व्यावसायिक परीक्षण रिपोर्ट
**COMMERCIAL TEST REPORT**

संख्या/ **No.: Machine- 47/2981/2023**
माह/**Month: April, 2023**

**THIS TEST REPORT VALID UP TO : 30th April, 2028**

# NEPTUNE, NBC-520
# BRUSH CUTTER


सत्यमेव जयते
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
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## 11. HARDNESS AND CHEMICAL COMPOSITION OF ROTOR BLADES

### 11.1 Hardness:

### 11.1.1 Hardness of circular blade:

| Sr. No. | As per IS: 6025:1982 HRC | As observed (HRC) | Remarks |
|---|---|---|---|
| | 48 to 58 | 48.1 | Conforms |

### 11.2 Chemical composition analysis:

### 11.2.1 Circular blade:

| Constituents | As per IS: 6025-1982 | Composition as observed (% of weight) | Remarks |
|---|---|---|---|
| Carbon (C) | 0.70 to 0.95 | 0.6304 | **Does not conform** |
| Manganese (Mn) | 0.30 to 0.50 | 1.5432 | **Does not conform** |
| Silicon (Si) | -- | 0.3062 | -- |
| Sulphur (S) | -- | 0.0460 | -- |
| Phosphorous (P) | -- | 0.0192 | -- |

## 12. FIELD TEST

Field tests were conducted for 12.15 hours with circular blade attachment and 13.74 hours with straight blade 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 circular blade | For nylon blade |
| 1. | Field condition | Leveled | Leveled |
| 2. | Intensity of grass | Medium | Medium |
| 3. | Number of grass/weed in 1 sq. m | 38 to 101 | 230 to 760 |
| 4. | Height of grass/weed, cm | 69 to 267 | 08 to 54 |
| 5. | Diameter of grass/weed, mm | 3.1 to 12.5 | 0.54 to 4.5 |
| 6. | Mass of grass cut, Kg/h | 110.80 to 128.00 | 11.70 to 35.90 |
| 7. | Area covered (Rate of work) ha/h | 0.054 to 0.061 | 0.052 to 0.063 |
| 8. | Time required for one hectare, h | 16.39 to 18.52 | 15.87 to 19.23 |
| 9. | Fuel consumption<br>l/h<br>l/ha | <br>1.07 to 1.10<br>17.54 to 19.64 | <br>1.00 to 1.20<br>16.95 to 21.15 |

### 12.1 Cutting using circular blade

### 12.1.1 Rate of work

i) Area covered (Rate of work) was observed as 0.54 to 0.061 ha/h.
ii) Time required for one hectare was observed as 16.39 to 18.52 hours.
iii) Numbers of perennial weed in one square meter was 38 to 101
iv) Mass of perennial weed cut was 110.80 to 128.00 kg/h.

### 12.1.2 Fuel consumption

Fuel consumption was observed as 1.07 to 1.10 l/h and 17.54 to 19.64 l/ha.

**12.2 Cutting using nylon rope assembly**

**12.2.1 Rate of work**

i) Area covered (Rate of work) was observed as 0.052 to 0.063 ha/h.

ii) Time required for one hectare was observed as 15.87 to 19.23 h

iii) Mass of grass cut was observed as 11.70 to 35.90 kg/h.

iv) No. of grass stem in one $m^2$ area was 230 to 760

**12.2.2 Fuel consumption**

Fuel consumption was observed as 1.00 to 1.20 l/h. and 16.95 to 21.15 l/ha.

**12.3 Labor requirement**

To ensure the cutting work without interruption, two operators are required to work alternatively. Additionally, one more labour 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 |
|---|---|---|---|---|---|---|
| Circular blade | 12.15 | 369.60 | 358.70 | 10.90 | 2.95 | 0.24 |
| Nylon rope | 13.74 | 3370.00 | 315.00 | 3055.00 | 90.65 | 6.59 |

## 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 as follows

30 minutes work – 10 minutes rest – 20 minutes work – 10 minutes rest – 20 minutes work -15 minutes rest & so on.

## 14. ADJUSTMENT, DEFECTS, BREAKDOWNS & REPAIR

No noticeable defect/breakdown observed during test.

## 15. COMPONENTS/ASSEMBLY INSPECTION AND ASSESSMENT OF WEAR

**15.1 Engine :**

The engine and other assemblies were dismantled after 36.0 hours of engine operation.

**15.1.1 Cylinder :**

| Cylinder bore dia. (mm) | | | | | | |
|---|---|---|---|---|---|---|
| Top Position | | Middle position | | Bottom Position | | Max. permissible wear limit (mm) |
| Thrust | Non-thrust | Thrust | Non-thrust | Thrust | Non-thrust | |
| 43.99 | 44.00 | 44.01 | 44.02 | 44.01 | 44.0 | 40.165 |

**15.2 Valve guides and valve springs**

Valve spring stiffness, kgf/mm : **Not applicable**

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

| Sr. No. | Parameters | Specification | Observed | Remarks |
|---|---|---|---|---|
| 1. | Type | Self propelled, portable | Self propelled | Conforms |
| 2. | Type of cutting attachment | Circular disc/Straight blade/Nylon rope | Circular blade & nylon rope used | Conforms |
| | **Circular blade** | | | |
| 3. | Material of circular/Straight blade | Alloy Steel | Alloy steel | Conforms |
| 4. | No. of teeth on circular disc blade | 50-100 | 80 | Conforms |
| 5. | Root diameter/Overall diameter (mm) | 200-270 | 255 | Conforms |
| 6. | Thickness of disc (mm) | 1.5 Min | 1.6 | Conforms |
| 7. | Teeth thickness (mm) | 2.0 Min | 2.0 | Conforms |
| 8. | Material of blade | M42 | M42 | Conforms |
| 9. | Hardness of blade, HRC | 68-70 | 48.1 (Average) | Conforms as per IS:6025-1982 |
| | **Straight blade** | | | |
| 10. | Diameter of straight blade (mm) | 250-350 | Straight blade is not recommended by applicant | -- |
| 11. | Width of ends/at center (mm) | 50/70, Min. | | |
| 12. | Thickness of straight blade (mm) | 1.5 Min | | |
| | **Nylon rope** | | | |
| 13. | Length of nylon rope (mm) | 2000-4000 | Length 3370 mm | Conforms |
| 14. | Diameter of nylon rope (mm) | 2.5 to 4.0 | Diameter- 2.7 mm | Conforms |
| 15. | Type of engine | Compression ignition/Spark ignition | Spark ignition | Conforms |
| 16. | Starting method | Manual/Recoil/Self-starting | Manual/Recoil starting | 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) | 1.20 lit. | Conforms |
| 20 | On off provision in fuel supply system | Must be provided | **Not provided** | **Does not conform** |

| | | | | |
|---|---|---|---|---|
| 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 belt 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. | Just a sticker and not proper labeling plate is provided on the machine with following information.<br>Make-Neptune<br>Model-NBC-520<br>Serial no. –BC-1091<br>Mfg- 2022<br>Neptune Packing Pvt. Ltd.<br>19/1, New Agrawal Nagar,<br>Distt. Indore-452001 | **Partially conform** |
| 30. | Literature | 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 On-Off provision on fuel supply system is not provided, It **MUST** be looked into.

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

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

i) Name and address of manufacturer
ii) Name and address of applicant
iii) Country of origin
iv) Make
v) Model
vi) Year of manufacturer
vii) Serial number
viii) Engine number
ix) Engine hp
x) Rated rpm
xi) SFC

## 18. TECHNICAL LITERATURE

The following literature was provided during the testing.

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

However, the manual needs to be updated as per IS: 8132-1999

## TESTING AUTHORITY

| | |
|---|---|
| Er. SANJAY KUMAR<br>AGRICULTURAL ENGINEER | |
| **Dr. MUKESH JAIN**<br>**DIRECTOR** | 06.04.2023 |

## 19. APPLICANT'S COMMENTS

We have noted the comments and suggestions mentioned in the test reports.
Same will be followed in regular supplies of products.