COMMERCIAL TEST REPORT

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SUMMARY OF OBSERVATIONS, COMMENTS AND RECOMMENDATIONS

16.1 Compatibility of tractor on the combine

16.1.1 Adequacy of power:
During the period of test, no over loading of the prime mover was observed. The power available from the prime mover to drive the combining unit was found to be adequate.

16.1.2 Modifications on standard tractor:
The following modification in the tractor is made in order to make it suitable for combine use.

i) One dust removing fan ahead of tractor radiator is provided which prevents the accumulation of dust to radiator front grill cover.

ii) Chain & sprocket arrangement to drive the combine drive wheel.

16.2 Header lifting test:
During 1000 cycles, no leakage of hydraulic oil was observed and working of hydraulic system is normal.

16.3 Turning ability:
Diameter of turning circle at LHS & RHS was found satisfactory.

16.4 Visibility:
The visibility around the cutter bar from operator's seat in normal sitting position is satisfactory.

16.5 Braking Performance:

i) The stopping distance and pedal force corresponding to mean deceleration of 2.5 m/sec² was observed as 13.93 m and 148 N under cold condition.

ii) The performance of parking brake was found satisfactory.

16.6 Mechanical Vibration:
The amplitude of mechanical vibration of components marked as (*) in chapter 11 of this report are on higher side. This calls for providing suitable remedial measures to dampen the vibration to improve the operational comfort and service life of various components & sub assemblies.

16.7 Noise measurement:

i) The ambient noise emitted by the machine was measured as 88 dB(A).

ii) The noise at driver's ear level was measured as 95 dB(A).

16.8 Field Test:

16.8.1 Summary of field tests: Summary of field observation are tabulated in Table 4.

Table 4: The results of the field tests.

<table>
<thead>
<tr>
<th>S. No</th>
<th>Parameters</th>
<th>Range of parameters</th>
<th>Average of parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Wheat Harvesting</td>
<td>Paddy Harvesting</td>
</tr>
<tr>
<td>1.</td>
<td>Speed of operation (kmph)</td>
<td>2.91 to 2.94</td>
<td>1.73 to 1.86</td>
</tr>
<tr>
<td>2.</td>
<td>Area covered (ha/h)</td>
<td>0.58 to 0.85</td>
<td>0.40 to 0.50</td>
</tr>
<tr>
<td>3.</td>
<td>Fuel consumption: (l/h)</td>
<td>5.0 to 5.30</td>
<td>5.25 to 7.50</td>
</tr>
<tr>
<td></td>
<td>- (l/ha)</td>
<td>6.25 to 8.60</td>
<td>11.44 to 15.0</td>
</tr>
<tr>
<td>4.</td>
<td>Crop throughput (tonne/h)</td>
<td>4.97 to 8.11</td>
<td>6.53 to 7.68</td>
</tr>
</tbody>
</table>
16.8.2 **Wheat Harvesting:**

i) The grain breakage in all the varieties tested was measured as 0.981 to 1.686 %.

ii) The total processing losses varies from 1.731 to 2.380 %.

iii) The total non-collectable losses ranged from 0.844 to 1.701 %.

iv) The threshing efficiency ranged from 99.3 to 99.7 %

v) The cleaning efficiency ranged from 96.3 to 97.9 %.

16.8.3 **Paddy Harvesting:**

i) The grain breakage ranged from 0.974 to 1.723 %.

ii) The total non-collectable losses ranged from 1.608 to 3.007 %.

iii) The total processing losses varies from 1.510 to 1.907 %.

iv) The threshing efficiency ranged from 99.3 to 99.9 %

v) The cleaning efficiency ranged from 95.6 to 97.2 %.

16.8.4 **Harvesting of any other crops:**

The performance of combine to harvest wheat and paddy was evaluated.

16.8.5 **Ease of Operation and Safety Provision:**

i) The controls provided around the operator are within easy reach but not properly labelled with proper symbols. Therefore it is recommended that the symbols as per the requirement of IS-6283-1998 may be provided.

ii) Safety device/slip clutches on front auger, undershot conveyor and grain & tailing elevator are essential from safety point of view & are provided in the machine.

iii) The grain tank needs to be provided with suitable device to know the grain fill.

iv) Provision for adjusting threshing drum speed is provided at operator’s platform to suit the harvesting of different varieties and conditions of crops.

v) The design of stone trap needs to be modified for easy cleaning.

vi) The safety provisions to protect the grain and tailing auger, blower body from damage while crossing the field bunds are considered essential and is provided from safety point of view.

16.8.6 **Assessment of Wear:**

i) The condition of the components of brake system and steering system was observed to be normal.

ii) The condition of the bearing, chains, sprockets and belts was observed to be normal.
iii) The components of starter motor and alternator were found in normal working condition.
iv) The rate of wear of rasp bar and peg teeth of threshing cylinder & concave were observed to be normal.

16.9 **Hardness and Chemical composition:**

16.9.1 The hardness of knife blade at hardened zone & hardness of knife guard are conforming to limit as specified in their relevant code, whereas the hardness of knife blade at remainder zone is slightly less than the limit which should be looked into in future.

16.9.2 Carbon & manganese content of knife blade are higher whereas the carbon content of knife back are lower than the limit of specified in relevant code IS:6025-2004 & IS:10378-2006 respectively. These should be looked into in future at regular production level.

16.10 **Maintenance/Service problems:**

No noticeable maintenance/service problem was observed during the course of test at this Institute.

16.11 **Labelling of Combine Harvester:**

The labelling plate is provided on the combine harvester, however make & model of prime mover, power and SFC may be provided on labelling plate.

16.12 **Literature supplied with the Machine:**

Following literature were provided by the manufacturer.

i) Spare part catalogue.

ii) Tractor operator manual

Therefore, it is suggested to develop complete literature for combine harvester as per IS:8132:1999 in Hindi and other regional languages for the guidance of users & technical personnel.

17. **SELECTED PERFORMANCE AND OTHER CHARACTERISTICS OF COMBINE HARVESTER AS PER IS: 15806-2008.**

<table>
<thead>
<tr>
<th>S. No</th>
<th>Performance parameters</th>
<th>Characteristics</th>
<th>Requirement</th>
<th>Declared</th>
<th>Observed</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Prime mover performance</td>
<td>i) Max. Power (absolute)</td>
<td>Average max. power observed during 2 hrs. max. power test in natural ambient condition should not be less than -5% of the declared value.</td>
<td>Not applicable</td>
<td>Not applicable</td>
<td>--</td>
</tr>
</tbody>
</table>

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### ii) Max. power during field test after adjusting the no load engine speed as per declaration of the applicant, kW

- Max. power observed must not be less in -5% of declared value.
- Not applicable
- Not applicable

### iii) Power at rated engine speed, kW

- The observed value must not be less -5% of the declared value by the applicant.
- Not applicable
- Not applicable

### iv) Specific fuel consumption g/kWh.

- The average observed value during 2 hr. max. power test must be within ±5% of the declared value by applicant/manufacturer.
- Not applicable
- Not applicable

### v) Max. smoke density, bosch no.

- Max. smoke density at 80% load between the speed at max. power & 55% of speed at max. or 1000 rpm which ever is higher, should be observed as per CMVR rule requirement which are as below -
  - For tractor :- 5.2 bosch no. or 75 hartridge
  - For engine :- Free declaration or natural aspirated or turbo charges -65 hartridge
- Not applicable
- Not applicable
<table>
<thead>
<tr>
<th></th>
<th></th>
<th>vi) Max. crank shaft torque, N·m</th>
<th>Max. crank shaft torque observed during the test after no. load engine speed is adjusted as per manufacture's recommendation for field work must not be less than 8% of declare value by manufacturer.</th>
<th>Not applicable</th>
<th>Not applicable</th>
<th>--</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>vii) Back torque, %</td>
<td>7% min.</td>
<td>Not applicable</td>
<td>Not applicable</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td>viii) Max. operating temp.</td>
<td>To be declared by manufacturer. Not Specified 105°C</td>
<td>Not applicable</td>
<td>Not applicable</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td>i) engine oil</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ii) Coolant</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ix) Lubrication oil consumption</td>
<td>1% of SFC at 5hr. max. power test during high ambient condition</td>
<td>Not applicable</td>
<td>Not applicable</td>
<td>--</td>
</tr>
<tr>
<td>2.</td>
<td>Brake performance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>i) Max. stopping distance at a force equal to or less than 600 N on brake pedal, m</td>
<td>10 m or S ≤ 0.15V + V²/130 V=s speed corresponding to 80% of design max. speed, kmph</td>
<td>--</td>
<td>5.93</td>
<td>Conforms</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii) Max. force exerted on brake pedal to achieve a deceleration of 2.5 m/sec².</td>
<td>≤ 600N.</td>
<td>--</td>
<td>148</td>
<td>Conforms</td>
<td></td>
</tr>
<tr>
<td></td>
<td>iii) Whether parking brake is effective at a force of 600 N at foot pedal or 400 N at Hand and lever</td>
<td>Yes or No</td>
<td>--</td>
<td>Yes</td>
<td>Conforms</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Mechanical vibration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>i) Operator's platform</td>
<td>120 μm max.</td>
<td>--</td>
<td>190</td>
<td>Does not Conform</td>
<td></td>
</tr>
<tr>
<td>COMB-142/1726/2015</td>
<td>TRACTOR POWERED COMBINE HARVESTER 'BALKAR B-525', COMMERCIAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>---------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii) Steering wheel</td>
<td>150 µm max.</td>
<td>--</td>
<td>300</td>
<td>Does not Conform</td>
<td></td>
</tr>
<tr>
<td></td>
<td>iii) Seat with driver seated</td>
<td>120 µm max.</td>
<td>--</td>
<td>330</td>
<td>Does not Conform</td>
<td></td>
</tr>
<tr>
<td>4. Air cleaner oil pull over</td>
<td>i) Max. oil pull over in % age when tested in accordance with IS: 8122 pt. (II)-2000</td>
<td>0.25% max.</td>
<td>-</td>
<td>Not applicable</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>5. Noise measurement</td>
<td>i) Max. ambient noise emitted by combine db (A)</td>
<td>As per CMVR 88 db (A)</td>
<td>-</td>
<td>88</td>
<td>Conforms</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii) Max. noise at operator's ear level db (A)</td>
<td>As per CMVR, 98 db (A)</td>
<td>-</td>
<td>95</td>
<td>Conforms</td>
<td></td>
</tr>
<tr>
<td>6. Discard limit</td>
<td>To be specified by manufacturer, mm</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>i) Cylinder bore diameter</td>
<td>-do-</td>
<td>-</td>
<td>Not applicable</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii) Piston diameter</td>
<td>-do-</td>
<td>-</td>
<td>Not applicable</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td></td>
<td>iii) Ring end gap</td>
<td>-do-</td>
<td>-</td>
<td>Not applicable</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td></td>
<td>iv) Ring groove clearance</td>
<td>-do-</td>
<td>-</td>
<td>Not applicable</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td></td>
<td>v) Diametral and axial clearance of big end bearing</td>
<td>-do-</td>
<td>-</td>
<td>Not applicable</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td></td>
<td>vi) Diametral and axial clearance of main bearings</td>
<td>-do-</td>
<td>-</td>
<td>Not applicable</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td></td>
<td>vii) Thickness of brake lining</td>
<td>-do-</td>
<td>-</td>
<td>Not applicable</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td></td>
<td>viii) Thickness of clutch plate</td>
<td>-do-</td>
<td>-</td>
<td>Not applicable</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>7. Field performance</td>
<td>i) Suitability for crops</td>
<td>Wheat &amp; paddy essential</td>
<td>-</td>
<td>Wheat, paddy</td>
<td>Conforms</td>
<td></td>
</tr>
</tbody>
</table>
### Grain Breakage in Grain Tank

- **Wheat**: 0.981 to 1.686%
  - Avg. 1.368%
- **Paddy**: 0.974 to 1.723%
  - Avg. 1.234%

Conforms

### Non Collectable Losses

- **Wheat**: 0.844 to 1.701%
  - Avg. 1.413%
- **Paddy**: 1.608 to 3.007%
  - Avg. 2.171%

Conforms

### Threshing Efficiency

- **Wheat**: 99.3 to 99.7%
  - Avg. 99.4%
- **Paddy**: 99.3 to 99.9%
  - Avg. 99.7%

Conforms

### Cleaning Efficiency

- **Wheat**: 96.3 to 97.9%
  - Avg. 97.0%
- **Paddy**: 95.6 to 97.2%
  - Avg. 96.7%

Conforms

### Safety Requirement

#### i) Guards against all moving parts

- Essential

Provided

Conforms

#### ii) Lighting arrangement

- a) Head light
- b) Parking light
- c) Indication
- d) Reverse gear
- e) Brake
- f) Number plate
- g) Work light

- Essential

Provided

Conforms

#### iii) Grain tank cover

- Essential

Provided

Conforms
<table>
<thead>
<tr>
<th></th>
<th>iv) Spark arrester in engine's exhaust</th>
<th>Essential</th>
<th>-</th>
<th>Not provided, however tractor engine is equipped with turbo charger which eliminates the requirement of spark arrester</th>
</tr>
</thead>
<tbody>
<tr>
<td>v)</td>
<td>Stone trap before concave</td>
<td>Essential</td>
<td>-</td>
<td>Provided</td>
</tr>
<tr>
<td>vi)</td>
<td>Rear view mirror</td>
<td>Essential</td>
<td>-</td>
<td>Provided</td>
</tr>
<tr>
<td>vii)</td>
<td>Slip clutch at following drives - a) Cutting platform b) under shout conveyor drive c) Grain &amp; tailing elevator</td>
<td>Essential</td>
<td>-</td>
<td>Provided</td>
</tr>
<tr>
<td>viii)</td>
<td>Anti-slip surfaces at operator's platform &amp; ladder &amp; proper gripping for the control levers</td>
<td>Essential</td>
<td>-</td>
<td>Provided</td>
</tr>
<tr>
<td>ix)</td>
<td>Working clearance around the controls</td>
<td>Essential 70 mm, min.</td>
<td>-</td>
<td>Provided</td>
</tr>
<tr>
<td>x)</td>
<td>Labelling of control gauge</td>
<td>Essential</td>
<td>-</td>
<td>Provided</td>
</tr>
<tr>
<td>9.</td>
<td>Material of construction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i)</td>
<td>Knife guard should conforms to IS:6024-2004</td>
<td>The guard (except ledger plate) shall be manufactured from malleable iron casting (IS: 2108-1977), steel casting (IS: 1030-1974) or steel forging (IS: 2004-1978)</td>
<td>C=0.3077% Si=0.8228% Mn=0.4635% P=0.0133% S=Nil</td>
<td>Unascertainable as the relevant code does not specify the content limit.</td>
</tr>
</tbody>
</table>
### TRACTOR POWERED COMBINE HARVESTER ‘BALKAR B-525’, COMMERCIAL

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Category of breakdowns</th>
<th>Category (evaluative/ Non evaluative)</th>
<th>Requirements as per IS: 1.806-2008</th>
<th>As observed</th>
<th>Whether meets the requirements (Yes/No.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Critical</td>
<td>Evaluative</td>
<td>No critical breakdown</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>2.</td>
<td>Major</td>
<td>Evaluative</td>
<td>Not more than three and neither of them should be repetitive in nature</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>3.</td>
<td>Minor</td>
<td>Evaluative</td>
<td>Not more than five and frequency of each should not be more than three</td>
<td>None</td>
<td>Yes</td>
</tr>
</tbody>
</table>

10. Labelling of combine harvester

- Essential as per IS: 10273
- Provided
- Conforms

11. Break down (critical major & minor)

#### TESTING AUTHORITY

- **G.R. AMBALKAR**
  - Agricultural Engineer
  - Signature

- **R.K. NEMA**
  - Senior Agricultural Engineer
  - Signature

- **HIMAT SINGH**
  - Director
  - Signature

Test report compiled by: Sh. B.N. Dixit, Sr. Tech. Assistant

#### 18. APPLICANT’S COMMENTS

<table>
<thead>
<tr>
<th>Para No.</th>
<th>Our reference</th>
<th>Applicant’s comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.1</td>
<td>17 (3)</td>
<td>We will make arrangement to reduce the mechanical vibration of the harvester in regular production.</td>
</tr>
<tr>
<td>18.2</td>
<td>17 (9) (ii)</td>
<td>Our all performance of the the knife is satisfactory further we will match the actual carbon content to the required in further production.</td>
</tr>
</tbody>
</table>