

व्यावसायिक परीक्षण रिपोर्ट
COMMERCIAL TEST REPORT

संख्या / No. : Comb – 131/1640/2014
माह / Month: August, 2014



COMBINE HARVESTER
'JOHN DEERE R-40', TRACK TYPE



सत्यमेव जयते

भारत सरकार
कृषि मंत्रालय
(कृषि एवं सहकारिता विभाग)

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

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16.7 Wear of the Peg Teeth bar:

The wear of the beater bar of the threshing cylinder 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 50.64 hours of test (g)	Percent wear (%)
1.	548.4	537.1	2.06
2.	489.4	476.5	2.64
3	541.4	529.8	2.14
4	531.2	520.0	2.11
5.	511.9	501.2	2.09
6.	519.4	504.5	2.87
7.	472.8	458.3	3.07
8.	510.3	493.5	3.29
9.	514.7	496.3	3.57

**17 SUMMARY OF OBSERVATIONS, COMMENTS AND RECOMMENDATIONS****17.1 Engine Performance Test:**

Engine Brake power, kW (Ps)	Crankshaft torque, Nm(kgf-m)	Engine speed (rpm)	Hourly fuel consumption kg/h (l/h)	Specific fuel consumption kg/kWh (kg/hph)	Specific energy, kWh/l (hph/l)
i) Maximum power - 2 hours test:					
46.74 (63.55)	203.2 (20.72)	2300	12.323 (14.847)	0.266 (0.194)	3.148 (4.280)
40.83 (55.51)	183.5 (18.71)	2225	11.963 (14.414)	0.293 (0.215)	2.833 (3.851)*
ii) Power at rated engine speed (2400 rpm)					
43.25 (58.80)	180.2 (18.38)	2400	12.580 (15.157)	0.291 (0.214)	2.853 (3.879)
38.86 (52.83)	161.9 (16.51)	2400	12.341 (14.969)	0.318 (0.234)	2.613 (3.553)*
iii) Maximum torque:					
35.63 (48.44)	237.5 (24.22)	1500	9.103 (10.968)	0.255 (0.188)	3.249 (4.416)
32.82 (44.62)	218.8 (22.31)	1500	8.759 (10.553)	0.267 (0.196)	3.110 (4.228)*
iv) Five hour rating test:					
a) Engine loaded to 90% of maximum power:					
39.62 (53.87)	165.3 (16.86)	2397	12.429 (14.975)	0.314 (0.231)	2.646 (3.597)*
b) maximum power:					
40.68 (55.33)	183.5 (18.71)	2217	11.929 (14.373)	0.293 (0.216)	2.830 (3.850)*

* Under high ambient condition.

Remarks:

- i) The maximum power output of the engine was observed as 46.74 kW (63.55 Ps) at 2300 rpm of engine at full throttle setting which is also recommend for field operation.
- ii) The specific fuel consumption corresponding to maximum power at full throttle setting and setting recommended for field operation was measured as 0.264 Kg/kWh (0.194 kg/hph).
- iii) The back-up torque of the engine was measured as 16.59 & 19.24 % under natural ambient condition & High ambient conditions respectively.
- iv) The maximum smoke density was recorded as 4.25 (Bosch No.).
- v) The maximum temperature of engine oil, coolant(water) and exhaust gas were observed as 100.4, 88 and 490° C respectively.
- vi) The lubricating oil & coolant consumption during five hours rating test were measured as 0.56 g/kWh (0.412 g/hph) and 0.31% of total coolant capacity respectively.

17.2 Turning ability:

The radius of turning circle at LHS and RHS was observed satisfactory.

17.3 Visibility:

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

17.4 Mechanical Vibration:

The amplitude of mechanical vibration of components are given in chapter 12 of this report.

17.5 Noise measurement:

- i) The ambient noise emitted by the machine was measured as 87.3 dB(A) which.
- ii) The noise at driver's ear level was measured as 96.2 dB(A).
- iii) The noise level at both level as above are within specified limit.

17.6 Field Test:**17.6.1 Summary of field tests:**

The results of the field test are summarized below:

S. No.	Observation	Paddy harvesting	Average observed
1.	Speed of operation (kmph)	3.10 to 4.79	3.77
2.	Area covered (ha/h)	0.423 to 0.578	0.483
3.	Fuel consumption:		
	- (l/h)	7.133 to 8.518	7.736
	- (l/ha)	14.071 to 18.176	16.130

4.	Crop throughput (tonne/h)	5.89 to 11.20	8.52
5.	Grain breakage in main grain outlet(%)	NIL to 0.167	0.036
6.	Header losses(%)	0.056 to 4.248	1.611
7.	Total non-collectable losses(%)	0.160 to 4.484	1.890
8.	Total collectable losses(%)	0.266 to 2.268	0.898
9.	Total processing losses(%)	0.442 to 2.575	1.213
10.	Threshing efficiency(%)	97.69 to 99.72	99.08
11.	Cleaning efficiency(%)	93.07 to 98.10	96.63



17.6.1.1 Paddy Harvesting:

During harvesting, the grain breakage in different varieties of paddy ranged from Nil to 0.167%. The sieve losses varied from 0.088 to 0.824% in paddy crop. The header losses in paddy varied from 0.056 to 4.248%.

The total non-collectable losses in different varieties of paddy ranged from 0.160 to 4.484%. The collectable losses in paddy ranged from 0.266 to 2.268%, and the total processing losses in different varieties of crops ranged from 0.442 to 2.575%. The threshing efficiencies in paddy varied from 97.69 to 99.72. The cleaning efficiency in wheat and paddy varied from 93.07 to 98.10%. For variety wise details of these losses **Table-3** may be referred.

17.6.2 Break down and repairs

A crackage found in casing of turbo charger unit (After running time 11.79 h of machine)

17.6.3 Harvesting of any other crops:

The performance of combine to harvest only paddy crop which was evaluated as the same were recommended by the applicant.

17.6.4 Ease of Operation and Safety Provision:

- i) The controls provided around the operator are within easy reach, and labelled with symbols as per the requirement of IS-6283-1998 may be provided.
- ii) Spark arresting device is not provided in the engine exhaust system which is considered essential. However engine is with turbocharger.
- iii) Slip clutch / safety device in knife drive, crop auger drive and threshing drum drive are considered essential from safety point of view which needs to be provided.
- iv) The mechanical arrangement for adjusting the reel speed though provided, needs to be modified such that the same could be controlled from operators position.

17.6.5 Assessment of Wear:

- i) The wear of engine components i.e cylinder liners, piston, piston rings, valves, valve guides, springs, big-end bearings and main bearings were observed within the permissible limit.
- ii) The transmission gears and components were found in normal working condition.
- iii) The timing gears, clutch lining, release bearing were found in normal working condition.
- iv) The condition of the components 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 components of starter motor and alternator were found in normal working condition.
- vii) The rate of wear of peg teeth bar of threshing cylinder & concave were observed to be normal.

17.7 Hardness and Chemical composition:

The Hardness and chemical composition of knife blade in reminder zone is not complying with limit of IS :6025-1999.

17.8 Maintenance/Service problems:

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

17.9 Identification plate of Combine Harvester:

The identification plate is provided on the combine harvester as specified in IS:10273-1999.

17.10 Literature supplied with the Machine:

The following literature in English were supplied with the machine for reference during testing and these were found adequate, however, it needs to be developed in Hindi and other regional languages for the guidance of the users

1. Operator manual.
2. Part catalogue
3. Service manual

18. SELECTED PERFORMANCE AND OTHER CHARACTERISTICS AS PER IS: 15806-2008.

S. No.	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	It should not be less than 5% of the declared value.	48.0 (65.26)	46.74 (63.55)	Conforms
ii)	Max. power observed during test after adjusting the no load engine speed as per recommendation of the manufacturer for field work, kW	Max. power observed must not be less than 5% of declared value.	48.0 (65.26)	46.74 (63.55)	Conforms
iii)	Power at rated engine speed, kW	The observed value must not be less than 5% of the declared value by the applicant.	Not specified	43.25 (58.80)	Does not conform

iv)	Specific fuel consumption g/kWh.	The average observed value during 2 hr. max. power test must be within $\pm 5\%$ of the declared value by applicant/manufacturer.	260	266	Conforms
v)	Max. smoke density (bosch no.) 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	For tractor :- 5.2 bosch no. or 75 hartridge For engine :- Free deceleration or natural aspirated or turbo charges - 65 hartridge	5.2	4.25	Conforms
vi)	Max. crank shaft torque, (N-m) observed during the test after no load engine speed is adjusted as per manufacture's recommendation for field work	It must not be less than 8% of declare value by manufacturer.	237	237.5	Conforms
vii)	Back up torque, %	7% min.	--	19.24	Conforms
viii)	Max. operating temp. To be declared by manufacturer	i) engine oil ii) Coolant	135 105	100.4 87	Conforms Conforms
ix)	Lubrication oil consumption, g/kWh	1% of SFC at max. power during high ambient condition	2.93	0.560	Conforms
2.	Brake performance				
i)	Max. stopping distance at a force equal to or less than 600 N on break pedal, m	$10 \text{ m or } S \leq 0.15V + V^2/130$ V= speed corresponding to 80% of design max. speed, kmph	--	Due to track test is not applicable for a machine	--
ii)	Max. force exerted on brake pedal to achieve a deceleration of 2.5 m/sec ² .	$\leq 600\text{N.}$	--	Not specified	--

	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.	Mechanical vibration					
	i)	Operator's platform	120 µm max.	--	330	Does not conform
	ii)	Accelerator level	150 µm max.	--	230	Does not conform
	iii)	Seat with driver seated	120 µm max.	--	300	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 machine is provided with dry type air cleaner.	--
5.	Noise measurement					
	i)	Max. ambient noise emitted by combine dB (A)	88 dB (A) as per CMVR	--	87.3	Conforms
	ii)	Max. noise at operator's ear level dB (A)	98 dB (A) as per CMVR,	--	96.2	Conforms
6.	Discard limit					
	i)	Cylinder bore diameter	Should not exceed the values declared by the manufacture	106.77	106.51	Conforms
	ii)	Piston diameter	-do-	106.30 (min) (at skirt)	106.36 (at skirt)	Conforms
	iii)	Ring end gap	--do--	1 st comp-0.75	1 st comp-0.50	Conforms
2 nd comp-2.0				2 nd comp-1.50	Conforms	
Oil control-0.75				Oil control-0.45	Conforms	
	iv)	Ring grove clearance	--do--	1 st comp-NA	1 st comp-NA	Conforms
2 nd comp-0.25				2 nd comp-0.11	Conforms	
Oil control-0.25				Oil control-0.09	Conforms	
	v)	Diametrical and axial clearance of big end bearing	-do-	Diametric al-0.32 Axial-0.38	Diametrical-0.09 Axial-0.25	Conforms Conforms



	vi)	Diametrical and axial clearance of main bearings	--do--	Diametrical-0.32 End float-0.50	Diametrical -0.09 End float-0.20	Conforms Conforms
	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		Only for paddy	-
	ii)	Grain breakage in grain tank	≤ 2.5 %		Avg. 0.036 (Nil to 0.167)	Conforms
	iii)	Non collectable losses	≤ 2.5% for wheat, paddy & gram ≤ 4.0% for soybean		Avg. 1.890 (0.160 to 4.484)	Conforms
	iv)	Threshing efficiency	≥ 98% wheat & paddy		Avg. 99.08 (97.69 to 99.72)	Conforms
	v)	Cleaning efficiency	≥ 96 % wheat & paddy		Avg. 96.63 (93.07 to 98.10)	Conforms
8.	Safety requirement					
	i)	Guards against all moving per	Essential	--	Provided	Conforms
	ii)	Lighting arrangement a) Head light b) Parking light c) Indication d) Reverse gear e) Brake f) Number plate	Essential as per CMVR	--	CMVR is not applicable for track combine	--
	iii)	Grain tank cover	Essential	--	Provided	Conforms
	iv)	Spark arrester in engine's exhaust	Essential	--	Not provided	Does not conform However the engine is with turbocharger
	v)	Stone trap before concave	Essential	--	Not provided	Does not conform
	vi)	Rear view mirror	Essential	--	Not provided	Conforms
	vii)	Slip clutch at following drives – a) Cutting platform b) under shout conveyor drive c) Grain & tailing elevator	Essential	--	Not provided Not provided Not provided	Does not conform
	viii)	Anti slip surfaces at operator platform &	Essential	--	Provided	Conforms

9.		ladder & proper gripping for the control levers				
	ix)	Working clearance around the controls	Essential 70 mm, min.	--	Provided	Conforms
	x)	Labelling of control gauge	Essential	--	provided	Conforms
	i)	Guard should conform 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)	Not Applicable for track type machine as knife guard is not provided.	-	-
	ii)	Knife blade As per IS :6025 -1982	It must have Chemical composition as C= 0.70-0.95 % Mn =0.30-0.50 %	--	C= 0.81 Mn=0.42	Conforms Conforms
	iii)	Knife back Must meet the requirement of IS:10378-1982	The knife back shall be manufactured from Carbon Steel having minimum carbon content of 0.35 %	--	C=0.48	Conforms
	10.	Labelling of combine harvester				
	It should conform to IS: 10273-1987	Essential, It should mention make & model, Engine No., Chassis No., Year of manufacture, Power & SFC of engine	--	Provided	Conforms	
11.	Break down (critical major & minor)					
		Essential as per IS: 15806-2008 Annexure A1, A2, A3	--	A crack is found in turbo charger assembly casing. (minor)	Conforms	