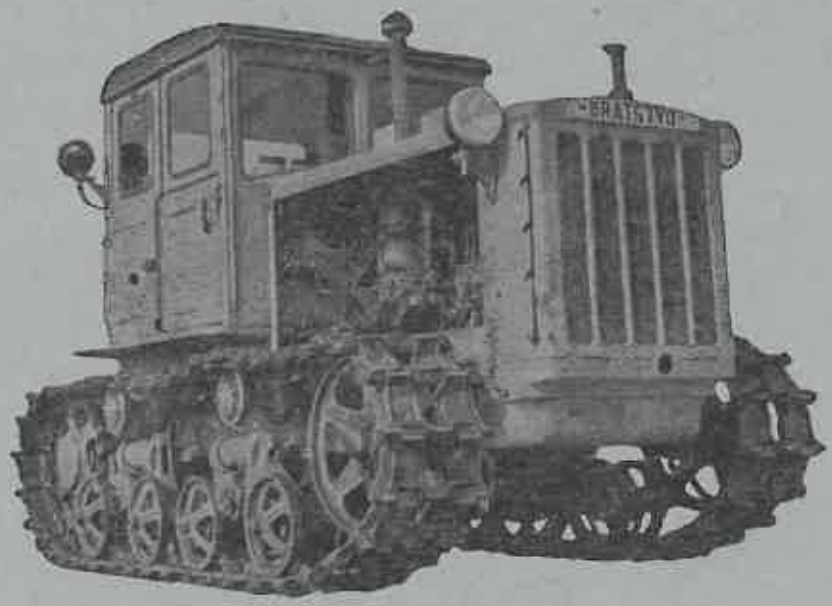
No. 40/1963/O.E.C.D.

SOCIALISTIC REPUBLIC OF CROATIA
INSTITUTE FOR MECHANIZATION IN AGRICULTURE
AGRICULTURAL FACULTY OF THE ZAGREB UNIVERSITY

TEST BULLETIN: O.E.C.D. No. 049

Date of Approval: 10th March 1964

REPORT ON TEST IN ACCORDANCE WITH O. E. C. D. TEST CODE FOR AGRICULTURAL TRACTORS



CRAWLER TRACTOR
MODEL BNT-60 F

Manufactured by: »BRATSTVO« Machine and Die Forgings Factory, Novi Travnik, Yugoslavia

Date of Tests: July/September 1963

This report has been approved by the O.E.C.D. Coordinating Centre (C.N.E.E.M.A., Antony, France) as being in accordance with the O.E.C.D. Tractor Test Code.

Date of Approval: 10th March 1964 Serial No.: 049

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

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SECTION I

SPECIFICATION OF TRACTOR

Tractor:

Make:	»Bratstvo« Machine and Die Forgings Factory, Novi Travnik
Model:	BNT-60 F
Type:	Diesel
No.:	Serial No. 0501

Engine:

Make:	»FAMOS« Engine Factory Sarajevo, Hrasnica
Model:	ET-65
Serial No.:	20450
Cylinders:	4 cylinders, vertical, in-line, 110 mm (4⅓ in.) bore × 140 mm (5½ in.) stroke, compression ratio 18:1, replaceable wet cylinder liners, overhead valves
Rated speed:	1800 rev/min
Fuel system:	Fuel: Diesel oil »Rikard Benčić« type P 14 T 13-9,37 A II OVR injection pump; »Rikard Benčić« type F 875 c injector nozzles; sediment bowl and water trap on suction side of feed pump, double filter on pressure side of feed pump. Injection pressure 75-85 kp/sq. cm (73-82 atm) Injection timing: 31—33° BTDC Capacity of fuel tank 250 l (55 UKgal)
Governor:	»Rikard Benčić« type R 20-90/RV 237 mechanical incorporated in fuel injection pump. Governed range of engine speed 500 rev/min to 1800 rev/min
Air cleaner:	Oil bath with pre-cleaner outside hood. Oil capacity 1·7 l (3·0 pt)
Oiling system:	Forced feed from gear type pump with screen in sump, SAE 20 heavy duty oil. Mann & Hummel type MWO 50/25 E filter. Recommended oil change period, 100 hr. Oil capacity 18 l (31·7 pt)
Cooling system:	Water cooled, pressuried, impeler assisted with 480 mm (18·9 in.) dia 4-blade belt driven fan Cooling water capacity: 18 l (4 UKgal)

Transmission:

Clutch:	»FAMOS« Engine Factory Sarajevo, single plate, dry, foot-pedal operated
Gearbox:	Own make sliding gear type, 5 forward speeds and 1 reverse. Total transmission oil capacity 12·4 l (21·8 pt). Recommanded oil viscosity in summer SAE 140, in winter SAE 90. Oil change period, 500 hr

Gear No.	Number of engine revolutions for one revolution of driving sprocket	Theoretical travelling speed for 1800 rev/min of engine, km/h	(mile/h)
1st	62·88	3·52	(2·19)
2nd	48·61	4·55	(2·83)
3rd	41·60	5·31	(3·30)
4th	35·93	6·16	(3·83)
5th	28·58	7·65	(4·75)
Reverse	94·32	2·35	(1·46)

Steering device:	By hand levers, and pedals. Activated are steering clutches, and steering brakes
Brakes:	Steering brakes. Foot-pedal operated, latch on foot-pedals for parking
Traction treads:	Lenght of tread 7370 mm (24 ft 21 in.) Lenght of tread in ground contact 1620 mm (5 ft 3·8 in) Tread width: 390 mm (15·4 in.). Track 1435 mm (56½ in.) (Center-to-center of treads). Bearing surface area of treads 13875 sq. cm (2151 sq. in.). Treads downward pressure 0·4 kp/sq. cm (5·69 lb/sq. in.). Driving sprockets pitch diameter 652 mm (25·6 in.)
Power take-off:	
Main:	6-spline, 34·9 mm (1⅜ in.) dia, at rear of tractor, not independent of main clutch
Height above ground:	750 mm (29·5 in.)
Speed (at 1800 rev/min engine speed):	760 rev/min
Direction of rotation:	Clockwise viewed from tractor rear
Gears ratio:	1:2·37
Reduction-multiplication gears:	Gear ration 1·44:1 or 1:1·44
Power lift:	None
Belt pulley:	None
Drawbar:	Vertical adjustment 340, 390, 470 or 510 mm (13·4, 15·4, 18·5 or 2·00 in.) With central hole and 2 holes 90 mm (3·55 in.) apart either side of centre line. Distance from rear axle: 530 mm (20·9 in.)
Hitch:	2 forward 350 mm (13·8 in.) above ground
Electrical equipment:	
Voltage:	12 V, and 24 V
Generator:	»Iskra« type DGD (12/300/1400)
Batteries:	Two 12 V »Munja« type 6 Ef 9, lead-acid, capacity 135 amp hr
Starting device:	»Iskra« type SL 3 24/4/11 starter motor
Overall dimensions:	
Overall length:	3630 mm (11 ft 10·9 in.)
Overall width:	1880 mm (6 ft 2·91 in.)
Overall height:	2270 mm (7 ft 5·36 in.)
Minimum ground clearance:	With full grouser penetration: 330 (13 in.)
Weight:	Fully equipped: 5 465 kp (11 950 lb)
Special remarks:	The weight is without driver

SECTION II

LABORATORY TESTS

1. Compulsory tests: Power take-off test

Date and location of tests: 1st September 1963, Zagreb

Type of dynamometer: Electrical swinging frame, Siemens—Schuckert

Position of governor control: Fully open

Fuel: Diesel oil, density 0·835 kp/cu. dm at 15° C (59·°F), Cetane No. 58

Engine Oil: R. n. R. SUPER HD 20/S2, SAE No. 20

Transmission oil: SAE No. 140

Horse-pover,	Speed		Torque,	Fuel consumption			Temperature			Atmos. conditions	
	engine,	p. t. o.		per hour,	specific,	h.p. hours/ unit of vol.	Coo-lant,	Oil,	Fuel,	Air temp,	Atmos. press-ure,
Metric h. p. (U. S. h. p.)	rev/min	rev/min	kpm (lb ft)	kp/h (UK gal/h)	p/metric h. p. h (lb/ h. p. h)	met. h. p. h/l (h. p. h/ gal)	°C (°F)	°C (°F)	°C (°F)	°C (°F)	mm Hg (in. Hg)
A. MAXIMUM POVER — SUSTAINED											
57·4 (56·6)	1780	1082	23·1 (167·1)	10·89 (2·87)	190 (0·424)	4·42 (19·8)	85 (185)	75 (167)	23 (73)	20 (68)	755 (29·8)
B. POWER AT STANDARD P.T.-O. SPEED (1000 rev/min)											
55·5 (54·7)	1655	1005	24·1 (174·3)	10·35 (2·73)	187 (0·416)	4·48 (20·1)	83 (181)	65 (149)	18 (64)	18 (64)	755 (29·8)
C. POWER AT MAXIMUM TORQUE											
37·3 (36·8)	1030	624	25·9 (187·3)	6·49 (1·71)	174 (0·388)	4·80 (21·6)	88 (193)	72 (162)	25 (77)	19 (66)	755 (29·8)
D. POWER AT RATED SPEED											
58·4 (57·7)	1800	1090	23·2 (167·8)	11·0 (2·90)	189 (0·421)	4·43 (19·9)	85 (185)	75 (167)	21 (70)	19 (66)	755 (29·8)
No load, maximum engine speed: 1940 rev/min											

2. **Supplementary tests:** Engine test

Date and location of tests: 30th July 1963, Sarajevo — Hrasnica

Type of dynamometer: Water brake, Heenan & Froude

Position of governor control: Fully open

Fuel: Diesel oil, density 0·835 kp/cu. dm at 15°C (59°F)
Cetane No. 54

Engine oil: R.n.R. SUPER HD 20/S2 SAE No. 20

Transmission oil: SAE No. 140

Horse-power, Metric h. p. (U. S. h. p.)	Engine speed, rev/min	Torque, kpm (lb ft)	Fuel consumption: per hour, kp/h (Uk gal/h)	Fuel consumption: specific, p/metric h. p. h (lb/ h. p. h)	Fuel consumption: h.p.hours/ unit of vol. met. h.p.h/l (h. p. h/ gal)	Temperature: Coo-lant, °C (°F)	Temperature: Oil, °C (°F)	Temperature: Fuel, °C (°F)	Atmospher. conditions: Air temp, °C (°F)	Atmospher. conditions: Atmos. pressure, mm Hg (in. Hg)
A. MAXIMUM POWER — SUSTAINED										
63·9 (63·0)	1754	26·1 (188·8)	11·10 (2·92)	174 (0·388)	4·80 (21·6)	67 (152)	84 (184)	28 (82)	24 (75)	720 (28·4)
B. POWER AT MAXIMUM TORQUE										
49·9 (49·2)	1332	26·8 (193·8)	8·80 (2·32)	176 (0·392)	4·74 (21·2)	66 (151)	75 (167)	24 (75)	21 (70)	721 (28·4)
C. POWER AT RATED SPEED										
64·5 (63·6)	1800	25·8 (186·6)	11·2 (2·95)	174 (0·388)	4·80 (21·6)	80 (176)	75 (167)	28 (82)	22 (72)	721 (28·4)
No load, maximum engine speed: 1930 rev/min										

SECTION III

DRAWBAR TEST ON GRASSLAND

Date of tests:	25th—30th August 1963, Zagreb
Type of surface:	Grassland on clay soil
Position of governor control lever:	Fully open
Fuel:	Diesel oil, density 0·835 kp/cu. dm at 15° C (59° F) Cetane No. 58
Engine oil:	R.n.R. SUPER HD 20/S2, SAE No. 20
Transmission oil:	SAE No. 140
Weight with the driver:	5 540 kp (12 216 lb)
Height of drawbar above ground:	340 mm (13·4 in.)

(1) MAXIMUM POWERS AND PULLS:

Gear No.	Maximum powers					Air temp, °C (°F)	Atmos. pressure, mm Hg (in. Hg)	Maximum pulls	
	Horse-power, metric h. p. (U. S. h. p.)	Corres-ponding pull, kp (lb)	Engine speed, rev/min	Forward speed, km/h (mile/h)	Eegine coolant temp, °C (°F)			Pull, kp (lb)	Reason for stall
1st	49·5 (48·8)	3880 (8550)	1800	3·45 (2·14)	75 (167)	24 (75)	751 (29·6)	4560 (10055)	Spin of treads
2nd	50·1 (49·4)	3190 (7034)	1730	4·24 (2·63)	80 (176)	23 (73)	750 (29·6)	3600 (7938)	Engine stall
3rd	48·5 (47·8)	2510 (5535)	1780	5·07 (3·15)	75 (167)	23 (73)	750 (29·6)	2900 (6395)	Engine stall
4th	47·2 (46·5)	2200 (4851)	1780	5·80 (3·60)	75 (167)	23 (73)	750 (29·6)	2600 (5733)	Engine stall
5th	44·5 (43·9)	1650 (3638)	1780	6·58 (4·08)	80 (176)	32 (90)	758 (29·9)	1710 (3770)	Engine stall

(2) FUEL CONSUMPTION:

Gear No.	Optimum fuel consumption			Range of pull over which specific fuel consumption does not exced the optimum consumption by more than 10% kp (lb)
	Specific fuel consumption p/metric h. p. h (lb/h. p. h)	in h. p. hour per unit of volume drawbar metric h. p. h/l (h. p. h/gal)	Corresponding pull kp (lb)	
1st	220 (0·490)	3·80 (17·1)	4360 (9614)	3200 — 4560 (7056 — 10055)
2nd	211 (0·470)	3·97 (17·9)	3510 (7740)	2850 — 3600 (6284 — 7938)
3rd	228 (0·507)	3·67 (16·5)	2510 (5535)	2200 — 2900 (4851 — 6395)
4th	229 (0·510)	3·66 (16·4)	2360 (5204)	1850 — 2600 (4079 — 5733)
5th	246 (0·548)	3·40 (15·3)	1710 (3770)	1450 — 1710 (3197 — 3770)

SECTION IV

I. **Location of centre of gravity:**
Tractor with tanks filled, with driver (75 kp) — 1156 mm (45½ in.) forward of driving sprocket centre

II. **Turning space:**
4·26 m (14 ft)
Track 1435 mm (56½ in.)

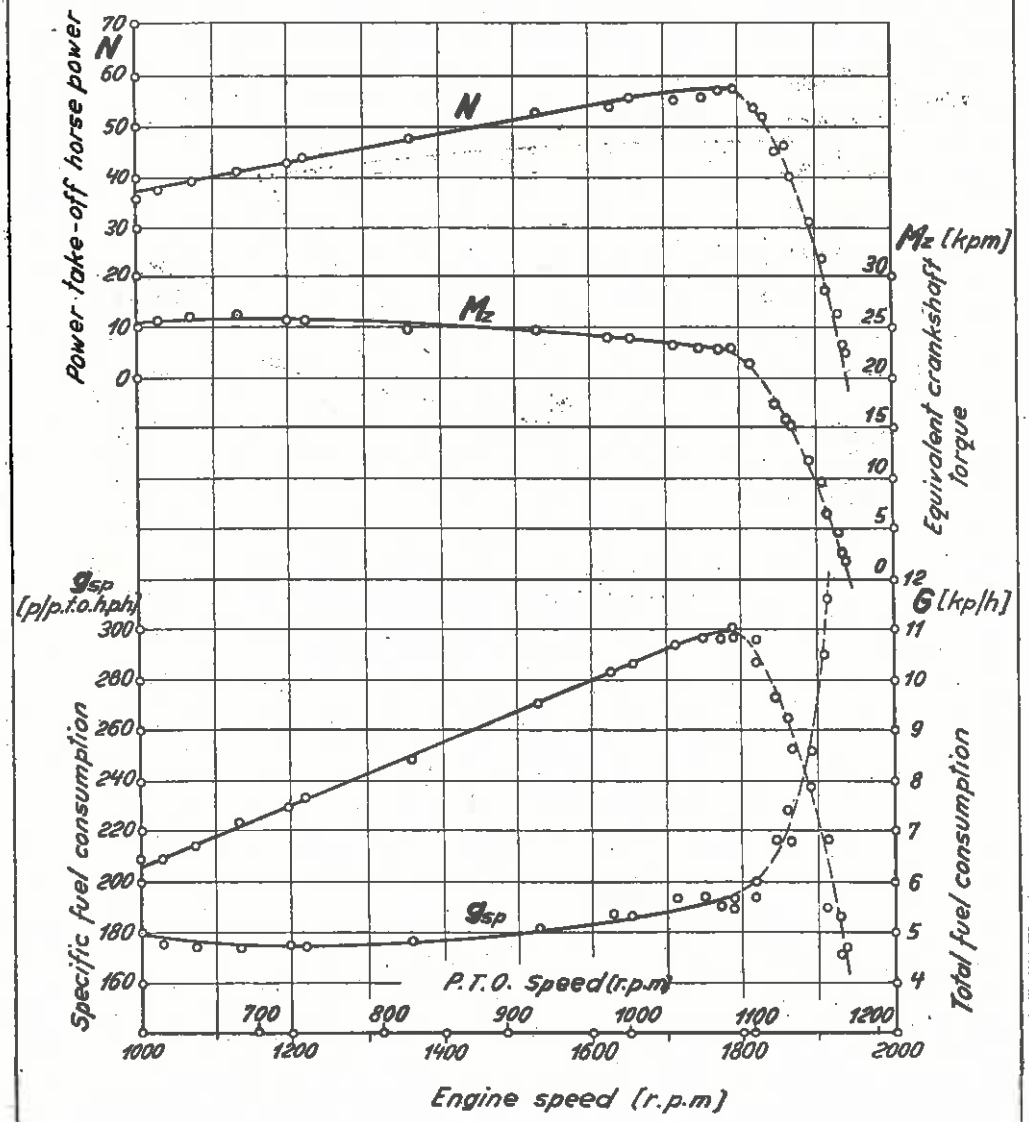
SECTION V

1. **Repairs and adjustments during test:**
None
2. **Remarks:**
None

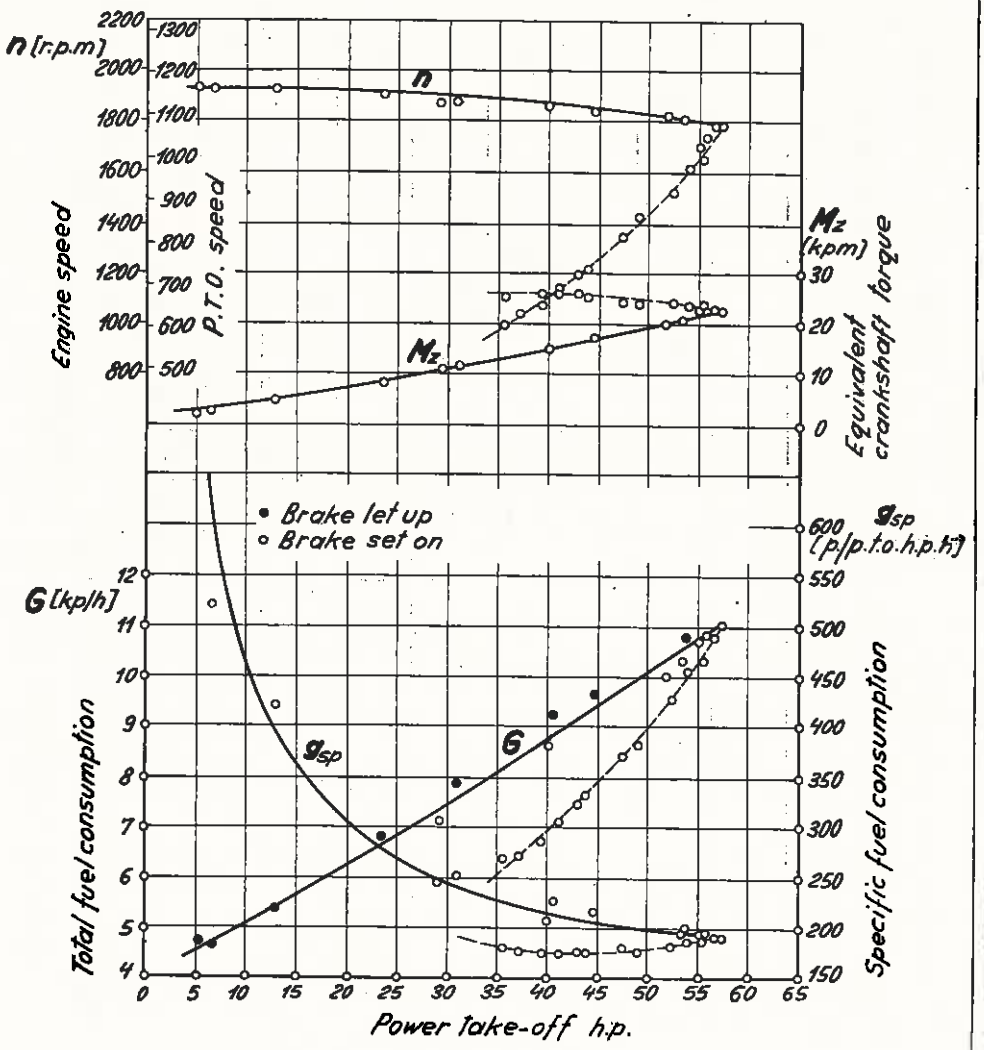
Test Engineer: D. KRPAN
Officer in charge: V. OBELIĆ
Director: N. DERETA
Date: 4th October 1963

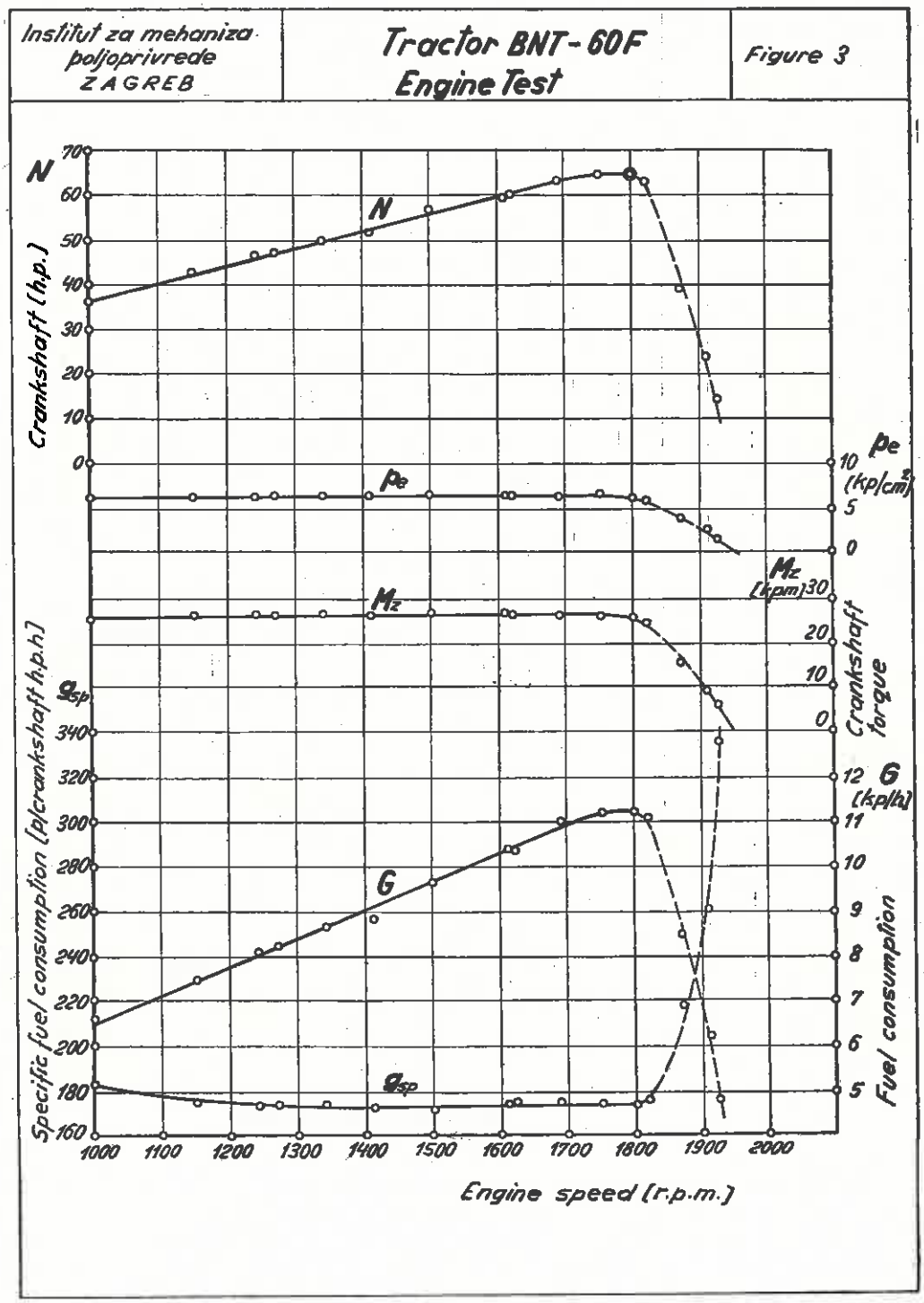
APPENDIX

Institut za mehanizaciju poljoprivrede ZAGREB	Tractor BNT-60F Power take-off Test	Figure 1



Institut za mehanizaciju poljoprivrede ZAGREB	Tractor BNT-60F Power take-off Test	Figure 2

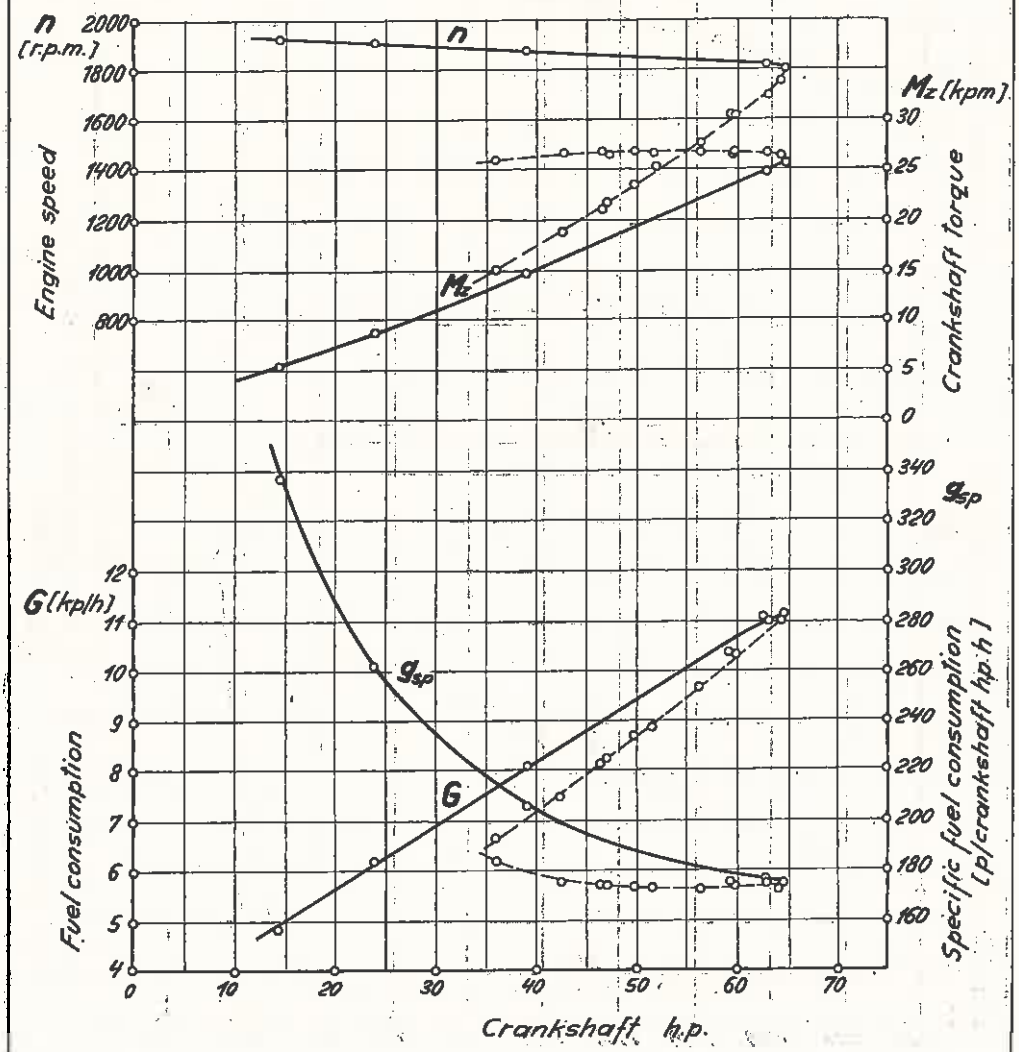



Institut za mehaniza poljoprivrede ZAGREB
Tractor BNT-60F
Engine Test
Figure 3
N
Crankshaft (h.p.)
70
60
50
40
30
20
10
0
N
pe
pe
(kp/cm²)
10
5
0
Mz
[kpm]30
20
10
0
Crankshaft torque
Mz
gsp
Specific fuel consumption [p/crankshaft h.p.h]
340
320
300
280
260
240
220
200
180
160
G
(kp/h)
12
11
10
9
8
7
6
5
Fuel consumption
G
gsp
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
Engine speed (r.p.m.)

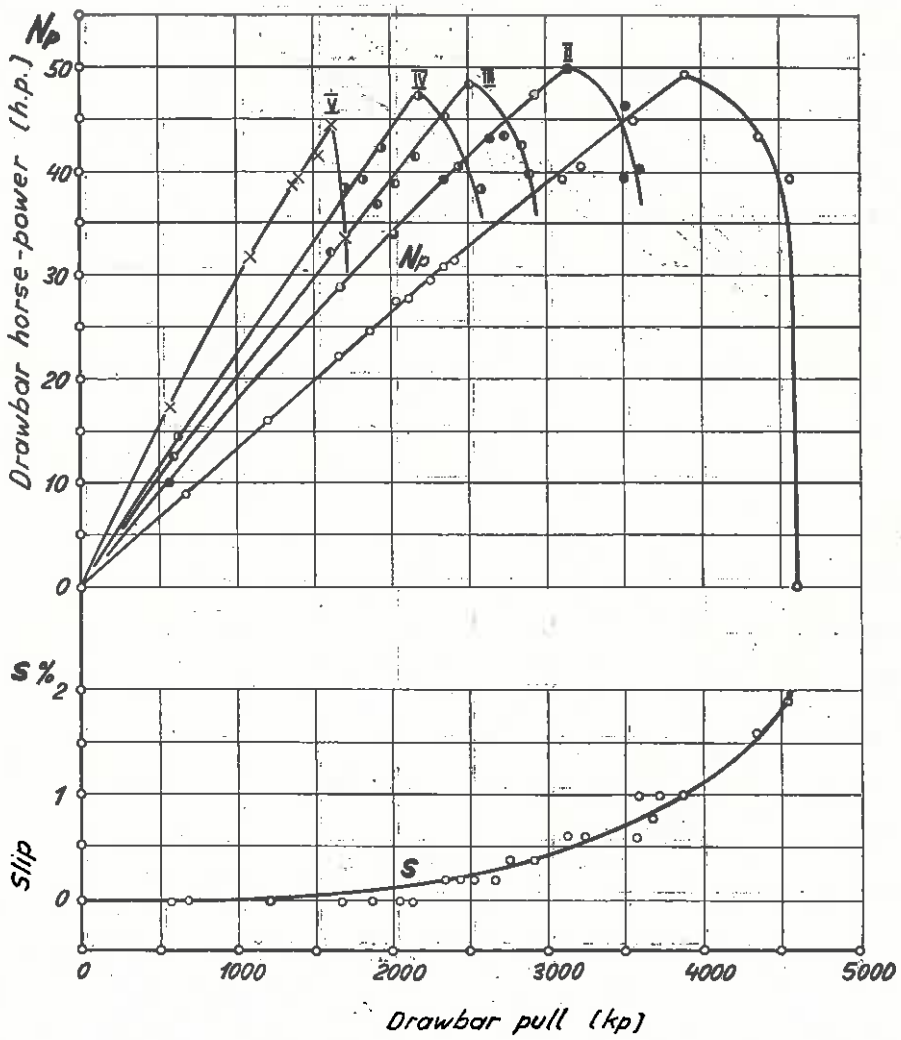
Institut za mehanizaciju poljoprivrede ZAGREB

Tractor BNT-60F
Engine Test

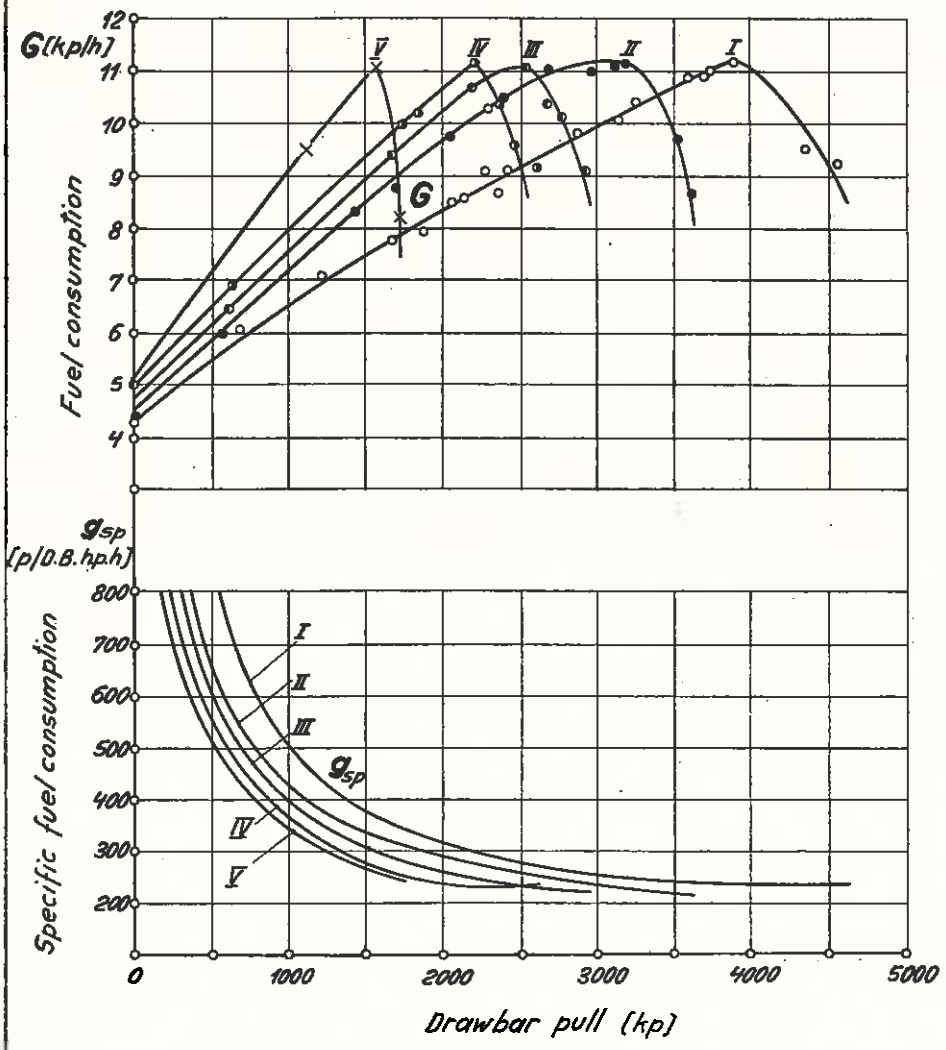
Figure 4



Institut za mehanizaciju poljoprivrede ZAGREB	Tractor BNT-60F Drawbar Test	Figure 5



Institut za mehanizaciju poljoprivrede ZAGREB	Tractor BNT-60F Drawbar Test	Figure 6



Tisak Grafičkog zavoda Hrvatske, Zagreb