INDOFARM AGRICOM 1070 SELF PROPELLED, COMBINE HARVESTER (TRACK TYPE)

GOVERNMENT OF INDIA
MINISTRY OF AGRICULTURE
(DEPARTMENT OF AGRICULTURE & CO-OPTERATION)

CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE
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18. SUMMARY OF OBSERVATIONS. COMMENTS AND RECOMMENDATIONS

18.1 Engine performance Test:

<table>
<thead>
<tr>
<th>Engine Brake Power, (KW)</th>
<th>Crankshaft Torque, (Nm)</th>
<th>Engine Speed (rpm)</th>
<th>Hourly Fuel Consumption kg/h, (l/h)</th>
<th>Specific Fuel Consumption (kg/kwh)</th>
<th>Specific Energy (kwh/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I) Maximum Power- 2 hours test:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43.4</td>
<td>146.0</td>
<td>2840</td>
<td>13.21</td>
<td>0.252</td>
<td>3.32</td>
</tr>
<tr>
<td>II) Power at rated engine speed test (2800 RPM)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43.2</td>
<td>147.3</td>
<td>2800</td>
<td>12.94</td>
<td>0.251</td>
<td>3.33</td>
</tr>
<tr>
<td>41.4</td>
<td>141.2</td>
<td>2800</td>
<td>12.74</td>
<td>0.256</td>
<td>3.27*</td>
</tr>
<tr>
<td>III) Maximum torque:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27.0</td>
<td>171.9</td>
<td>1500</td>
<td>7.57</td>
<td>0.229</td>
<td>3.65</td>
</tr>
<tr>
<td>24.6</td>
<td>156.5</td>
<td>1499</td>
<td>7.00</td>
<td>0.232</td>
<td>3.61*</td>
</tr>
<tr>
<td>IV) Five hour rating test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Engine loaded to 90% of maximum power:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38.0</td>
<td>125.0</td>
<td>2905</td>
<td>11.67</td>
<td>0.257</td>
<td>3.26*</td>
</tr>
<tr>
<td>b) Maximum power:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41.2</td>
<td>139.0</td>
<td>2833</td>
<td>12.64</td>
<td>0.256</td>
<td>3.26*</td>
</tr>
</tbody>
</table>

*Under high ambient condition

Remarks:
I) The maximum power output of the engine was observed as 43.6 kW at 2849 rpm of engine at full throttle.
II) The specific fuel consumption corresponding to maximum power at full throttle setting measured as 0.252 kg/kwh
III) The back-up torque of the engine was measured as 17.7 % under natural ambient condition at full throttle.
IV) The maximum smoke density was recorded as 0.23 m−1 (Bosh No.).
V) The maximum temperature of engine oil, coolant (water) and exhaust gas were observed as 97.92 and 620 respectively.
VI) The lubricating oil & coolant consumption during five hours rating test were measured as 0.48 g/kwh & 0.33 % of total coolant capacity respectively.

18.2 Turning Ability:
The radius of turning cycle of LHS and RHS was observed satisfactory.

18.3 Visibility:
The visibility around the cutter bar from operator’s seat in normal siting position is satisfactory.

18.4 Braking Performance:
No specific brake mechanism is provided. The combine stop by bringing the control levers of LHS and RHS driving roller/track to the neutral position.

18.5 Mechanical Vibration:
The amplitude of mechanical vibration of components are given in the chapter 8 of this report. The observation reading marked (*) for various assemblies on higher side and suitable arrangement should be provided to dampen the vibration for the operator’s comfort.
18.6 Noise Measurement:
   I) The ambient noise emitted by the machine was measured as 87 db (A).
   II) The noise at drivers ear level was measured as 92 db (A) which is within limit when compared to warming levels of 98 db (A).

18.7 Field Test:

Summary of field test:
The result of the field test for the paddy harvesting is summarized below.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Observation</th>
<th>Range of observation</th>
<th>Average of observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Speed of operations, kmph</td>
<td>1.93 to 3.45</td>
<td>-</td>
</tr>
<tr>
<td>2.</td>
<td>Area covered (ha/h)</td>
<td>0.212 to 0.299</td>
<td>-</td>
</tr>
<tr>
<td>3.</td>
<td>Fuel consumption:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-(l/h)</td>
<td>7.53 to 8.17</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-(l/ha)</td>
<td>26.92 to 37.91</td>
<td>-</td>
</tr>
<tr>
<td>4.</td>
<td>Crop throughput (tonne/ha)</td>
<td>6.20 to 16.00</td>
<td>-</td>
</tr>
<tr>
<td>5.</td>
<td>Grain breakage in main grain outlet (%)</td>
<td>0.14 to 1.15</td>
<td>0.401</td>
</tr>
<tr>
<td>6.</td>
<td>Header losses (%)</td>
<td>0.072 to 0.475</td>
<td>0.24</td>
</tr>
<tr>
<td>7.</td>
<td>Total non-collectable losses (%)</td>
<td>0.099 to 0.709</td>
<td>0.363</td>
</tr>
<tr>
<td>8.</td>
<td>Total collectable losses (%)</td>
<td>0.38 to 3.92</td>
<td>2.134</td>
</tr>
<tr>
<td>9.</td>
<td>Total processing losses (%)</td>
<td>0.95 to 4.38</td>
<td>2.66</td>
</tr>
<tr>
<td>10.</td>
<td>Threshing efficiency (%)</td>
<td>95.98 to 99.46</td>
<td>97.8</td>
</tr>
<tr>
<td>11.</td>
<td>Cleaning efficiency (%)</td>
<td>93.07 to 98.20</td>
<td>96.4</td>
</tr>
</tbody>
</table>

18.7.1 Paddy Harvesting
   I) The grain breakage range from 0.14 to 1.15 % which is considered to be normal.
   II) The total non-collectable losses ranged from 0.099 to 0.709 % which is considered to be normal.
   III) The total processing losses ranged from 0.95 to 4.38 % which is considered to be on higher side against max. limit of 2.5 % specified by BIS.
   IV) The threshing efficiency ranged from 95.98 to 99.46 % which does not meet the requirements.
   V) The cleaning efficiency ranged from 93.07 to 99.20 % which does not meet the requirements.

Necessary improvements are required to be incorporated to reduce the total processing losses and to improve cleaning and threshing by the applicant.

18.7.2 Harvesting of any other crops:
The performance of combine to harvest the paddy crop was evaluated as the recommended by the applicant.
18.7.3  Ease of operation and safety provision:
   i) The control provider around the accelerator is within easy reach. But not labeled with symbols as per Indian standard. Therefore it is recommended that the symbol as per the requirement of IS-6283-1998 may be provided.
   ii) The stone trap needs to be provided before the threshing unit.
   iii) Spark arresting device is not provided in the engine exhaust system which is considered essential.
   iv) Slip clutch/ safety devices in knife drive, crop auger and threshing drum drive are considered essential from safety point of view which needs to be provided.
   v) The provision for adjusting the reel speed is not provided, which needs to be provided.
   vi) The grain tank is should be provided with suitable device to know the grain fill.
   vii) Mechanical lock for reel in raised position needs to be provided to ensure safety while working on cutter bar.

18.7.4  Assessment of Wear:
   i) The wear of engine components i.e. cylinder liners, piston, piston rings, valves, valve guides, springs, big-end bearing were observed within the permissible limit.
   ii) The transmission gears and components wear found in normal working condition.
   iii) The timing gears, clutch lining, release bearing were found in normal working condition.
   iv) The condition of the component of hydraulic system and steering system was observed to be normal.
   v) The condition of the bearing, chains, sprockets and belts was observed to be normal.
   vi) The component of starter motor and alternator were found in normal working condition.
   vii) The rate of wear of peg teeth bar of threshing cylinder & cylinder concave were observed to be normal.

18.7.5  Hardness and chemical composition:
   i) The hardness of knife blade in reminder zone is not within the permissible limit of IS: 6025-1999.

18.8  Maintenance / service problems:
   No noticeable maintenance / service problem was observed during the course of test at this institute however the following provisions needs to be provided in the machine:
   i) Provision of threshing drum speed variation to cater for varying crop conditions.

18.9  Safety provisions:
   i) The slip clutch should be provided in all the drives to prevent the damage to the drive belts and fire hazard in case of choking of combine harvester during the crop harvesting.
   ii) The tail lights, hazard indicator lights and reflectors should be provided on combine harvesters to prevent any accident during crossing of village roads in night during the harvesting operation.
   iii) Grain unloading light should be provided for safe and ease parking of grain collecting vehicle.
   iv) The provision for mechanical lock of cutting platform in raised position should be provided for safety during maintenance work.
18.10 Identification plate of combine:
The identification plate is provided on the combine harvester as specified in IS :10273-1999.

18.11 Literature supplied with the machine:

The following literature supplied in English were supplied with the machine for reference during testing and these were found adequate, however, it needs to be modified in Hindi and other regional language for the guidance of the users in accordance with IS :8132-1983.
   2. Operator’s Service book Tata 497 SP Industrial Engine
   3. Spare Part’s Catalogue Agricom 1070

18.12 Citizen Charter:

<table>
<thead>
<tr>
<th>Duration of Test</th>
<th>Test duration under citizen charter</th>
<th>Whether the report released within time frame given in citizen charter</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 2012 to December 2012 – 8 Months</td>
<td>09 Months</td>
<td>Yes</td>
<td>--</td>
</tr>
</tbody>
</table>

TESTING AUTHORITY:

R.K. NEMA
AGRICULTURAL ENGINEER

H.L. YADAV
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C.R. LOHI
DIRECTOR

Test Report compiled by: Shri. Pratyush Satya, Senior Technical Assistant.