POWER WEEDER
‘ BCS, MC 730D’

GOVERNMENT OF INDIA
MINISTRY OF AGRICULTURE
(DEPARTMENT OF AGRICULTURE & COOPERATION)

NORTHERN REGION FARM MACHINERY TRAINING AND TESTING INSTITUTE
TRACTOR NAGAR, SIRSA ROAD, HISAR-125001 (HARYANA)
12. **FIELD TEST**

The field tests consisting of dry land operation were conducted for 48.4 hours. All the field tests were conducted at the full accelerator setting the working width of weeder was 0.620 m. All, 7 tests were conducted in light soil at the HLRDC farm, Hisar. All tests were conducted in row crops (BT Cotton). The summary of the field test for dry land operation is represented in table-3.

**Crop parameters:**

- i) Row to row distance (m) - 1.05 to 1.40
- ii) Height of crop (m) - 0.250 to 0.890
- iii) Type of weed - Seasonal weeds
- iv) Height of weed (cm) - 9.5 to 110

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>i)</td>
<td>Type of soil</td>
<td>Sandy soil</td>
</tr>
<tr>
<td>ii)</td>
<td>Av. Soil moisture, %</td>
<td>8.1 to 15.5</td>
</tr>
<tr>
<td>iii)</td>
<td>Bulk density of soil, g/c.c</td>
<td>1.30 to 1.72</td>
</tr>
<tr>
<td>iv)</td>
<td>Speed of operation, kmph</td>
<td>2.16 to 2.37</td>
</tr>
<tr>
<td>v)</td>
<td>Depth of cut, cm</td>
<td>9.13 to 11.38</td>
</tr>
<tr>
<td>vi)</td>
<td>Width of cut, cm</td>
<td>106 to 110</td>
</tr>
<tr>
<td>vii)</td>
<td>Area covered, ha/hr</td>
<td>0.2013 to 0.2370</td>
</tr>
<tr>
<td>viii)</td>
<td>Fuel consumption</td>
<td>0.726 to 0.902</td>
</tr>
<tr>
<td>ix)</td>
<td>Weeding efficiency (%)</td>
<td>84.93 to 90.20</td>
</tr>
</tbody>
</table>

**12.1 Rate of work:**

The rate of work is assessed by the area covered during field operation. Area covered by the machine ranged from 0.2013 to 0.2370 ha/hr at the speed of 2.16 to 2.37 kmph.

**12.2 Quality of work:**

Quality of work is assessed by the depth of cut in field operation. Depth of cut was observed from 9.13 to 11.38 cm.

**12.3 Weeding efficiency**

The field performance of the machine was found satisfactory and weeding efficiencies were observed from 84.93 to 90.20.

**13. ADJUSTMENT, DEFECTS, BREAKDOWNS & REPAIR:**

No Breakdown occurred during 48.44 hrs of field test.

**14. COMPONENTS/ASSEMBLY INSPECTION AND ASSESSMENT OF WEAR**

**14.1 Engine:**

The Engine and other assemblies were dismantled after 48.44 h of engine operation.

**14.1.1 Cylinder:**

<table>
<thead>
<tr>
<th>Cylinder bore dia (mm)</th>
<th>Top Position</th>
<th>Middle position</th>
<th>Bottom Position</th>
<th>Max. permissible wear limit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Thrust side</td>
<td>Non-thrust side</td>
<td>Thrust side</td>
<td>Non-thrust side</td>
</tr>
<tr>
<td></td>
<td>82.08</td>
<td>82.08</td>
<td>82.06</td>
<td>82.05</td>
</tr>
</tbody>
</table>
## 15. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Characteristics</th>
<th>Category* (Evaluative/ Non evaluative)</th>
<th>Requirements</th>
<th>Tolerance (as per IS : 13539-2008)</th>
<th>As observed</th>
<th>Whether within the tolerance limit (yes/no)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<tr>
<td>1.</td>
<td><strong>Engine Performance:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i)</td>
<td>Max. power under two hours test, kW</td>
<td>Evaluative</td>
<td>5.5</td>
<td>-7.5/+15</td>
<td>4.30</td>
<td>No</td>
</tr>
<tr>
<td>ii)</td>
<td>Power at rated engine speed, kW</td>
<td>Non-evaluative</td>
<td>5.5</td>
<td>±5%</td>
<td>3.43</td>
<td>No</td>
</tr>
<tr>
<td>iii)</td>
<td>Specific fuel consumption corresponding to Max. power, g/kWh</td>
<td>Non-evaluative</td>
<td>300</td>
<td>±5%</td>
<td>269</td>
<td>No</td>
</tr>
<tr>
<td>iv)</td>
<td>Specific fuel consumption corresponding to rated power, g/kWh</td>
<td>Non-evaluative</td>
<td>Not specified</td>
<td>±5%</td>
<td>299</td>
<td>--</td>
</tr>
<tr>
<td>v)</td>
<td>Max. equivalent crankshaft torque, N-m</td>
<td>Non-evaluative</td>
<td>16</td>
<td>±8%</td>
<td>13.6</td>
<td>No</td>
</tr>
<tr>
<td>vi)</td>
<td>Max. operating temperature:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Engine oil coolant</td>
<td>Evaluative</td>
<td>120°C±10</td>
<td>--</td>
<td>111°C</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>- Lub. Oil consumption, g/kWh</td>
<td>Evaluative</td>
<td>NA</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>vii)</td>
<td></td>
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<td>viii)</td>
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<td></td>
<td>ix)</td>
<td></td>
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</tbody>
</table>

**NOTE:**
- IS: 13539-2008 refers to the Indian Standards specification for engines.
- NA: Not Applicable
- Yes/No: Indicates whether the requirement is met within the tolerance limit.
2. **Noise level:**
   a) Maximum ambient noise emitted by the power tiller, dB(A)
      - **Evaluative**
      - As per CMVR: 88
      - 80
      - Yes
   b) Maximum noise at operator’s ear level, dB(A)
      - **Evaluative**
      - As per CMVR: 98
      - 92.0
      - Yes

3. **Air cleaner oil pull over**
   - Maximum percentage of oil pull over (mass basis)
     - **Evaluative**
     - 0.25%
     - Not applicable as dry type air cleaner provided

4. **Amplitude of mechanical vibration (microns) at:**
   i) Steering handle grips
      - **Non-evaluative**
      - 100 max.
      - 180
      - No
   ii) Accelerator lever
      - **Non-evaluative**
      - 100 max
      - 110
      - No

5. **Discard limit (mm):**
   i) Cylinder bore diameter
      - **Evaluative**
      - 82.20
      - 82.08
      - Yes
   ii) Piston dia at skirt on thrust side
      - **Evaluative**
      - 81.82
      - 81.70
      - Yes
   iii) Ring end gap
      - **Evaluative**
      - Top ring: 1.25
      - 0.40
      - Yes
      - 2nd ring: 1.25
      - 0.50
      - Yes
      - Oil ring: 0.50
      - 0.50
      - Yes
   iv) Ring groove clearance:
      - **Evaluative**
      - Top ring: 0.25
      - 0.10
      - Yes
      - 2nd ring: 0.25
      - 0.07
      - Yes
      - Oil ring: NA
      - 0.09
      - --
   v) Clearance of big end bearing:
      - **Evaluative**
      - Diometrical: 0.11
      - 0.09
      - Yes
      - Axial: 2.5
      - 1.1
      - Yes
   vi) Clearance of main bearing
      - **Evaluative**
      - Diometrical: 0.15
      - 0.08
      - Yes
      - Axial: 0.75
      - 0.10
      - Yes

6. **Safety requirements**
   i) Provision of guards on moving parts other than rotavator
      - **Evaluative**
      - Yes
      - Provided
      - Yes
   ii) Location and direction of exhaust emission to be away from the operator and machine for stationary operation
      - **Evaluative**
      - Yes
      - Provided
      - Yes
   iii) Covers on hot parts
      - **Evaluative**
      - Yes
      - Provided
      - Yes
| iv) | Locking of parking stand lever | Evaluative | Yes | -- | Provided | Yes |
| v) | Protective shield for rotavator to prevent flying of mud and stones | Evaluative | Yes | -- | Provided | Yes |
| vi) | Accidental engaging of reverse speed gear when rotary is in operation | Evaluative | Yes | -- | Provided | Yes |

* The evaluative/non evaluative requirements are derived from Indian Standard IS: 13539:2008. Power tillers recommendations on selected performance characteristics.

15.7 **Engine performance**

15.7.1 The maximum power under two hour test was observed as 4.30 kW against the declared value of 5.5 kW. It is not within the tolerance limit specified as per IS:13539:2008 (Power tiller recommendations on selected performance characteristics). It should be look into.

15.7.2 Power at rated engine speed under normal ambient condition was observed as 3.43 kW against the requirement of 5.5 kW which is only 62.4 % of the declared value. It should be looked into.

15.7.3 The maximum crank shaft torque under normal ambient condition was observed 13.6 Nm against the declared value of 16 Nm which is not within specified limit. It should be looked into.

15.8 **Mechanical Vibration**

The amplitude of mechanical vibration on various assemblies of machine is on higher side. This calls for dampening down of vibration to improve the operation comfort and service life of component.

15.9 **Noise measurement**

Maximum noise at operator’s ear level & by standard level emitted by the rotary tiller was observed as 92 dB(A) & 80 dB(A) respectively.

15.10 **Rotor blades**

15.10.1 The hardness of hatchet blade does not meet the requirements of IS:6690-1981 (reaffirmed in 2002) This may be looked into at regular production level.

15.10.2 The chemical composition of blade does not meet the requirements of IS:6690-1981 (reaffirmed in 2002) . This may be looked into at regular production level.

15.10.3 The hourly rate of wear of rotor blade was observed to be 0.05 to 0.10%.

15.10.4 The wear percentage on dimensional basis at tip, 40 & 80 mm from tip were observed.

15.11 **Field test**

No breakdown occurred during field testing of Power Weeder.

15.12 **Performance results in brief**

During operation the output of the rotary power weeder was 0.2013 to 0.2370 ha/h at a forward speed of 2.16 to 2.37 kmph. Further, at 9.13 to 11.38 cm depth of cut, the weeding efficiency is recorded as 84.93 to 90.20.

15.13 **Wear assessment**

All of the parameters of wear assessment were within limit.
15.14 Safety and comfort
   i) Controls are provided with symbols as per IS: 6283(Part I & II)-1988.
   ii) Safety signs, hazard symbols and safety warnings are provided on machine.

15.15 Ease of operation and handling
Not noticeable difficulty was observed during operation & handing.

15.16 Maintenance/Service problems
No noticeable maintenance/service problem was observed during the test.

15.17 Features, if any
   i) Adjustable and reversible with shock absorbing mounts of handle bar facilitates in transportation & operation.
   ii) Provision for height adjustment of handle bar as per operator’s convenience.
   iii) The differential system is provided in the final drive for easy turning.

15.18 Labelling plate
   i) The specific fuel consumption declaration is not provided on labelling plate of engine on power weeder. It may be provided.
   ii) The model of power weeder should be given on labelling plate and decals of model name should be also as per the model name specified.

16. LITERATURE
   (i) The power weeder operator cum maintenance manual for 710, 720, 730 & 740 is provided for reference during test. However the same as well as service manual may be brought out as per IS: 8132:1999.
   (ii) The safety instructions booklet in official language should be provided with each machine which should cover the safety instructions provided in Annexure A of Indian Standard IS: 15925:2012.

TESTING AUTHORITY

G.R. AMBALKAR
Agricultural Engineer

R.K. NEMA
Senior Agricultural Engineer

HIMAT SINGH
Director

Test report compiled by: Sh. Maan Singh, Sr. Tech. Assistant

17. APPLICANT’S COMMENTS

<table>
<thead>
<tr>
<th>Para No.</th>
<th>Our Reference</th>
<th>Applicant’s Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>17.1</td>
<td>15.7</td>
<td>These points have been taken up with our engine manufacturer to look into declared value.</td>
</tr>
<tr>
<td>17.2</td>
<td>15.8</td>
<td>We are informing same to our manufacturer to improve the product.</td>
</tr>
<tr>
<td>17.3</td>
<td>15.8 &amp; 18.9</td>
<td>Corrective actions are being taken and very soon a better available solution will be implemented in future production.</td>
</tr>
</tbody>
</table>