

OECD Approval No : 1523 Full Code
Date of Approval : 30 August, 1994

**Report on Test In accordance with the OECD Standard Code
for the Official Testing of Agricultural Tractors**

MITSUBISHI SHAKTI MT 180 D (4WD) TRACTOR



Manufactured by : VST Tillers Tractors Limited
Whitefield Road, Post Box No. 4801,
Mahadevapura - P.O.,
Bangalore - 560 048. I N D I A

Submitted for test by : The Manufacturer

Report No. : 665

Date : June, 1994

**GOVERNMENT OF INDIA
(MINISTRY OF AGRICULTURE)
CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE,
BUDNI (M.P.), INDIA.
PHONE : (07564) 34529.**

T-301/665/1/OECD	MITSUBISHI SHAKTI MT 180 D (4 WD) TRACTOR	
-------------------------	--	--

This is a report on a tractor test in accordance with OECD STANDARD CODE for the Official Testing of Agricultural Tractor.

It does not contain an evaluation of the tractor on practical work.

This report has been approved by the OECD Co-Ordinating Centre (CEMAGREF, France) as being in accordance with the OECD STANDARD CODE.

Date of approval : 30th August, 1994

OECD No.: 1523
Full Code

In this report all performance characteristics are given corresponding to the International System of Units.

The relationship to the Technical System of Units is given by the following conversions:

Forces	1kN	=	1000 N	=	102 kgf
Powers	1kW			=	1,36 PS
Pressures	1MPa	=	10 bar	=	10,2 kgf/cm ²
	100 kPa	=	1000 mbar	=	750,10 mm of Hg

This report should not be reproduced in part or full without prior permission of the Director, Central Farm Machinery Training and Testing Institute, BUDNI (M.P.), India.

CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE - BUDNI

T-301/665/1/OECD	mitsubishi shakti mt 180 d (4 wd) tractor	
-------------------------	--	--

TABLE OF CONTENTS

	PAGE NUMBER
I. SPECIFICATION OF TRACTOR	1
II. CONDITION DURING TEST	13
III. TEST RESULTS	
A. COMPULSORY TESTS	
1. MAIN POWER TAKE-OFF PERFORMANCE (540)	16
2. HYDRAULIC POWER AND LIFTING FORCE	18
3. DRAWBAR PERFORMANCE	20
4. TURNING AREA AND TURNING CIRCLE	23
5. LOCATION OF CENTRE OF GRAVITY	23
6. BRAKING	23
7. MEASUREMENT OF EXTERNAL NOISE LEVEL	24
8. REPAIRS AND ADJUSTMENTS DURING THE TESTS	25
9. REMARKS	25
ANNEXURE - I : MAIN POWER TAKE-OFF CURVES	

T-301/665/1/OECD	MITSUBISHI SHAKTI MT 180 D (4 WD) TRACTOR	1
------------------	---	---

Tractor manufacturer's name and address : M/s VST TILLERS TRACTORS LTD.
P.B.No. 4801, Whitefield Road,
Mahadevapura-P.O.,
Bangalore - 560 048. INDIA.

Location of tractor assembly : Bangalore, India
Submitted for test by : The manufacturer
Selected for test by : C.F.M.T.T.I., BUDNI (M.P.) INDIA
Place of running in : C.F.M.T.T.I., BUDNI (M.P.) INDIA
Duration of running in (hours) : 30
Location of test : C.F.M.T.T.I., BUDNI (M.P.) INDIA

I. SPECIFICATION OF TRACTOR

Tractor

Make : VST
Trade Name : MITSUBISHI SHAKTI
Model : MT 180 D
Type : Four wheel, four wheel driven, unit construction.
Serial Number : TD - 189 A - 01354
1st Serial Number : MT - 180 D - 005

Engine

Make : MITSUBISHI SHAKTI
Model : K 3 C
Type : Four stroke, water cooled, indirect injection,
naturally aspirated, diesel engine.
Serial No. : EK - 3 C 9. A 01479

Cylinders

Number/Disposition	:	Three, Vertical, Inline
Bore/Stroke (mm/mm)	:	70/78
Capacity (cu.cm)	:	900 (as per manufacturer)
Compression ratio	:	23:1 (as per manufacturer)
Arrangement of valves	:	Overhead
Cylinder Liners	:	Dry

Super Charging : None

Fuel System

Fuel Feed System	:	Gravity feed
Make, type and model of fuel filter(s)	:	MICO, LIC-BOSCH, INDIA, one paper element, 9450030101
Capacity of fuel tank (litre)	:	18
Make, type and model of injection pump	:	NIPPON DENSO, JAPAN, Inline, Plunger, 3J K3C - 13 MT 94500-269
Serial No.	:	PER 3M 55/IND 269
Manufacturer's production setting of injection pump at rated engine speed & full load (Cu.mm) per stroke at 40 °C	:	22.5±1.0
Timing	:	21±2 degree before TDC
Make, type and model of injectors	:	NIPPON DENSO, JAPAN, PINTLE 1663 10F & 5F
Injection pressure (MPa)	:	11.8±1.0

Governor

Make	:	VST, India
Model	:	None
Type	:	Mechanical incorporated on injection pump drive gear

T-301/665/1/OECD	mitsubishi shakti mt 180 d (4 wd) tractor	3
-------------------------	--	----------

Governed range of engine speed (rev/min) : 900-2900

Rated engine speed (rev/min) : 2700

Air Cleaner :

Pre-Cleaner

Make, Model and Type : VST, India, none, wire mesh screen

Location of air intake : On top of air cleaner tube, outside bonnet.

Main Air - Cleaner

Make and Type : VST, India, Oil bath

Model : None

Location : Right hand side of engine, outside bonnet

Maintenance indicator : None Fitted

Lubrication System

Type of feed pump : Force feed from Lobe (trochoid) pump

Make, type of filter(s) : Elofic India, full flow replaceable canister

Number : One

Oil cooling device : None

Cooling System

Type of coolant : Water

Type of pump : Centrifugal

Specification of fan : Belt driven, puller

Number of fan blades : Six

Fan diameter (mm) : 295

Coolant capacity (litre) : 5.02

Type of temperature control : None

Super pressure system (kPa) : 88.3

STARTING SYSTEM

Make	:	Mitsubishi Electric, Japan
Model	:	M 2T5
Type	:	Electrical, pre-engaged solenoid operated
Starter motor power rating (kW)	:	1.6
Cold starting aid	:	Heater plug provided for each cylinder
Safety device	:	Operable only when high/low gear range selector is neutral position.

Electrical System

Voltage (V)	:	12
Earthing polarity	:	Negative

Generator

Make	:	PMP Auto India
Model	:	7030 9L-021
Type	:	Alternator, belt driven
Output rating	:	12 V, 35 A

Battery

Number, make and type	:	1, Exide, Type - 6 x N7L, Lead acid
Rating	:	45 Ah at 20 hours discharge rate

Exhaust system

Make	:	VST, India
Model	:	None
Type	:	Horizontal, cylindrical, shielded
Location	:	On left hand side of engine
Height of outlet above ground (mm)	:	755

TRANSMISSION TO WHEELS**Clutch (Travel & power take-off)**

Make	:	Ceekay Auto, India
Model	:	None
Type	:	Dry, single plate
Number of plate(s)	:	One
Diameter of plate(s) (mm)	:	180
Method of operation	:	Mechanically by pedal

Gear box

Make	:	VST, India
Model	:	None
Type	:	Mechanical manual operation, 3 forward and 1 reverse speeds with high and low range selector.
Number of gears	:	6 forward, 2 reverse
Available options	:	None

Rear axle and final drives

Make	:	VST, India
Model	:	None
Type	:	Crown wheel and pinion with outboard final reduction spur gear drives.

Differential lock

Type	:	Mechanical, splined sleeve on right hand differential shaft
Method of engagement	:	Pedal operated
Method of disengagement	:	Automatic

Front axle and final drives

Make	:	VST, India
Model	:	None
Type	:	Crown wheel and pinion, differential assembly and kingpin reduction units
Differential lock	:	None fitted

Total ratios and travelling speeds

Gear	Group or Range	Number of engine revolutions for one revolution of the driving wheels	Nominal travelling speed* at rated engine speed of 2700 rev/min (km/h)
<u>Forward</u>			
1	Low	341.9	1.23
2	Low	225.7	1.87
3	Low	132.7	3.18
1	High	77.7	5.43
2	High	51.3	8.22
3	High	30.2	13.98
<u>Reverse</u>			
1	Low	267.7	1.58
2	High	60.9	6.93

(*) Calculated with rear tyre dynamic rolling radius of 414.3 mm (ISO 4251/1-1984)

Number of revolutions of front wheels for one revolution of rear wheels : 1.54

POWER TAKE - OFF**Main power take - off**

Type	:	Not independent
Method of engagement	:	Mechanically engaged by a hand lever
Number of shaft (s)	:	One
Method of changing power take-off speeds	:	Through hand lever on left hand side of gear box
Clutch	:	See main clutch

Power take-off proportional to engine speed**540 rev/min**

Location	:	Rear of tractor
Diameter of power take-off shaft end (mm)	:	34.84
Number of splines	:	Six to ISO 500/1979
Height above ground (mm)	:	466
Distance from the median plane of the tractor	:	Central
Distance behind rear wheel axis (mm)	:	250
Pto speed at rated engine speed (rev/min):	:	623
Other available pto speeds corresponding to rated engine speed (rev/min)	:	919 and 1506
Engine speed at standard power take-off speed (rev/min)	:	2340
Ratio of rotation speeds (Engine speed to pto speed)	:	4.334:1
Power restriction and maximum torque	:	SAE recommendation 15-25 kW
Direction of rotation (viewed from rear of tractor)	:	Clockwise

POWER LIFT

Make	:	NACHI, Japan
Model	:	None
Type of hydraulic system	:	Open centre, live, single lever operation
Number & type of cylinder (s)	:	One Single acting, internal
Type of linkage lock for transport	:	Hydraulic
Relief valve pressure setting (MPa)	:	13.5
Opening pressure of cylinder safety valve (If fitted)	:	None fitted
Lift pump type	:	Gear
Transmission between pump and engine	:	Driven by engine camshaft
Number and type of filter (s)	:	One, full flow wiremesh strainer
Site of oil reservoir	:	Transmission housing
Type, number and location of tapping point(s)	:	One, an adapter plate fitted to delivery pipe
Maximum volume of oil available to external cylinders (l)	:	12
Auxiliary hydraulic system	:	None fitted

THREE POINT LINKAGE

Category	:	JIS 1 (As per applicant)
Category adapter	:	None
Controls	:	Position control by the action of lift arms.

Table 1.1
Dimensions of linkage when attached to the standard frame

			Dimensions or range (mm)	Setting used in test (mm)
Length of lift arms		(A)	270	270
Length of lower links		(B)	566	566
Distance of lift arm pivot point from rear wheel centre line	Horizontally	(a)	65	65
	Vertically	(b)	272	272
Horizontal distance between the two lower link points		(u)	350	350
Horizontal distance between the two lift arm end points		(v)	248	248
Length of upper link		(S)	450 to 712	528
Distance of upper link pivot point from rear wheel centre line	Horizontally	(c)	160	160
	Vertically	(d)	307/247	307
Distance of lower link pivot point from rear wheel centre line	Horizontally	(e)	156 behind	156
	Vertically	(f)	114 below	114
Distance of lower link pivot points to lift rod pivot points on lower link centre line	Horizontally	(D)	429	429
	Vertically	(E)	On centre line	0
Length of lift rods		(i)	365 to 490	380
Height of lower hitch points relative to the rear wheel centre line (situated 414.3 mm above the ground level)				
- In low position		(h)	369 to 161	214
- In high position		(H)	266 to 58	191
Height of lower hitch points when locked in transport position		Any height within lift range (Hydraulic transport lock)		

Assuming r = tyre dynamic rolling radius of 414 mm

SWINGING DRAWBAR : None fitted

TRAILER HITCH

Type : Box structure

Hole diameter (mm) : 26.5

Height above ground level (mm) : 237 (fixed)

Distance of hitch point from rear wheel axis, horizontally (mm) : 235

Distance of hitch point from the power take-off shaft end (mm) :

- Vertically : 190 below

- Horizontally : 15 forward

Maximum vertical permissible load (kN) : Not specified

HOLED DRAWBAR

Type : Round bar

Length (mm) : 525

No. of holes : 4

Distance between holes (mm) : 105

Dia of holes (mm) : 12

Diameter of drawbar (mm) : 50.0

Height above ground (mm) :

- Minimum : 45

- Maximum : 628

Horizontal distance to power take-off shaft end (mm) : 482

STEERING

Make : VST, India
 Model : None
 Type : Mechanical, screw & nut with re-circulating balls
 Method of operation : Manually by steering control wheel of 396 mm diameter

BRAKES**Steering brakes**

None fitted

Service Brake :

Make : VST, India
 Model : None
 Type : Mechanical, internal expanding shoe
 Method of operation : Independent or combined, pedal, mechanical
 Trailer braking take-off : None fitted

Parking Brake :

Type : Mechanical, lock on service brakes

Method of operation : Hand lever

WHEELS

Number (mm)

Four

Front

Two, steering

Rear

Two, driving

Wheel base (mm)

1425

Track width adjustment :

	Minimum (mm)	Maximum (mm)	Adjustment method
Front	806	806	None
Rear	730	880	By interchanging wheels

T-301/665/1/OECD	MITSUBISHI SHAKTI MT 180 D (4 WD) TRACTOR	12
------------------	---	----

PROTECTIVE STRUCTURE : None fitted

DRIVER'S SEAT

Make/Model/Type : VST, India/None/Cushioned

Type of suspension & damping : Helical springs with rubber damper

Range of adjustment (mm) :

Longitudinal : 60

Vertical : None

MISCELLANEOUS

Additional seat : None fitted

LIGHTING

Unrestricted beam angle in plan view : 130 degree

	Height of centre of beam above ground (mm)	Size (mm)	Distance from outside edge of lights to median plane of tractor (mm)
Head lights	775	140x80	208
Side lights	970	75x60	415
Rear lights	960	70	337
Rear mudguard reflector	875	65x45	335

T-301/665/1/OECD	MITSUBISHI SHAKTI MT 180 D (4 WD) TRACTOR	13
------------------	---	----

II. CONDITIONS DURING TEST

Overall dimensions :

	Length (mm)	Width		Height at top of	
		Minimum (mm)	Maximum (mm)	Seat backrest (mm)	Protective structure (mm)
Ballasted	2713	961	1105	1280	--
Unballasted	2613	925	1105	1280	--

Ground clearance of unballasted tractor (mm)

: 200

Clearance limiting part

: Plates for mounting lower links bracket

Tractor mass (4 WD) :

	Ballasted		Unballasted	
	Without driver (Kg)	With driver (Kg)	Without driver (Kg)	With driver (Kg)
Front	360	375	300	315
Rear	445	505	385	445
Total	805	880	685	760

Ballast :

	Weights		Water (Kg)
	Number	Total mass (Kg)	
Front (On frame)	3	60	Nil
Rear	1 per wheel	60	Nil

T-301/665/1/OECD	MITSUBISHI SHAKTI MT 180 D (4 WD) TRACTOR	14
------------------	---	----

Tyres and Trackwidth Specification

Parameter	Front	Rear
Tyres :		
Dimensions	5.00-12	8.00-18
Ply rating	4	4
Type	Cross ply	Cross ply
Maximum load (tyre manufacturer's) kg.	210	520
Maximum load (tractor manufacturer's) kg.	210	520
Inflation pressure (tyre manufacturer's) bar	2.2	1
Dynamic rolling radius, mm	269	414
Chosen track width: (manufacturer's nominal) mm	806	730

Oils and Lubrication

Capacity and Change Interval :

	Capacity (l)	Oil change (h)	Filter change (h)
Engine	3.0	1st change 30 hours subsequent change after every 100 hours	Same as Engine oil
Front axle and final drive	2.5	1st change after 30 hours subsequent change after every 200 hours	Not applicable
Gear box, Rear axle, Hydraulic system Final drive(rear)	11.65	1st change after 30 hours, subsequent change after every 200 hours	No change only cleaning
Steering	Approx 200 gms of grease	Replace only while overhauling	Not applicable

T-301/665/1/OECD	MITSUBISHI SHAKTI MT 180 D (4 WD) TRACTOR	15
------------------	---	----

Specifications

Oils/Lubricants	Recommended	Used during test
<u>Engine oil</u> Type	SAE 30 at 10 to 30 degree C SAE 40 or SAE 20 W 40 at 30 degree C and above	As recommended
<u>Transmission oil and final drives (rear) oil</u> Type	SAE 85 W at 0 to 35 degree C SAE 90 EP at 10 degree C and above	As recommended
<u>Front differential & final drive oil</u> Type	SAE 85 W/SAE 90 EP at 10 degree C and above	As recommended
Hydraulic fluid	Common with transmission	---
<u>Steering</u> Type	M.P. Grease	M.P. Grease
Recommended grease	M.P. Grease & wheel bearing grease	M.P. Grease
Number of lubrication points	9	

Fuel :
Type

: High speed Diesel oil with diesel index of 57 and Kinematic Viscosity of 2.8 cSt at 38 degree C meeting specification of Indian standard Number 1460-1974.

Density

: 0.842 kg/l at 15 degree C

T-301/665/1/OECD	MITSUBISHI SHAKTI MT 180 D (4 WD) TRACTOR	16
------------------	---	----

III. TEST RESULTS

A. COMPULSAORY TESTS

1. MAIN POWER TAKE-OFF PERFORMANCE

Date and location of tests : 20.10.93 & 21.10.93
at CFMT&TI, BUDNI (M.P.) INDIA

Type of dynamometer : Eddy current, Fuchino

Power (kW)	Speed, rev/min.		Fuel consumption			Specific Energy (kWh/l)
	Engine	P.T.O.	Hourly,		Specific,	
			(l/h)	(kg/h)	(g/kWh)	
1	2	3	4	5	6	7
1.1 MAXIMUM POWER - 2 HOUR TEST						
11.6	2700	623	4.79	4.03	349	2.42
1.2 POWER AT RATED ENGINE SPEED						
11.6	2700	623	4.81	4.05	348	2.42
1.3 POWER AT STANDARD POWER TAKE - OFF SPEED (540±10 rev/min)						
10.9	2340	540	4.37	3.68	336	2.50
1.4 PART LOADS						
1.4.1 Torque corresponding to maximum power :						
11.6	2700	623	4.81	4.05	348	2.42
1.4.2 85% of the torque obtained in 1.4.1 :						
10.1	2739	632	3.92	3.30	326	2.58
1.4.3 75% of the torque defined in 1.4.2 :						
7.7	2787	643	3.30	2.78	360	2.34
1.4.4 50% of the torque defined in 1.4.2 :						
5.5	2843	656	2.75	2.32	418	2.01

T-301/665/1/OECD	MITSUBISHI SHAKTI MT 180 D (4 WD) TRACTOR	17
------------------	---	----

1	2	3	4	5	6	7
1.4.5 25% of the torque defined in 1.4.2 :						
3.0	2878	664	2.20	1.85	622	1.35
14.6 Unloaded :						
0.0	2917	673	1.56	1.31	—	—
1.5 PART LOADS AT STANDARD POWER TAKE-OFF SPEEDS (540±10 rev/min)						
1.5.1 The torque corresponding to maximum power :						
10.9	2340	540	4.37	3.68	336	2.50
1.5.2 85% of torque obtained in 1.5.1 :						
9.7	2405	555	3.66	3.09	319	2.64
1.5.3 75% of torque defined in 1.5.2 :						
7.4	2440	563	2.96	2.49	335	2.51
1.5.4 50% of torque defined in 1.5.2 :						
5.1	2535	585	2.40	2.02	396	2.13
1.5.5 25% of torque defined in 1.5.2 :						
2.6	2579	595	1.87	1.58	613	1.37
1.5.6 Unloaded :						
0.0	2613	603	1.35	1.14	—	—

No load maximum engine speed : 2917 rev/min

Equivalent crankshaft torque
at maximum power (2 hours test) : 40.9 Nm

Equivalent crankshaft torque at
rated engine speed : 41.2 Nm

Maximum equivalent crankshaft
torque (Engine speed 2000 rev/min) : 45.7 Nm

T-301/665/1/OECD	MITSUBISHI SHAKTI MT 180 D (4 WD) TRACTOR	18
------------------	---	----

Mean Atmospheric Conditions :

Temperature	:	27 degree C
Pressure	:	98.2 kPa
Relative humidity	:	77%

Maximum Temperatures :

Coolant	:	103 degree C
Engine oil	:	117 degree C
Fuel	:	27 degree C
Engine air intake	:	45 degree C

2. HYDRAULIC POWER AND LIFTING FORCE :

Date of tests	:	12.02.91 to 14.02.91 and 23.08.93
---------------	---	-----------------------------------

2.1 Hydraulic Power Test

Sustained pressure with relief valve open	:	13.5 MPa
Pump delivery rate at minimum pressure	:	12.0 l/min

	Flow rate l/min	Pressure MPa	Power kW
Flow rate corresponding to a hydraulic pressure equivalent to 90% of the actual relief valve pressure setting and corresponding hydraulic power	11.7	12.2	2.4
Flow rate and hydraulic pressure corresponding to maximum hydraulic power	12.0	12.0	2.4

T-301/665/1/OECD	MITSUBISHI SHAKTI MT 180 D (4 WD) TRACTOR	19
------------------	---	----

Tapping point used for test : External circuit tapping

Temperature of hydraulic fluid,
if different from 65 ± 5 degree C : N.A.

Opening pressure of the unloading valve : N.A.

Closing pressure of the unloading valve : N.A.

2.2 Power Lift Test

	At the hitch point	On the frame
Height of lower hitch points above ground in down position	200 mm	200 mm
Vertical movement	390 mm	405 mm
Maximum corrected force exerted through full range	4.08 kN	3.00 kN
Corresponding pressure of hydraulic fluid	12.2 MPa	12.2 MPa
Moment about rear wheel axis	2.99 kNm	4.03 kNm
Maximum tilt angle of mast from vertical	—	7 degrees

Linkage settings for test - see Table 1.1 and Figure 1.1

T-301/665/1/OECD	mitsubishi shakti mt 180 D (4 WD) TRACTOR	20
------------------	---	----

Lifting heights relative to the horizontal plane including the lower link pivot points :											
mm	-100	-60	-55	0	+100	+200	+290	+300	+325	+340	+350
Lifting forces (the values measured are corrected to correspond to a hydraulic pressure equivalent to 90% of the actual relief valve pressure delivered by the hydraulic system :											
at the hitch points, kN	5.11	4.85	—	4.72	4.33	4.18	4.16	2.16★	—	—	—
Corresponding pressure : 12.2 MPa											
at the frame kN	—	—	4.73	4.51	4.08	3.82	—	3.57	3.48	3.18	3.00
Corresponding pressure : 12.2 MPa											

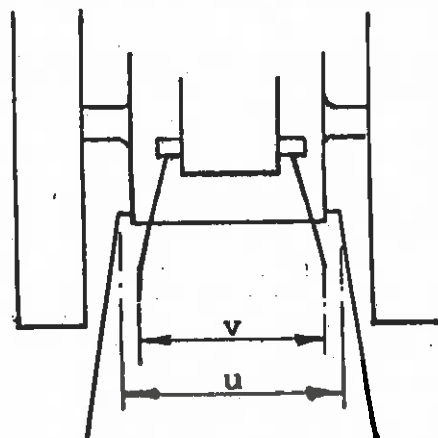
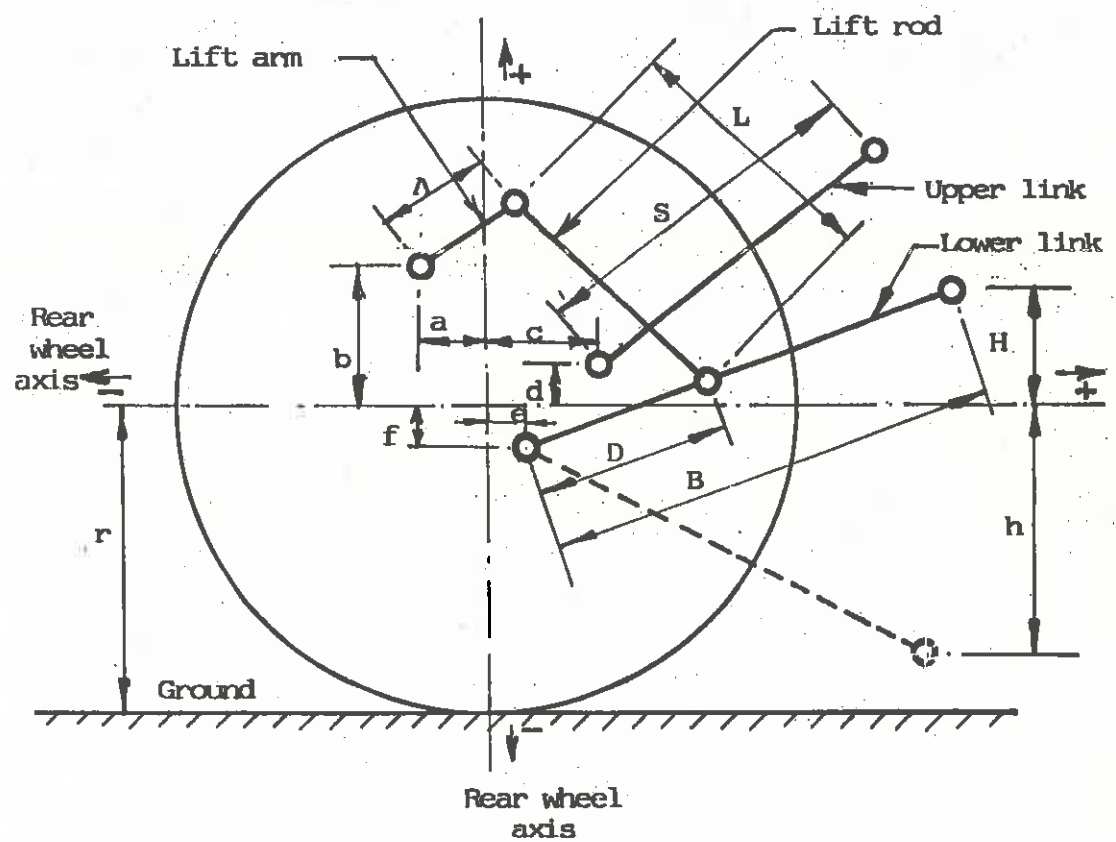
★ Value corresponds to R.V. pressure of 6.49 MPa.

3. DRAWBAR PERFORMANCE

Date of test : 14.01.94 to 28.01.94

Type of track : Concrete

		Tyre inflation pressure (kPa)	
Condition	Height of drawbar above ground (mm)	Front	Rear
Unballasted	410 (2 WD) / 395 (4WD)	216	98
Ballasted	395 (2WD) / 395 (4WD)	216	98



LIFT TEST

Linkage Geometry

Gear and range	Power (kW)	Drawbar pull (kN)	Speed (km/h)	Engine speed (rev/min)	Wheel slip Rear/Front (%)	Specific Fuel Consumption (g/kWh)	Specific energy (kWh/l)	Temperature			Atmospheric Conditions		
								Fuel (°C)	Coolant (°C)	Engine oil (°C)	Temperature (°C)	Relative humidity (%)	Pressure (kPa)

3.1 MAXIMUM POWER IN TESTED GEARS (Unballasted Tractor)**3.1.1 Tractor with front axle disengaged (rear wheel drive only) :**

+L1	1.3	4.4	1.09	2868	15.2	1301	0.64	22	64	76	20	51	98.6
+L2	2.0	4.3	1.66	2867	15.1	942	0.88	22	62	77	20	51	98.7
+L3	3.3	4.2	2.80	2847	14.9	651	1.28	20	66	75	19	49	98.6
+H1	5.8	4.4	4.69	2789	15.2	500	1.66	18	66	75	18	53	98.6
H2	8.1	4.2	6.97	2725	14.9	424	1.94	28	76	80	24	41	98.2

3.1.2 Tractor with front axle engaged (rear and front wheel drive) :

+L1	1.9	6.6	1.05	2871	14.9/15.4	955	0.88	27	68	80	25	74	98.7
+L2	3.0	6.8	1.58	2841	15.2/15.1	710	1.16	27	72	81	23	78	98.7
+L3	4.7	6.4	2.66	2808	14.9/11.5	523	1.58	28	75	84	28	61	98.1
+H1	7.9	6.5	4.41	2714	14.9/13.8	442	1.87	22	76	81	21	85	98.8
H2	9.6	4.9	6.98	2699	10.6/8.1	414	2.00	24	79	82	22	84	98.7

3.2 MAXIMUM POWER IN TESTED GEARS (Ballasted Tractor)**3.2.1 Tractor with front axle disengaged (rear wheel drive only) :**

+L1	1.8	6.2	1.04	2849	15.1	985	0.83	35	75	86	33	48	98.5
+L2	2.7	6.3	1.55	2824	15.1	736	1.12	26	69	83	28	52	98.8
+L3	4.6	6.2	2.64	2806	15.0	529	1.56	26	74	85	28	53	98.7
+H1	7.4	6.1	4.35	2705	15.0	435	1.90	27	78	87	28	55	98.7
H2	9.4	5.0	6.85	2701	12.0	405	2.03	29	80	88	28	53	98.7

Gear and range	Power (kW)	Drawbar pull (kN)	Speed (km/h)	Engine speed (rev/min)	Wheel slip Rear/ Front (%)	Specific Fuel Consumption (g/kWh)	Specific energy (kWh/l)	Temperature			Atmospheric Conditions		
								Fuel (°C)	Cool-ant (°C)	Engine oil (°C)	Tempe- rature (°C)	Relative humidity (%)	Pressure (kPa)
3.2.2 Tractor with front axle engaged (rear and front wheel drive) :													
+L1	2.2	7.7	1.03	2830	14.6/14.5	832	0.99	35	75	86	31	47	98.6
+L2	3.3	7.7	1.55	2801	14.6/16.4	628	1.31	33	76	83	31	49	98.5
+L3	5.7	7.9	2.60	2776	15.1/14.7	464	1.77	32	80	90	31	49	98.5
+H1	9.2	7.7	4.33	2695	15.0/13.0	414	1.99	26	92	95	28	57	98.8
H2	9.9	5.0	7.06	2696	8.4/9.3	396	2.07	33	90	97	30	53	98.7
3.3 TEN HOUR TEST :													
3.3.1 FIVE HOURS TEST at 75% of pull at maximum power,tractor with front axle engaged (rear and front wheel drive)													
H1	7.6	5.8	4.71	2739	8.7/7.2	398	2.07	23 to 33	80 to 88	90 to 99	26 to 33	38 to 57	98.5 to 98.8
3.3.2 FIVE HOUR TEST at pull corresponding to 15% wheel slip In 3.2.2 above, tractor with front axle engaged (rear and front wheel drive) :													
H1	9.5	7.7	4.43	2721	—	412	2.00	25 to 33	79 to 94	84 to 104	23 to 34	37 to 70	98.3 to 98.5

+ Maximum power restricted by wheel slip.

Total lubricating oil consumption during ten hours was observed to be 9.5 ml/h.

Remarks: The tests in higher gear (H3) than the gear (H2) in which maximum power was obtained could not be conducted due to the reason that tractor was found loosing direction control during operation when being pushed by tractor test loadcar.

T-301/665/1/OECD	MITSUBISHI SHAKTI MT 180 D (4 WD) TRACTOR	24
------------------	---	----

6.2 Fade Test

Speed before application of brakes km/h	Braking device control force, N	Mean deceleration m/sec ²
14.72	400	4.77

Maximum deviation of tractor
from its original course : None

Abnormal vibration : None

Brakes heating method : By towing

6.3 Parking Braking Device Test

Parameter	Ballasted tractor on 18% slope	
	Up hill	Down hill
Braking device control force (N)	235	235

7. MEASUREMENT OF EXTERNAL NOISE LEVEL

Date of test : 05.02.91

Sound level meter, Make/Type : Bruel & Kjaer/2230

Type of track : Concrete

Gear : 3

Range : High

Travelling speed before acceleration : 10.2 km/h

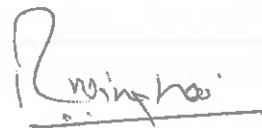

Sound level : 79.5 dB (A)

T-301/665/1/OECD	MITSUBISHI SHAKTI MT 180 D (4 WD) TRACTOR	25
------------------	---	----

8. REPAIRS AND ADJUSTMENTS DURING TESTS (Including running-in):

- 8.1 The high pressure pipe assembly of No. 1 fuel injector was replaced with new one.
- 8.2 Excessive leakage of diesel oil was noticed from joint of fuel unit (Part No. 1021003000) and fuel tank. Leakage rectified.
- 8.3 Low idle speed was adjusted to 900 rev/min.
- 8.4 Toe in/Toe out of front wheels was observed to be on higher side. It was adjusted to 3 to 4 mm.
- 8.5 The electrical system/starting circuit of the tractor was inoperative due to disconnection of the regulator assembly wires at soldered joints. The joints were repaired by soldering.

9. REMARKS : None

Test carried out at CFMT&TI, BUDNI, (M.P.), INDIA	
R.K. SINGHAI ASSISTANT ENGINEER (W)	
R. TIWARI DIRECTOR	

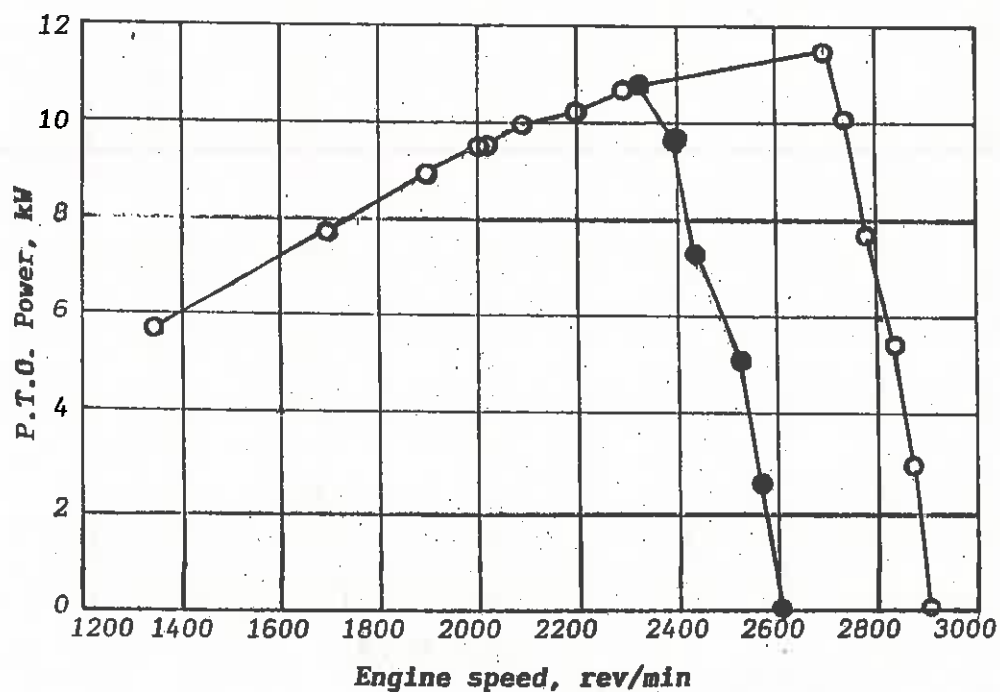
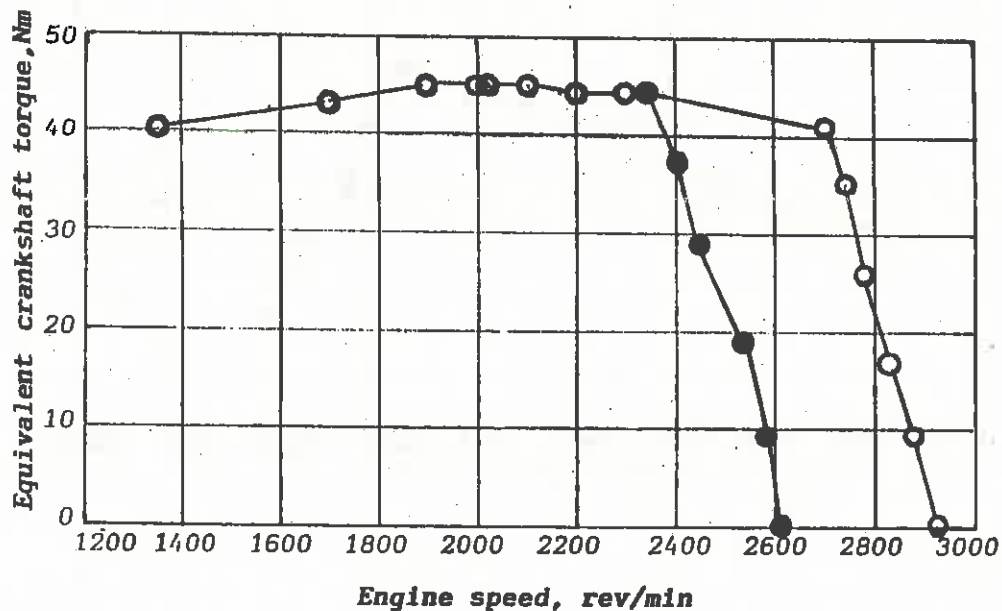
Dated : 20th June, 1994

PTO POWER TEST

ANNEX I POWER TAKE OFF CURVES

Governor set for maximum power at rated speed — 0

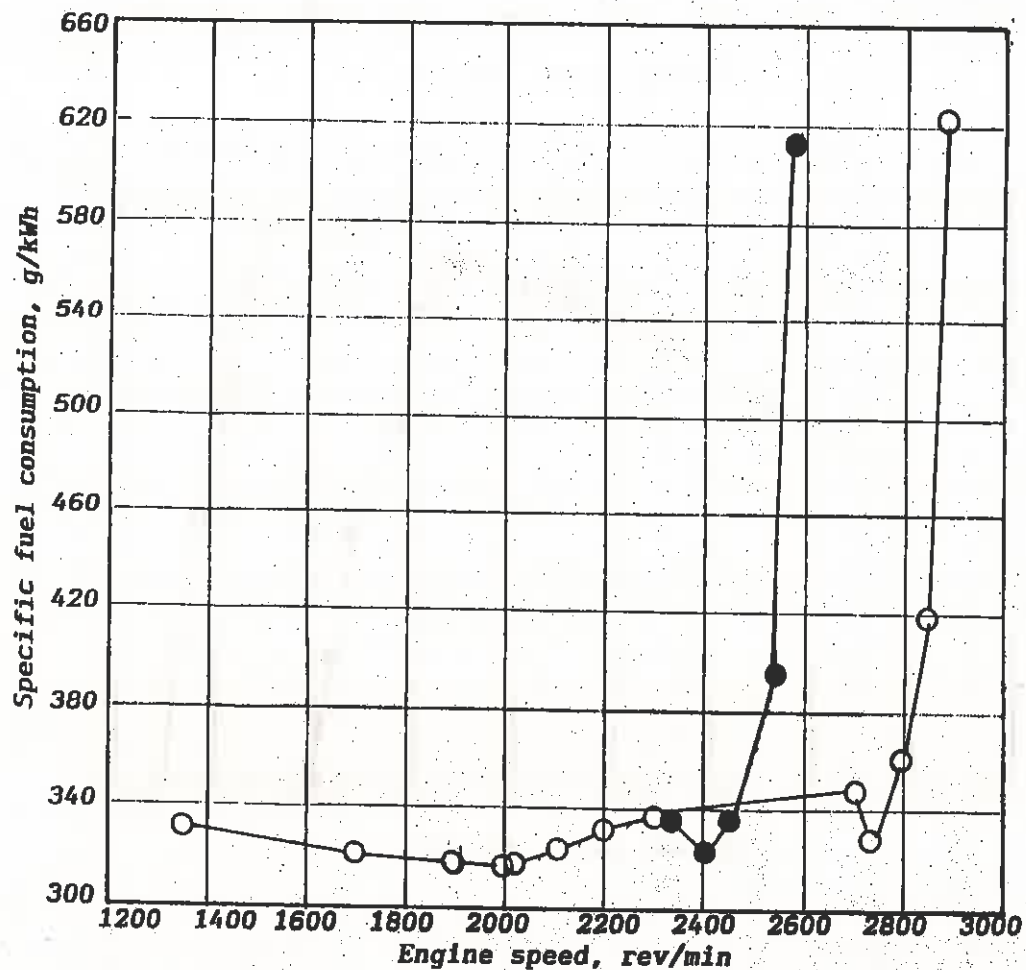
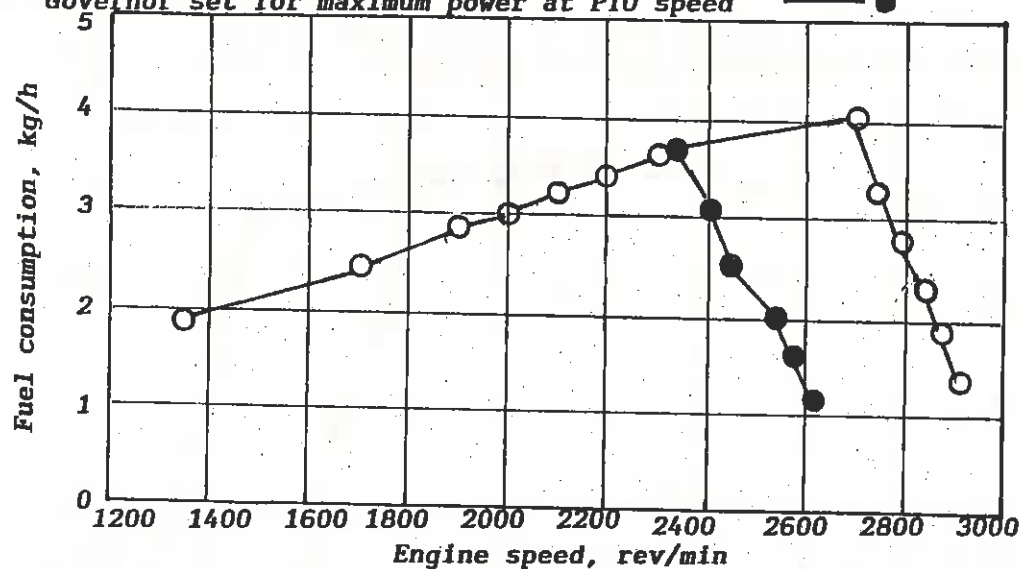
Governor set for maximum power at PTO speed — ●



PTO POWER TEST

ANNEX I POWER TAKE OFF CURVES

Governor set for maximum power at rated speed —○—
 Governor set for maximum power at PTO speed —●—



ANNEX I POWER TAKE OFF CURVESPTO POWER TEST

Governor set for maximum power at rated speed — ○ —
Governor set for maximum power at PTO speed — ● —

