

व्यावसायिक परीक्षण रिपोर्ट  
COMMERCIAL TEST REPORT

संख्या / No. : COMB-70/1423  
माह/ Month : August, 2012



**TRACTOR POWERED COMBINE HARVESTER  
'AMRIT (TDC)-795'**



सत्यमेव जयते

भारत सरकार  
कृषि मंत्रालय  
(कृषि एवं सहकारिता विभाग )

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

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**15.8 Wear of the Peg Teeth:**

The wear of the peg teeth of the threshing cylinder and concave was measured. The percentage wear on mass basis was computed and the results are given below:

Sl. No.	Original mass before test (g)	Mass after 29.4 hours of test (g)	Percent wear
<b>a) Peg teeth of threshing cylinder:</b>			
1.	220.5	219.4	0.50
2.	223.8	222.9	0.40
3	225.6	224.7	0.40
4	221.5	220.4	0.49
5	221.6	221.0	0.27
6	224.2	223.0	0.53
7	230.5	229.6	0.39
8	229.6	228.7	0.39
<b>b) Peg teeth of Concave:</b>			
1	223.1	221.9	0.54
2	221.1	219.0	0.95
3	220.4	218.0	1.09
4	224.0	223.0	0.45
5.	222.0	220.9	0.50
6.	229.6	228.8	0.35
7.	216.8	215.8	0.96
8.	219.6	218.0	0.73

**16. 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.

**16.2 Header lifting test :**

During 1000 cycles, no leakage of hydraulic oil was observed and working of hydraulic system is normal.

**16.3 Turning ability:**

Radius of turning circle of LHS & RHS was found satisfactory.

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#### 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 mean deceleration and stopping distance corresponding mean  $2.5 \text{ m/sec}^2$ , observed as 78 N and 9.7 m 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 84.4dB(A).
- ii) The noise at driver's ear level was measured as 95.4 dB(A).

#### 16.8 Field Test:

##### 16.8.1 Summary of field tests:

The results of the field test are summarized below:

S. No	Parameters	Range of parameters		Average of parameters	
		Wheat Harvesting	Paddy Harvesting	Wheat Harvesting	Paddy Harvesting
1.	Speed of operation (kmph)	2.52 to 3.31	2.43 to 2.65	2.27	2.54
2.	Area covered (ha/h)	0.670 to 0.820	0.656 to 0.809	0.767	0.739
3.	Fuel consumption: - (l/h) - (l/ha)	4.96 to 5.64 6.76 to 7.69	5.01 to 6.17 6.50 to 9.40	5.34 7.24	5.74 7.88
4.	Crop throughput (tonne/h)	6.8 to 10.7	8.2 to 11.5	8.6	9.6
5.	Grain breakage in main grain outlet(%)	0.396 to 0.600	0.500 to 0.604	0.469	0.546
6.	Header losses(%)	0.317 to 0.833	0.398 to 0.842	0.554	0.635
7.	Total non-collectable losses(%)	0.590 to 1.080	0.788 to 1.597	0.814	1.137
8.	Total collectable losses(%)	0.325 to 0.800	0.503 to 0.810	0.602	0.646
9.	Total processing losses(%)	1.145 to 1.545	1.450 to 1.957	1.331	1.694
10.	Threshing efficiency(%)	99.1 to 99.6	98.9 to 99.3	99.3	99.1
11.	Cleaning efficiency(%)	97.7 to 98.8	97.0 to 97.5	98.3	97.2

**16.8.2 Wheat Harvesting:**

- i) The grain breakage in all the varieties tested was measured as 0.396 to 0.600 %
- ii) The total non collectable losses ranged from 0.590 to 1.080 percent .
- iii) The threshing efficiency ranged from 99.1 to 99.6 %
- iv) The cleaning efficiency ranged from 97.7 to 98.8%.
- v) The total processing losses ranged from 1.145 to 1.545%.

**16.8.3 Paddy Harvesting:**

- i) The grain breakage ranged from 0.500 to 1.597%
- ii) The total non-collectable losses ranged from 0.788 to 1.597%
- iii) The threshing efficiency ranged from 98.9 to 99.3%.
- iv) The cleaning efficiency ranged from 97.0 to 97.5%.
- v) The total processing losses ranged from 1.450 to 1.957%

**16.8.4 Harvesting of any other crops:**

The performance of combine to harvest wheat and paddy was evaluated as per the recommendation of manufacturer.

**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 and direction of operation of controls are not provided for the guidance of operator. Therefore it is recommended that the symbols as per the requirement of IS-6283-1998 may be provided.
- ii) Safety device/slip clutches in threshing drum drive, reel drive, cutter bar drive & feeder conveyor drive are also considered essential from safety point of view.
- iii) The grain tank needs to be provided with suitable device to know the grain fill and covered fully in order to avoid any accident while working on the machine.
- iv) There is no provision for adjusting the threshing drum speed except the changing of pulley size which make it difficult to adjust the speed for harvesting different varieties of crop. Speed variation through suitable hydraulic variator pulley is recommended.
- v) The design of stone trap need to be modified for easy cleaning.
- vi) The safety frames to protect the grain and tailing auger, blower body from damage while crossing the field bunds are considered essential and may be 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 normal.

- ii) The condition of the bearing, chains, sprockets and belts was observed 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 normal.

**16.9 Hardness and Chemical composition:**

- i) The hardness of knife blade in the remainder zone is not complying with specified limit as per IS 56025-1991.
- ii) The chemical composition of knife blade does not conform to Indian standard. It should be incorporated 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. But it needs to be provided as per IS:10273-1999.

**16.12 Literature supplied with the Machine:**

16.12.1 The following literature was supplied with the machine for reference during testing.

- i. Operator manual for L & T John Deere 5310 tractor.
- ii. Partial filled combine specification along with CMVR report photocopy.

16.12.2 A operator manual in English is provided. However, it is necessary to be modified as per IS:8132-1999 in Hindi and other regional languages for the guidance of the users.

**17. Selected performance and other characteristics of combine harvester as per IS: 15806-2008.**

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

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		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 consumption fuel g/kWh.	The average observed value during 2 hr. max. power test must be within $\pm 5\%$ 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	--
		vi)	Max. crank shaft torque, N - m	Max. crank shaft torque observed during the test after no. load engine speed is adjusted as per manufacturer's recommendation for field work must not be less than 8% of declare value by manufacturer.	Not applicable	Not applicable	--

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		vii)	Back torque, %	7% min.	Not applicable	Not applicable	--
		viii)	Max. operating temp. i) engine oil ii) Coolant	To be declared by manufacturer. Not Specified 105°C	Not applicable	Not applicable	--
		ix)	Lubrication oil consumption	1% of SFC at 5hr. max. power test during high ambient condition	Not applicable	Not applicable	--
2.	<b>Brake performance</b>	i)	Max. stopping distance at a force equal to or less than 600 N on break pedal, m	10 m or $S \leq 0.15V + V^2/130$ $V =$ speed corresponding to 80% of design max. speed, kmph	--	4.23 In cold condition	Conforms
		ii)	Max. force exerted on brake pedal to achieve a deceleration of 2.5 m/sec <sup>2</sup> .	$\leq 600N$ .	--	78 In cold condition	Conforms
		iii)	Whether parking brake is effective at a force of 600 N at foot pedal or 400 N at Hand and lever	Yes or No	--	Yes	Conforms
3.	<b>Mechanical vibration</b>	i)	Operator's plateform	120 $\mu m$ max.	--	80	Conforms
		ii)	Steering wheel	150 $\mu m$ max.	--	120	Does not Conform
		iii)	Seat with driver seated	120 $\mu m$ max.	--	350	Does not Conform
4.	Air cleaner oil pull over	i)	Max. oil pull over in % age when tested in accordance with IS: 8122 pt. (II)-2000	0.25% max.	-	Not applicable as dry air filter is provided	--
5.	<b>Noise measurement</b>	i)	Max. ambient noise emitted by combine db (A)	As per CMVR 88 db (A)	-	84.4	Conforms
		ii)	Max. noise at operator's ear level db (A)	As per CMVR, 98 db (A)	-	95.4	Conforms
6.	<b>Discard limit</b>			To be specified by manufacturer, mm	-		

		i)	Cylinder bore diameter	-do-	-	Not applicable	--
		ii)	Piston diameter	-do-	-	Not applicable	--
		iii)	Ring end gap	-do-	-	Not applicable	--
		iv)	Ring groove clearance	-do-	-	Not applicable	--
		v)	Diametral and axial clearance of big end bearing	-do-	-	Not applicable	--
		vi)	Diametral end axial clearance of main bearings	-do-	-	Not applicable	--
		vii)	Thickness of brake lining	-do-	-	Not applicable	--
		viii)	Thickness of clutch plate	-do-	-	Not applicable	--
7.	Field performance	i)	Suitability for crops	Wheat & paddy essential	-	Wheat, paddy	Conforms
		ii)	Grain breakage in grain tank	≤ 2.5%	-	Wheat- 0.396 to 0.600% Avg. 0.469 Paddy- 0.500 to 0.604% Avg. 0.546%	Conforms Conforms
		iii)	Non collectable losses	≤ 2.5 % for wheat, paddy & gram ≤ 0.4 % for soybeans	-	Wheat- 0.590 to 1.080% Avg. 0.814% Paddy- 0.788 to 1.597% Avg. 1.123%	Conforms Conforms
		iv)	Threshing efficiency	≥ 98% wheat & paddy	-	Wheat- 99.1 to 99.6% Avg. 99.3% Paddy- 98.9 to 99.3% Avg. 99.1%	Conforms Conforms
		v)	Cleaning efficiency	≥ 96 % wheat & paddy	-	Wheat- 97.7 to 98.8% Avg. 98.3% Paddy- 97.0 to 97.5% Avg. 97.2%	Conforms conforms

8.	<b>Safety requirement</b>	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 as per report No. CMVR/com b-TM/2009/7 15.10.2009 of NRFMT&TI Hisar	Conforms
		iii)	Grain tank cover	Essential	-	Not provided	Does not conform
		iv)	Spark arrester in engine's exhaust	Essential	-	Not applicable	--
		v)	Stone trap before concave	Essential	-	Provided	Conforms
		vi)	Rear view mirror	Essential	-	Provided	Conforms
		vii)	Slip clutch at following drives – a) Cutting plateform b) under shout conveyor drive c) Grain & tailing elevator	Essential	-	Not provided	Does not conform
		viii)	Anti slip surfaces at operation platform & ladder & proper gripping for the control levers	Essential	-	Provided	Conforms
		ix)	Working clearance around the controls	Essential 70 mm, min.	-	Provided	Conforms
		x)	Labeling of control gauge	Essential	-	Provided	Conforms
9.	<b>Material of construction</b>	i)	Guard should conforms to IS:6024-1983	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)	Made from forged steel and ledger plate is integrated part of guard	C=0.26 Si=0.16 Mn=0.46 P=0.037 S=0.043	Unascertainable as the relevant code does not specify the content limit.
		ii)	Knife blade	It must have Chemical composition as C= 0.70-0.95 % Mn =0.30-0.50 %	Cold rolled steel (steel casting)	C=0.75 Mn=0.68	Conforms <b>Does not conform</b>

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	iii)	Knife back	The knife back shall be manufactured from Carbon Steel having minimum carbon content of 0.35 %	-	Carbon content is 0.16	Does not conform
10.	<b>Labelling of combine harvester</b>		Essential, It should mention make & model ,Engine No. Chassis No., Year of manufacture, Power & SFC of engine	-	Provided as per CMVR	Conforms
11.	<b>Break down (critical major &amp; minor)</b>		Essential as per IS: 15806-2008 Annexure A <sub>1</sub> , A <sub>2</sub> , A <sub>3</sub>	-	NIL	conforms

### **TESTING AUTHORITY**

(J.P. MANDAL AGRICULTURE ENGINEER)	<i>J.P. Mandal</i>
(P. K. CHOPRA) SENIOR AGRICULTURAL ENGINEER	<i>P.K. Chopra</i>
A. N. MESHRAM -DIRECTOR-	<i>A.N. Meshram</i>

Applicant's comments : Nil comments received