	31	767
6	84.0	1480	15.32	2297	2.5	219	3.7	76	29	94	18	21	769
7	80.9	940	23.24	2305	1.7	239	3.4	74	27	92	17	21	769

*Total oil consumption during ten hours duration of test ii) and iii) 62 g/h

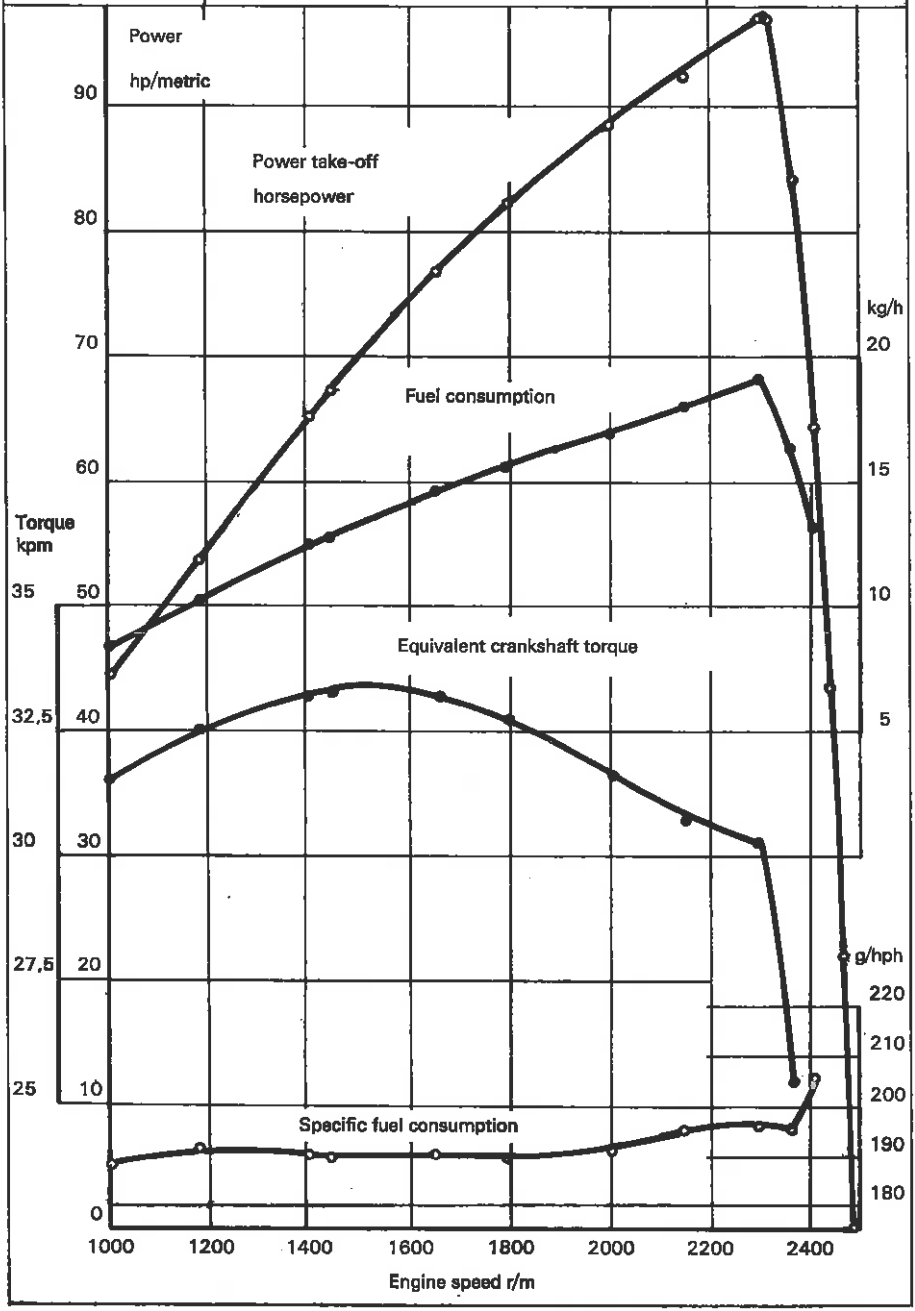
*Test iii) was carried out with additional ballast. Power, slip and fuel consumption do not correspond to test i) gear 2

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Power take-off test
BM/VOLVO T-800

Figure 1

18—19.1.68

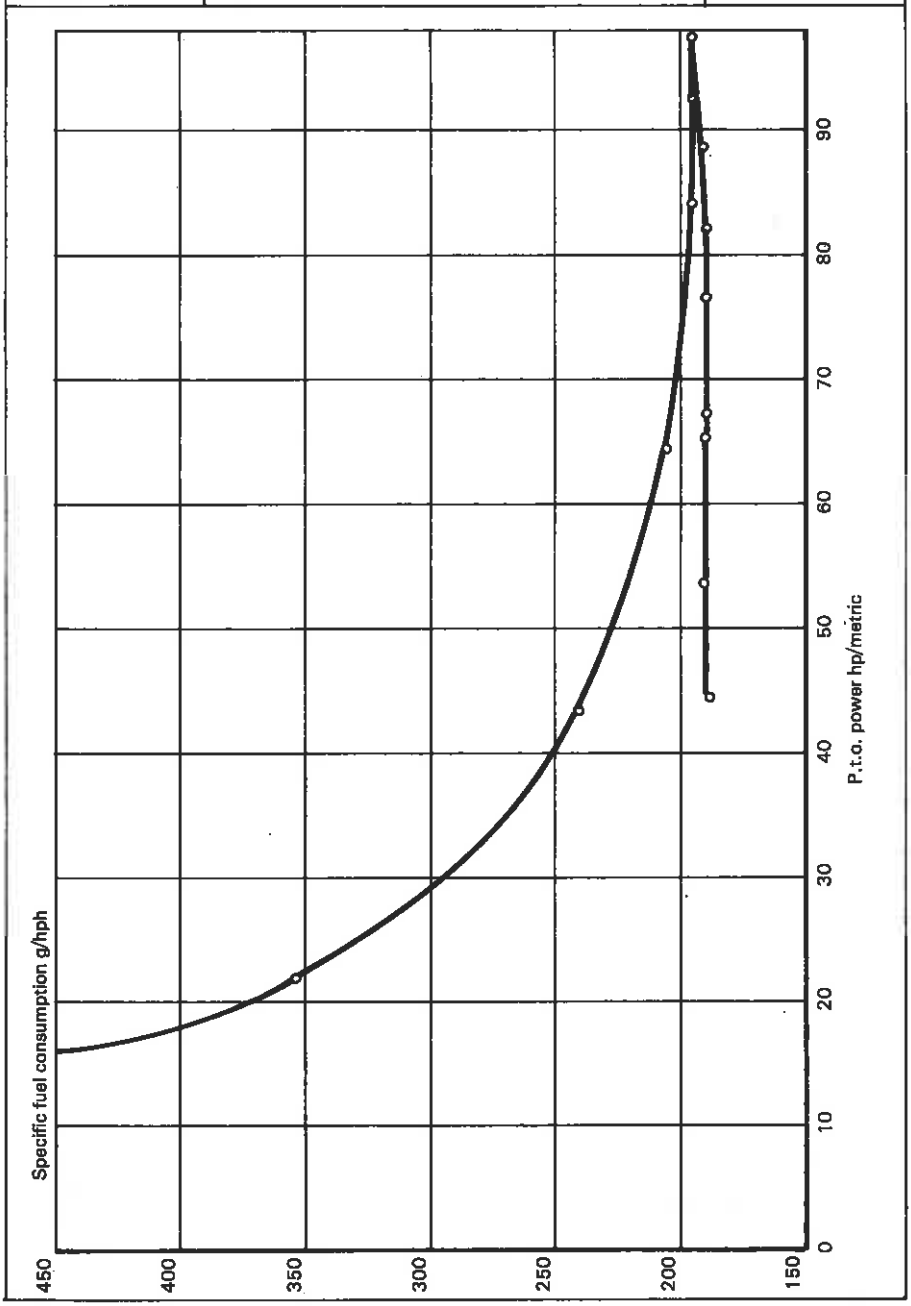


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Power take-off test
BM/VOLVO T-800

Figure 2

18—19.1.68



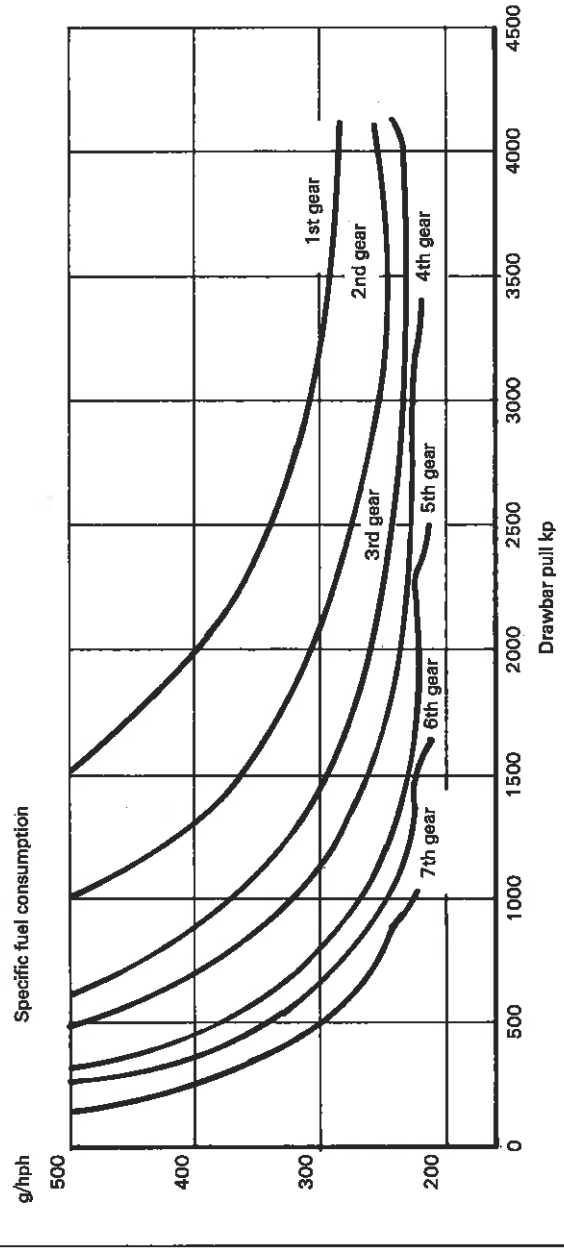
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Drawbar test on drum dynamometer BM/VOLVO T-800, with ballast

Figure 3

1—4.4.68

National Swedish Testing Institute for Agricultural Machinery	**Drawbar test on drum dynamometer BM/VOLVO T-800, with ballast**	Figure 4 1—4.4.68



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Drawbar test on drum dynamometer
BM/VOLVO T-800, with ballast

Figure 5

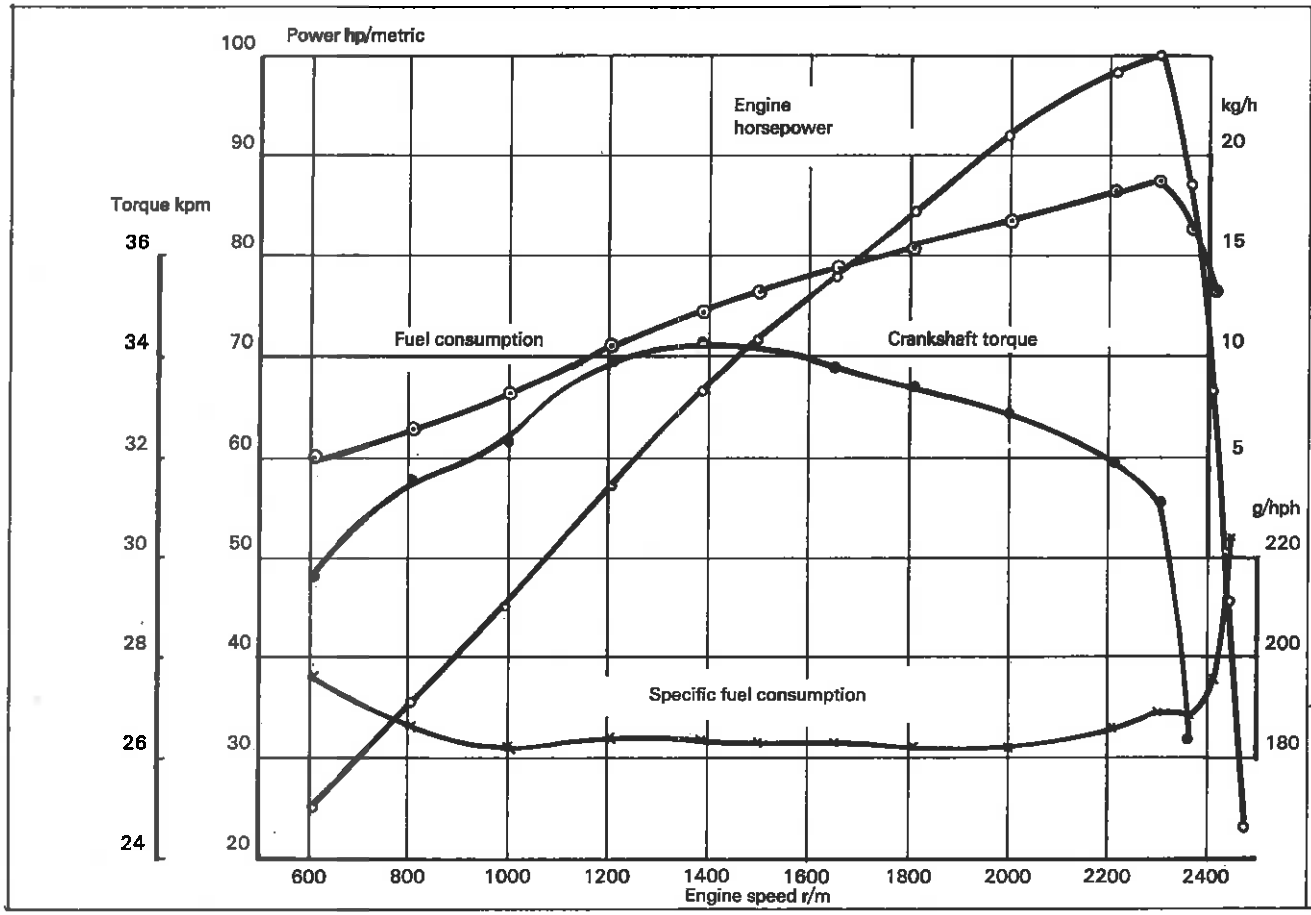
1—4.4.68

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Drawbar test on drum dynamometer BM/VOLVO T-800, with ballast

Figure 6

17—18.4.68



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Engine test BM/VOLVO T-800

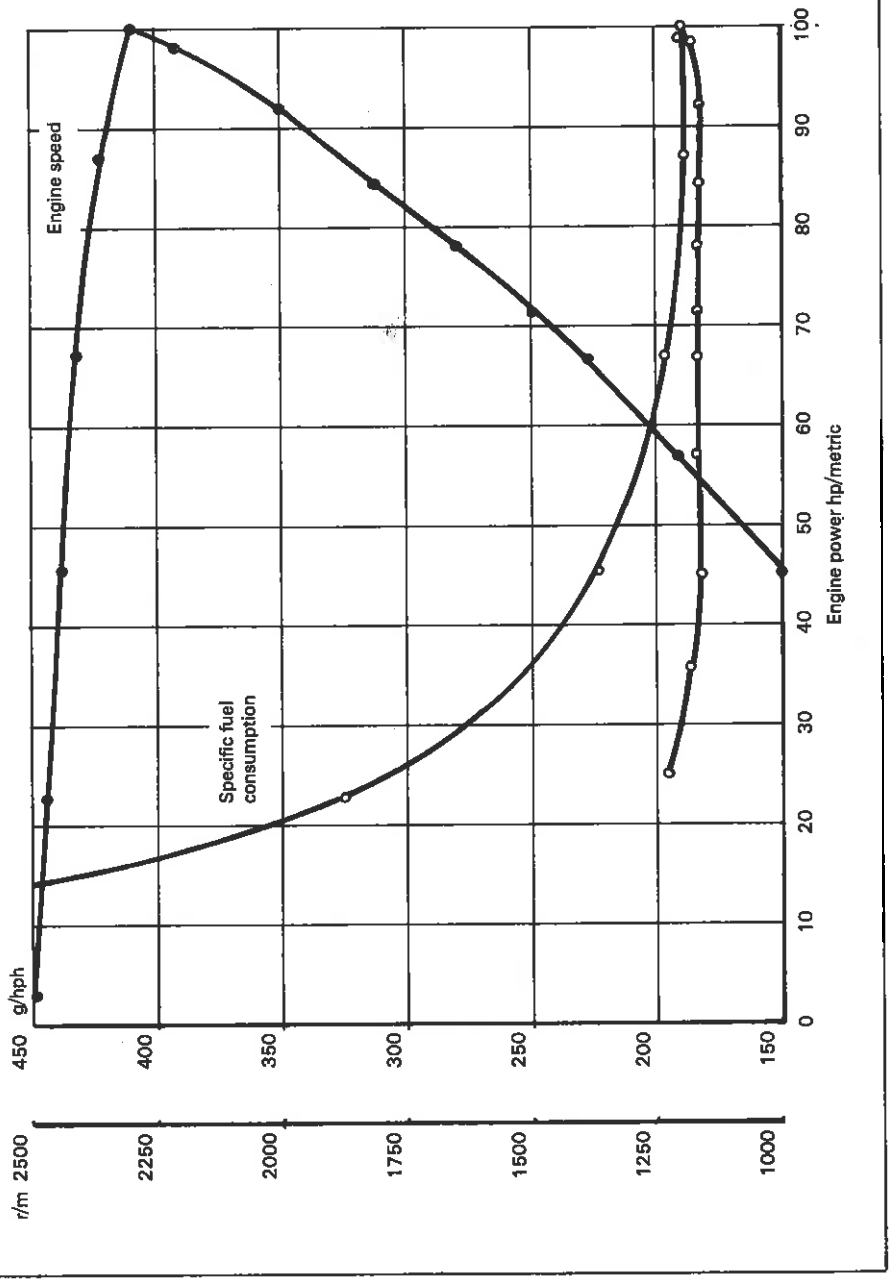
Figure 7
21—25.3.68

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Engine test
BM/VOLVO T-800

Figure 8

21—25.3.68

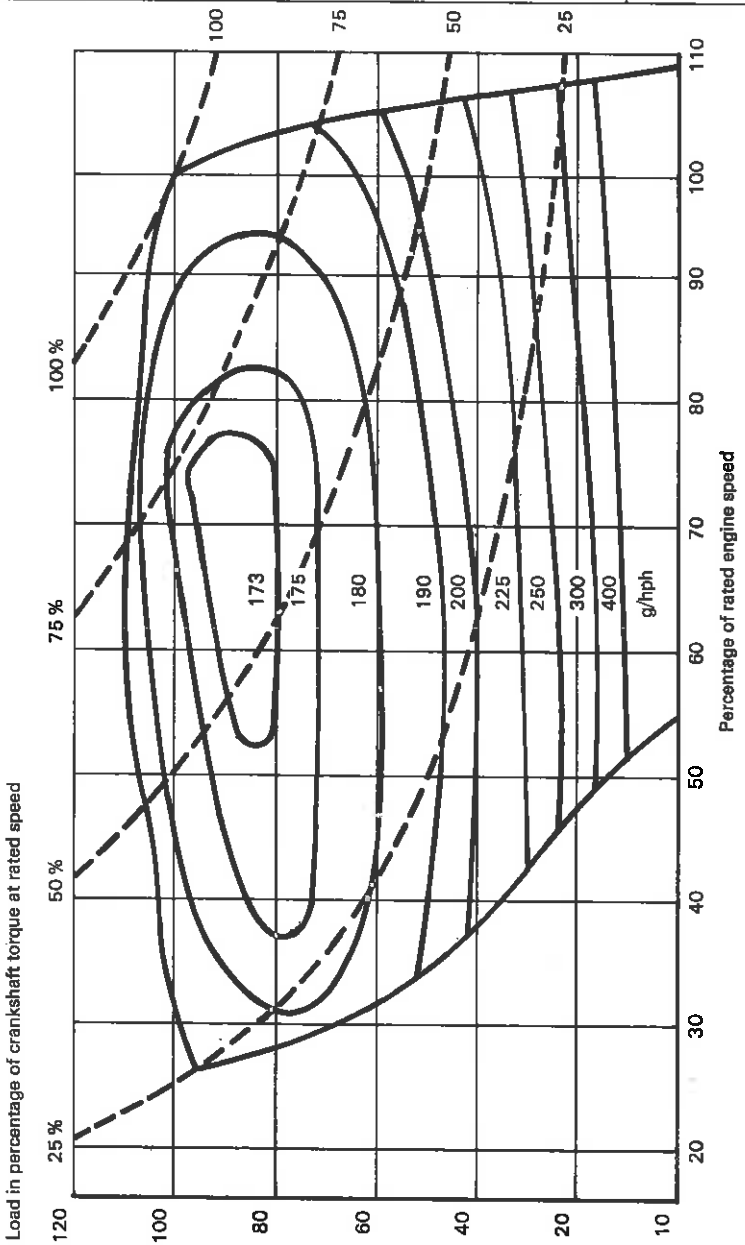


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Engine test
BM/VOLVO T-800

Figure 9

21—25.3.68



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