BCS 622 RB
REAPER BINDER

Government of India
Ministry of Agriculture and Farmers Welfare
Department of Agriculture, Cooperation and Farmers Welfare
Northern Region Farm Machinery Training and Testing Institute
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[ISO 9001:2008 COMPLIANT INSTITUTION]

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11. AIR CLEANER OIL PULL OVER TEST

Date : 3.12.2016

Range of atmospheric conditions:
- Temperature (°C) : 24 to 36
- Pressure (mm of Hg) : 744.2 to 745.8
- Relative humidity (%) : 15.8 to 40.5

Mass of oil in the air cleaner assemblies when filled with recommended grade of oil 5% in excess than marked level (g)

<table>
<thead>
<tr>
<th></th>
<th>Position</th>
<th>Slope (degree)</th>
<th>Loss of oil (g)</th>
<th>Oil pull over (%)</th>
<th>Remarks if any</th>
</tr>
</thead>
<tbody>
<tr>
<td>i)</td>
<td>Horizontal</td>
<td>Nil</td>
<td>0.9</td>
<td><strong>0.43</strong></td>
<td></td>
</tr>
<tr>
<td>ii)</td>
<td>Tilted longitudinally with front end up</td>
<td>15</td>
<td>0.5</td>
<td>0.24</td>
<td></td>
</tr>
<tr>
<td>iii)</td>
<td>Tilted longitudinally with rear end up</td>
<td>15</td>
<td>0.3</td>
<td>0.14</td>
<td></td>
</tr>
<tr>
<td>iv)</td>
<td>Tilted laterally with right side up</td>
<td>15</td>
<td>0.6</td>
<td><strong>0.29</strong></td>
<td></td>
</tr>
<tr>
<td>v)</td>
<td>Tilted laterally with left side up</td>
<td>15</td>
<td>0.5</td>
<td>0.24</td>
<td></td>
</tr>
</tbody>
</table>

Oil pull over may be on higher side

12. FIELD TEST

The reaper binder was operated in field for 26.67 hours (including running in 1.12 hours) only in wheat harvesting.

The crop parameters recorded during the test with wheat crop are as given in Annexure-I and summarized in Table-2

**Table-2 : Crop parameter**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Wheat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variety</td>
<td>HB 2967 and PB 43</td>
</tr>
<tr>
<td>Plant height (cm)</td>
<td>60 to 109</td>
</tr>
<tr>
<td>Plant population (No of tillers per m²)</td>
<td>205 to 290</td>
</tr>
<tr>
<td>Straw grain ratio</td>
<td>1.23 to 2.10:1</td>
</tr>
<tr>
<td>Moisture (%)</td>
<td></td>
</tr>
<tr>
<td>Grain</td>
<td>9.5 to 10.6</td>
</tr>
<tr>
<td>Straw</td>
<td>NR</td>
</tr>
</tbody>
</table>

The results of field performance test are given in Annexure – II and are summarized in Table-3
Table 3: Summary of field Test:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Observation</th>
<th>Wheat harvesting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Speed of operation, kmph</td>
<td>4.17 to 4.37</td>
</tr>
<tr>
<td>2</td>
<td>Area covered, ha/h</td>
<td>0.392 to 0.430</td>
</tr>
<tr>
<td>3</td>
<td>Width of cut, m</td>
<td>1.22 to 1.28</td>
</tr>
<tr>
<td>4.</td>
<td>Fuel consumption</td>
<td></td>
</tr>
<tr>
<td></td>
<td>l/h</td>
<td>0.74 to 0.93</td>
</tr>
<tr>
<td></td>
<td>l/ha</td>
<td>1.80 to 2.37</td>
</tr>
<tr>
<td>5</td>
<td>Losses</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre harvest losses (kg/ha)</td>
<td>3.00 to 9.33</td>
</tr>
<tr>
<td></td>
<td>Cutter bar losses (kg/ha)</td>
<td>16.00 to 24.00</td>
</tr>
<tr>
<td>6</td>
<td>Stubble height after harvesting,(cm)</td>
<td>5.0 to 12.0</td>
</tr>
<tr>
<td>7</td>
<td>Time required to cover 1 ha. area (h)</td>
<td>2.33 to 2.55</td>
</tr>
<tr>
<td>8</td>
<td>Field efficiency (%)</td>
<td>73.13 to 83.39</td>
</tr>
<tr>
<td>9</td>
<td>Average weight of bundle, kg</td>
<td>1.86 to 3.40</td>
</tr>
<tr>
<td>10</td>
<td>No. of bundles per hours</td>
<td>1390 to 1680</td>
</tr>
<tr>
<td>11</td>
<td>Percentage of unknotted bundles</td>
<td>1.0 to 5.0</td>
</tr>
</tbody>
</table>

12.1 Rate of work:
   i) During the tests the rate of work varied from 0.392 to 0.430 ha/h in wheat harvesting.
   ii) The fuel consumption varied from 0.74 to 0.93 l/h in wheat harvesting.
   iii) The fuel consumption per unit area harvested varied from 1.80 to 2.37 l/ha in wheat harvesting.

12.2 Quality of work:
   i) During wheat harvesting, cutter bar losses varied from 16.00 to 24.00 kg/ha.
   ii) Stubble height after harvesting was observed from 5.0 to 12.0 cm.
   iii) Percentage of unknotted bundles was observed as 1.0 to 5.0 percent.

12.3 Time required for daily maintenance:
   About 15 minutes are required for daily servicing and maintenance of reaper binder with one man only.

12.4 Labour requirement:
   Two person including driver are required for smooth operation of the machine in the field. Additional labour are required for collection of the sheaves (bundles).

12.5 Twine consumption:
   About one bundle of twine is required for one acre field.

12.6 Harvesting any other crop:
   The harvesting of wheat crop was done by the reaper binder.
14.6 **Big end bearing:**

<table>
<thead>
<tr>
<th>Bearing No.</th>
<th>Diametrical clearance (mm)</th>
<th>Axial clearance, mm</th>
<th>Maximum permissible wear limit, mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.07 to 0.06</td>
<td>0.35</td>
<td>Diametrical clearance Axial clearance</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Not specified</td>
</tr>
</tbody>
</table>

14.7 **Valve guides and valve springs:**

Valve and valve guide clearance, mm

- Inlet valve: 0.050
- Exhaust valve: 0.044

Valve spring rate, kg/mm

- Inlet valve: 1.37
- Exhaust valve: 1.37

No noticeable defect was observed for valve guide and valve spring.

14.8 **Timing gear:**

No noticeable defect was observed.

14.9 **Clutch:**

Overall thickness of clutch plate, mm: 4.25 to 4.51

No noticeable defect was observed.

14.10 **Brake:**

Thickness of brake shoe/ring, mm

- LHS: 5.54 to 7.40
- RHS: 5.53 to 7.38

No noticeable defect was observed.

15. **SUMMARY OF OBSERVATION, COMMENTS AND RECOMMENDATION**

15.1 **Engine performance test**

i) The maximum power of the engine was observed as 6.4 kW against declared value of 7.35kW which is just 87.1%. The variation between observed value and declared value is too much, and therefore, MUST be looked into for corrective measure.

ii) The specific fuel consumption during two hour maximum power test was observed as 271 g/kWh.

iii) During test, the maximum engine oil temperature was recorded as 146 degree C against the declaration of 140 degree C, which is not just on higher side but has serious repercussion as well. This MUST be looked into for improvement.

15.2 **Field test**

i) The area covered varied from 0.392 to 0.430 ha/h.

ii) The fuel consumption varied from 0.74 to 0.93 l/h and 1.80 to 2.37 l/ha.

iii) The cutter bar losses were observed as 16.0 to 24.0 kg/ha.

15.3 **Ease of operation & adjustment**

No noticeable difficulties was observed during the test.

15.4 **Assessment of wear**

No noticeable defect was observed in engine and machine components.
15.5 Hardness and chemical composition:
   i) The hardness of knife blade does not conform to the requirement of IS: 6025-1982.
   ii) The carbon content of knife blade is not within the required limit specified as per IS:6025-1982.
   iii) Carbon content of knife back is not within the requirement specified in IS:10378-1982. Use of materials for knife blade and knife back meeting BIS requirement is recommended.

15.6 Dimensional requirement of cutter bar assembly:
   i) The specifications of knife section, knife back and knife guard does not conform to IS: 6025-1999, IS: 10378 and IS: 6024-1983 respectively. This should be looked into at production level.

15.7 Noise measurement:
   Maximum noise level at bystandard’s position and at operator’s ear level was observed as 87.8 dB(A) and 99.3 dB(A) respectively. The noise level at bystandard’s lever is higher than the warning limit of 85 dB(A). The noise level at operator’s ear level is higher than warning and danger limit of 85 dB(A) and 90 dB(A) respectively for continuous exposure of 8 hours per day.
   This calls for reduction in noise level to improve operator’s comfort and safety.

15.8 Mechanical vibration:
   The amplitude of mechanical vibration of components marked as (*) in chapter 10 of this report may be consider on higher side. This calls for providing suitable remedial measures to dampen the vibration in order to improve the operational comfort and service life of various components & sub assemblies.

15.9 Air cleaner oil pull over test
   The maximum oil pull over on higher side observed at horizontal position and when machine is tilted laterally with right side up. It should be looked into for improvement.

15.10 Labeling plate
   Labeling plate is not provided on machine. A metallic labeling plate of permanent nature should be provided on machine with following information:-
   i) Make
   ii) Model
   iii) Serial No.
   iv) Year of manufacturer
   v) Manufacturer’s address
   vi) Engine make and model
   vii) Engine serial No.
   viii) Maximum power (kW)
   ix) Specific fuel consumption (g/kwh)

15.11 The dimension of knife blade does not meet the requirement of IS: 6025-1982. It should be improved.
15.12 The dimension of knife guard and ledger does not meet the requirements of IS: 6024-1983. It should be looked into for improvement.

15.13 There is discrepancy in engine maintenance schedule specifically for air cleaner and lubrication oil change period in reaper binder operator’s manual and engine maintenance manual, which is confusing for the users, and therefore, urgent corrective action is warranted.


15.15 The accelerator lever and stop lever does not meet the requirement of IS: 8133-1983. It should be looked into for corrective action.

16. TECHNICAL LITERATURE

The following literature was supplied with the machine during the course of test.

1. Operator’s manual (Multilingual- English, Hindi and Punjabi)
2. Trouble shooting manual (Hindi)
3. Owner manual, motor reaper binder 290 (Multilingual)
4. Maintenance manual & spare parts list of air cooled diesel engine Type- 1450, 1510, 1451.
5. Parts catalogue- Reaper binder

The operator’s manual provided needs to be updated as per IS: 8132-1999.

TESTING AUTHORITY

G. R. AMBALKAR
AGRICULTURAL ENGINEER

R. K. NEMA
SENIOR AGRICULTURAL ENGINEER

P. K. PANDEY
DIRECTOR

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>15.1 (i), (iii)</td>
<td>These points have been taken up with our engine manufacturer.</td>
</tr>
<tr>
<td>17.2</td>
<td>15.5, 15.6, 15.7, 15.8, 15.9, 15.11, 15.12 &amp; 15.13</td>
<td>Strict quality control action will be taken at production level and the same will be implemented in future production.</td>
</tr>
<tr>
<td>17.3</td>
<td>15.10, 15.14 &amp; 15.15</td>
<td>Corrective actions are being taken.</td>
</tr>
</tbody>
</table>