व्यावसायिक परीक्षण रिपोर्ट

COMMERCIAL TEST REPORT

संख्या/ **No.: Machine- 57/3100/2023**

माह/**Month: November, 2023**

THIS TEST REPORT VALID UP TO : 30th November, 2028

SPRAYMAN, S105
BRUSH CUTTER

भारत सरकार

Government of India

कृषि एवं किसान कल्याण मंत्रालय

Ministry of Agriculture and Farmers Welfare

कृषि एवं किसान कल्याण विभाग

Department of Agriculture and Farmers Welfare

उत्तरी क्षेत्र कृषि मशीनरी प्रशिक्षण एवं परीक्षण संस्थान

Northern Region Farm Machinery Training and Testing Institute

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[ISO 9001:2015 CERTIFIED]

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Sr. No.	Location		HD (μ)	VD (μ)
1	Handle	Left	100	90
		Right	60	120
2	Engine cover		500*	550*
3	Frame pipe		90	110
4.	Grass deflector		220*	210*

* The amplitude of mechanical vibration is on higher side.

10. NOISE MEASUREMENT

Noise at operator's ear level

Date of test	:	28.10.2023
Type of sound level meter	:	Casella CEL-63X
Temperature, ^{0}C	:	27.8
Pressure, kPa	:	98.8
Relative humidity, %	:	42.3
Background noise level, dB(A)	:	52.6
Observed noise level, dB(A)	:	82.0

11. HARDNESS AND CHEMICAL COMPOSITION OF ROTOR BLADES

11.1 Hardness:

11.1.1 Hardness of triangular blade:

Sr. No.	As per IS 6025:1982 (HRC)	As observed (HRC)	Remarks
	48 to 58	42.9	**Does not conform**

11.2 Chemical composition analysis:

11.2.1 Triangular blade:

Constituents	As per IS 6025:1982	Composition as observed (% of weight)	Remarks
Carbon (C)	0.70-0.95	0.73	Conforms
Manganese (Mn)	0.30 to 0.50	0.53	**Does not conform**
Silicon (Si)	--	0.41	--
Sulphur (S)	--	0.04	--
Phosphorous (P)	--	0.02	--

12. FIELD TEST

Field tests were conducted for 15.33 hours with triangular blade attachment and 12.59 hours with Nylon rope attachment. Detailed results of field tests are shown in Annexure-I & II and summarized in the ensuing table. Details about the operator are show in Annexure-III.

Sr. No.	Parameters	Seasonal Grass cutting	
		For triangular blade	For nylon rope
1	Field condition	Leveled	Leveled
2	Intensity of grass	High	High
3	Number of grass/weed in 1 sq. m	195 to 322	180 to 308

4	Height of grass/weed, cm	12 to 18	12 to 17
5	Diameter of grass/weed, mm	0.9 to 3.2	0.8 to 1.5
6	Mass of grass cut (kg/h)	89.9 to 173.4	89.9 to 126.7
7	Area covered (Rate of work), ha/h	0.030 to 0.031	0.025 to 0.036
8	Time required for one hectare, h	31.90 to 33.20	27.78 to 40.00
9	Fuel consumption l/h l/ha	 0.580 to 0.701 18.71 to 22.38	 0.400 to 0.520 14.44 to 17.24

12.1 Cutting using triangular blade

12.1.1 Rate of work

i) The average area covered (rate of work) was observed as 0.030 to 0.031 ha/h.
ii) Average time required for one hectare was observed as 31.90 to 33.20 hours.
iii) Average numbers of perennial weed in one square meter are was 195 to 322
iv) Average mass of perennial weed cut was 89.9 to 173.4 kg/h.

12.1.2 Fuel consumption

Fuel consumption was observed as 0.580 to 0.701 l/h and 18.71 to 22.38 l/ha.

12.2 Cutting using nylon rope assembly

12.2.1 Rate of work

i) Average area covered (rate of work)was observed as 0.025 to 0.036 ha/h.
ii) Average time required for one hectare was observed as 27.78 to 40.00 h.
iii) Average mass of grass cut was observed as 89.9 to 126.7 kg/h.
iv) Average No. of grass stem in one m^2 area was 180 to 308

12.2.2 Fuel consumption

Average fuel consumption was observed as 0.400 to 0.520 l/h. and 14.44 to 17.24 l/ha.

12.3 Labor requirement

To ensure the cutting work without interruption, two operators are required to work alternatively. Additionally, one more labor is needed to gather the collected bush/weeds.

12.4 Adequacy of power of prime mover

The power of prime mover was found adequate.

12.5 Wear analysis of critical components

Component	Duration of operation (h)	Initial length/ mass (mm/g)	Length/ Mass after operation (mm/g)	Loss of length/ mass (mm/g)	Percentage wear	Percentage wear on hour basis (27.92 hrs.)
Triangular blade	15.33	371.8	350.2	29.6	5.81	0.38
Nylon rope	12.59	2400	400	2000	83.33	6.62

13. EASE OF OPERATION & ADJUSTMENTS

Fatigue was observed just after half an hour of operation of the brush cutter, mainly, due to excessive mechanical vibration and noise. The operator complained about pain in different parts of his body like wrist & shoulder etc during operation.

Work-Rest cycle for this brush cutter is observed on follows:

30 minutes work – 10 minutes rest – 20 minutes work – 10 minutes rest – 20 minutes work -15

15.1.6 Piston Rings groove clearance:

Ring no.	Ring groove clearance, mm	Max. permissible wear limit, mm
1st compression ring	0.07	0.15
2nd compression ring	0.09	0.15
Oil ring	Not measured due to ring design constraint	

15.1.7 Valve guide clearance:

Valve guide diameter (mm)		Valve stem diameter (mm)		Valve guide clearance (mm)		Max. permissible wear limit (mm)	
Inlet	Exhaust	Inlet	Exhaust	Inlet	Exhaust	Inlet	Exhaust
3.50	3.51	3.47	3.46	0.03	0.05	-	-

15.2 Valve guides and valve springs

Valve spring stiffness, kgf/mm : Inlet valve - 0.48
Exhaust valve - 0.51

16. CRITICAL TECHNICAL SPECIFICATION
(Vide Ministry's communication No 13-9/2019 M &T (I&P) dated 26.04.2019)

Sr. No.	Parameters	Specification	Observed	Remarks
1.	Type	Self propelled, portable	Triangular Blade	Conforms
2.	Type of cutting attachment	Circular disc/Straight blade/nylon rope	Straight blade & nylon rope used	Conforms
		Circular blade		
3.	Material of Circular/straight blade	Alloy Steel	Alloy	Conforms
4.	No. of teeth on circular disc blade	50-100	Circular blade is not recommended by applicant	--
5.	Root diameter/Overall diameter (mm)	200-270		
6.	Thickness of disc (mm)	1.5 Min		
7.	Teeth thickness (mm)	2.0 Min		
8.	Material of Blade	M42		
9.	Hardness of Blade, HRC	68-70		
		Triangular blade		
10.	Diameter of straight/triangular blade (mm)	250-350	250	Conforms
11.	Width of ends/at center (mm)	50/70, Min.	50/70	Conforms
12.	Thickness of straight/ triangular blade (mm)	1.5 Min	1.5	Conforms
		Nylon rope		
13.	Length of nylon rope (mm)	2000-4000	Length 2400 mm	Conforms
14.	Diameter of nylon rope (mm)	2.5 to 4.0	Diameter- 2.6 mm	Conforms
15.	Type of engine	Compression ignition/Spark ignition	Spark Ignition	Conforms
16.	Starting method	Manual/recoil/self-starting	Manual/Recoil Start	Conforms
17	Type of clutch	Cone/centrifugal	Centrifugal	Conforms

18.	Type of gear drive	Bevel pinion	Bevel pinion	Conforms
19.	Capacity of fuel tank (l)	1.0 (min)	1.0 lit.	Conforms
20	On off provision in fuel supply system	Must be provided	Provided	Conforms
21.	Provision for easy start of engine	Must be provided	Choke is provided	Conforms
22.	Provision for emergency stop of engine	Must be provided	Provided	Conforms
23.	Provision for shield/cover to prevent flying of mud and stone from rotor	Must be provided	Provided	Conforms
24.	Provision for Grass deflector at the rear of the cutting mechanism			
25.	Provision for Pad with shoulder bet to dampen the vibration	Must be provided	Provided	Conforms
26.	Provision for cover on exhaust.	Must be provided	Provided	Conforms
27.	Direction of exhaust emission away from operator	Must be provided	Provided	Conforms
28.	Provision for safety kit (helmet, ear plug, mask, hand gloves, safety glass, Protective cloth, safety shoes)	Must be provided	Provided	Conforms
29.	Marking/labeling of machine	The labeling plate should be riveted on the body of machine having Name and address of manufacturer & Applicant, country of origin Make, Model, year of manufacturer, Serial Number, Engine number, Engine HP, rated rpm & SFC.	A sticker is provided on the machine having following information Make- Sprayman Model-S105 Engine – JX35 Power – 0.80 kW Serial No.- ZAE35400012 SPC- 0.525 kg/	**Partially conform**
30.	Literatures	Operator manual, Service manual and Parts catalogue should be provided.	Provided	Conforms

17. COMMENTS AND RECOMMENDATIONS

17.1 The amplitude of mechanical vibration marked as (*) on the relevant chapter, are on drastically higher side. It is not just directly concerned with operator's health, safety and comfort, but also adversely affects the useful life of the components. In view of above, this deserved to be given top priority for corrective action.

17.2 The chemical composition of blades does not conform, to the requirements of IS: 6025-1982. This needs to be looked into for corrective action.

17.3 The hardness of blade does not conform, to the requirements of IS 6025:1982.

17.4 A suitable labeling plate (not sticker) needs to be provided with "Interlia" following information.

1. Name and address of manufacturer
2. Name and address of applicant
3. Country of origin
4. Make
5. Model
6. Year of manufacture
7. Serial number
8. Engine number
9. Enginc hp
10. Rated rpm
11. SFC

17.5 The frequency of breakage of nylon rope is high.

18. TECHNICAL LITERATURES

Only user's manual was provided by the applicant during the test.

The following literatures, therefore, **MUST** be provided as per IS 8132:1999 for guidance.

i) Operator's manual
ii) Service manual
iii) Parts catalogue

TESTING AUTHORITY

Er. SANJAY KUMAR **AGRICULTURAL ENGINEER**	
Dr. MUKESH JAIN **DIRECTOR**	06.11.2023

19. APPLICANT'S COMMENTS

Sr. No.	Our reference	Applicant comments
19.1	17.1	We will ask manufacturer to find the ways to reduce the vibration.
19.2	17.2 & 17.3	We will change the blade composition and hardness as per IS standard.
19.3	17.4	We will change the labelling plate information as per IS standards.