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व्यावसायिक परीक्षण रिपोर्ट
COMMERCIAL TEST REPORT

संख्या / No. : Comb -102/1531
माह / Month: August, 2013



**SELF PROPELLED COMBINE HARVESTER
"NEW HIRA-785"**



सत्यमेव जयते

भारत सरकार
कृषि मंत्रालय
(कृषि एवं सहकारिता विभाग)

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

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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:					
92.1(125.2)	409.2(41.8)	2250	24.468 (29.611)	0.266(0.195)	3.110(4.228)
77.2 (105.0)	550.9 (56.2)	1400	18.251 (22.012)	0.237 (0.174)	3.505 (4.765)**
ii) Power at rated engine speed (2200 rpm)					
94.3(128.2)	428.6(43.7)	2200	24.507 (29.634)	0.260(0.191)	3.182(4.327)
87.0(118.3)	395.3(40.3)	2200	23.858 (29.060)	0.274(0.202)	2.994(4.070)*
iii) Maximum torque:					
79.9(108.6)	550.8(56.2)	1450	18.878 (22.773)	0.236(0.174)	3.509(4.770)
67.7(92.0)	520.7(53.1)	1300	17.207 (20.959)	0.254(0.187)	3.230(4.392)*
70.0 (95.2)	583.0(59.5)	1200	17.133 (20.618)	0.244 (0.179)	40.086 (5.555)**
iv) Five hour rating test*					
a) Engine run at 90% of maximum power load:					
81.4(110.7)	356.6(36.4)	2283	22.441(27.330)	0.276 (0.203)	2.980(4.052)
b) Engine run at maximum power load					
89.7(122.0)	407.7(41.6)	2200	24.133 (29.395)	0.269(0.198)	3.052(4.149)

* Under high ambient condition.

** At part throttle speed specified for field work (1700 rpm).

Remarks

- The maximum power output of the engine was observed as 92.1 kW (125.2 Ps) & 77.2 kW (105.0 Ps) at 2250 rpm and 1400 rpm of engine at full throttle and setting recommend for field operation respectively.
- The specific fuel consumption corresponding to maximum power at full throttle and setting recommended for field operation was measured as 0.266 and 0.237 Kg/kwh (0.195 and 0.174 kg/hph).
- The back-up torque of the engine was measured as 30.8 % in natural ambient at full throttle.
- The maximum smoke density was recorded as 4.45 (Bosch No.) which is within permissible limit
- The maximum temperature of engine oil, coolant (water) and exhaust gas was observed as 108.4, 99.0 and 492.2° C respectively.
- The lubricating oil & coolant consumption during five hours rating test were measured as 0.392 g/kWh (0.288 g/hph) and 0.32% of total coolant capacity respectively.

17.2 Turning ability

The radius of turning circle at LHS and RHS was observed satisfactory. Combine is not provided with independent brake pedals for right and left brake.

17.3 Visibility

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

17.4 Braking Performance

- The pedal force required and stopping distance corresponding to mean deceleration of 2.5 m/sec² was observed as 255 N & 12.38 m respectively.

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ii) The performance of parking brake was found satisfactory.

17.5 Mechanical Vibration

The noise level at legstanders fruition found 91.8 db(A) which does not conform with specified noise level 88 db(A) in IS 12180: 2000. The amplitude of mechanical vibration of components marked as (*) in para 12 of this report are 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.

17.6 Noise measurement

The noise level at bystander's position found 91.8 dB(A) which does not conform with specified noise level 88dB(A) in IS 12180:2000. The noise level at driver's ear level is found 96.9 dB(A) which conforms with specified noise level of 98dB(A) in IS 12180:2000

17.7 Field Test

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)	1.96 to 2.19	3.26 to 4.24	2.08	3.81
2.	Area covered (ha/h)	0.700 to 0.943	0.906 to 1.278	0.850	1.068
3.	Fuel consumption: - (l/h)	8.693 to 9.418	8.987 to 10.691	9.084	9.802
	- (l/ha)	9.691 to 13.110	7.032 to 10.821	10.818	9.342
4.	Crop throughput (tonne/h)	6.6 to 8.4	8.9 to 15.7	7.24	11.18
5.	Grain breakage in main grain outlet(%)	1.828 to 2.395	0.205 to 0.956	2.169	0.641
6.	Header losses(%)	1.335 to 3.109	0.252 to 1.504	2.158	0.537
7.	Total non-collectable losses(%)	1.360 to 3.121	0.274 to 1.617	2.205	0.634
8.	Total collectable losses(%)	0.000 to 1.061	0.380 to 2.331	0.311	1.013
9.	Total processing losses(%)	2.054 to 3.174	0.607 to 3.321	2.527	1.751
10.	Threshing efficiency(%)	98.92 to 99.08	97.64 to 99.08	99.02	98.75
11.	Cleaning efficiency(%)	95.97 to 96.90	95.13 to 97.57	96.19	96.32

17.7.1 Wheat Harvesting

- The grain breakage in all the varieties tested ranged from 1.828 to 2.395% (Average 2.169%) which is within the specified limit of 2.5% in IS: 15806-2008.
- The total non collectable losses ranged from 1.360 to 3.121% (Average 2.205%). Average value is within specified limit of 2.5% as specified in IS: 15806-2008.
- The total processing losses ranged from 2.054 to 3.174% (Avg. 2.527%) which is more than the specified limit of 2.5% in IS: 8122(Part-1)1994.
- The threshing efficiency ranged from 98.92 to 99.08% (Average 99.02%) which is above the specified limit of 98% in IS:15806-2008.

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- v) The cleaning efficiency ranged from 95.97 to 96.90% (Average 96.19%). Average value is above the specified limit of 96% in IS:15806-2008.

17.7.2 Paddy Harvesting

- i) The grain breakage ranged from 0.205 to 0.956% (Average 0.641%) which is within specified limit of 2.5% in IS:15806-2008.
 - ii) The total non-collectable losses ranged from 0.274 to 1.617% (Average 0.634%) which is within specified limit of 2.5% in IS:15806-2008.
 - iii) The total processing losses ranged from 0.607 to 3.321 % (Average 1.751%). Average value is within specified limit of 2.5% in IS:8122 (Part-1)1994.
 - iv) The threshing efficiency ranged from 97.64 to 99.08 % (Average 98.75%) Average value is above the specified limit of 98% in IS: 15806-2008.
 - v) The cleaning efficiency ranged from 95.13 to 97.57% (Average 96.32%) Average value is above the specified limit of 96% in IS: 15806-2008.
- Losses are within the specified limit and efficiencies are above the specified limit of Indian Standard on both the crops.

17.7.3 Harvesting of any other crops

The performance of combine to harvest wheat and paddy crops was evaluated as the same were recommended by the applicant.

17.7.4 Ease of Operation and Safety Provision

- i) The controls provided around the operator are within easy reach and labelled but not with symbols as per Indian standard. Therefore, it is recommended that the symbols as per the requirement of IS-6283-1998 may be provided at production level.
- ii) The design of stone trap need to be modified for easy cleaning without removing header unit.
- iii) Spark arresting device is not provided in the engine exhaust system which is considered essential.
- iv) Slip clutch / safety device in lifting platform and grain & tailing elevator are considered essential from safety point of view which needs to be provided at production level.
- v) The mechanical arrangement for adjusting the reel speed though provided needs to be modified such that the same could be controlled from operator's position.
- vi) The grain tank needs to be provided with suitable grain fill indicator device.
- vii) Mechanical lock for reel in raised position needs to be provided to ensure safety while working on cutter bar.

17.7.5 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 brake, 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.



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- vi) The components of starter motor and alternator were found in normal working condition.
- vii) The rate of wear of rasp bar and peg teeth of threshing cylinder & concave were observed as normal.

17.8 Chemical composition

Chemical composition of knife blade does not conform with limits specified in IS: 6025-1999 for manganese. Components conforming to Indian standard should be used at protection level.

17.9 Maintenance/Service problems

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

17.10 Labelling of Combine Harvester

The labelling plate as per IS:10273-1999 is provided on the combine harvester.

17.11 Literature supplied with the Machine

Operator manual for prime mover (engine) for repair and maintenance is provided. However, it needs to be modified as per IS:8132-1999 in Hindi and other regional languages to guide to users and operator of combine.

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 kW(Ps)	It should not be less than 5% of the declared value.	96 ± 5% (130.6±5%)	92.1(125.2)	Conforms
ii)	Max. power observed during test after adjusting the no load engine speed as per recommendation of the manufacturer for field work, kW(Ps)	Max. power observed must not be less than 5% of declared value.	75-80 (102 to108.8)	77.2(105.0)	Conforms
iii)	Power at rated engine speed, kW(Ps)	The observed value must not be less than 5% of the declared value by the applicant.	96 ± 5% (130.6±5%)	94.3(128.2)	Conforms
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.	235±5%	266	Does not conform
v)	Max. smoke density (bosch no.) at 80% load between the speed at	For tractor :- 5.2 bosch no. or 75 hartridge	--	4.45	Conforms

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		max. power & 55% of speed at max. or 1000 rpm which ever is higher, should be observed as per CMVR rule	For engine :- Free deceleration or natural aspirated or turbo charges - 65 hartridge			
	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 declared value by manufacturer.	475	601.0	Conforms
	vii)	Back up torque, %	7% min.	--	30.8	Conforms
	viii)	Max. operating temp. To be declared by manufacturer	i) engine oil ii) Coolant	120 95	108.4 99.0	Conforms Does not conform
	ix)	Lubrication oil consumption, g/kWh	1% of SFC at 5hr. max. power test during high ambient condition with tolerance limit of +10%.	2.69+10%	0.392	Conforms
2.	Brake performance					
	i)	Max. stopping distance at a force equal to or less than 600 N on brake pedal, m	10 m or $S \leq 0.15V + V^2/130$ V= speed corresponding to 80% of design max. speed, kmph	-	7.62m	Conforms
	ii)	Max. force exerted on brake pedal to achieve a deceleration of 2.5 m/sec ² .	$\leq 600N$.	--	255N	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	
3.	Mechanical vibration					
	i)	Operator's platform	120 μ m max.	--	140 μ m	Does not conform
	ii)	Steering wheel	150 μ m max.	--	160 μ m	Does not conform
	iii)	Seat with driver seated	120 μ m max.	--	90 μ m	Conforms
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 type air cleaner is provided	--



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5.	Noise measurement					
	i)	Max. ambient noise emitted by combine dB (A)	88 dB (A) as per CMVR	--	91.8	Does not conform
	ii)	Max. noise at operator's ear level dB (A)	98 dB (A) as per CMVR,	--	96.9	conforms
6.	Discard limit					
	i)	Cylinder bore diameter, mm	Should not exceed the values declared by the manufacture	107.534	107.27(max)	Conforms
	ii)	Piston diameter, mm	--do--	106.40	106.51(min)	Conforms
	iii)	Ring end gap, mm	--do--	2.0	0.65(max)	Conforms
	iv)	Ring groove clearance, mm	--do--	0.20	0.13(max)	Conforms
	v)	Diametrical and axial clearance of big end bearing, mm	--do--	Diame- trical 0.18 Axial 0.25	Diametrical 0.11(max) Axial - 0.20(max)	Conforms
	vi)	Diametrical and axial clearance of main bearings, mm	--do--	Diame- trical 0.178 Axial 0.356	Diametrical 0.10(max) Axial 0.15	Conforms Conforms
	vii)	Thickness of brake lining mm	--do--	Not specified	11.3	--
	viii)	Thickness of clutch plate, mm	--do--	up to rivet head	12.4	Conforms
7.	Field performance					
	i)	Suitability for crops	Wheat & paddy essential	Wheat & paddy	Suitable for Wheat & paddy	Conforms
	ii)	Grain breakage in grain tank	≤ 2.5 %	--	Wheat- 1.828 to 2.395% (Avg. 2.169%) Paddy 0.205 to 0.956 % (Avg. 0.641%)	Conforms for both wheat and paddy
	iii)	Non collectable losses	≤ 2.5% for wheat, paddy & gram ≤ 4.0% for soybean	--	Wheat- 1.360 to 3.121% (Avg. 2.205%) Paddy 0.274 to 1.617% (Avg. 0.634%)	Conforms for both wheat and paddy
	iv)	Threshing efficiency	≥ 98% wheat & paddy	--	Wheat- 98.92 to 99.08% (Avg.=99.02%) Paddy- 97.64 to 99.08% (Avg.=98.75%)	Conforms for both wheat and paddy
	v)	Cleaning efficiency	≥ 96 % wheat & paddy	--	Wheat- 95.97 to 96.90% (Avg.=96.19%) Paddy- 95.13 to 97.57% (Avg.=96.32%)	Conforms for both wheat and paddy

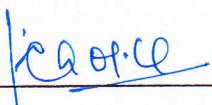
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8. Safety requirement					
i)	Guards against all moving per	Essential	--	Provided	Conforms
ii)	Lighting arrangement a) Head light b) Parking light c) Indication d) Reverse gear e) Brake f) Number plate	Essential as per CMVR	--	Provided	Conforms
iii)	Grain tank cover	Essential	--	Not provided	Does not Conform
iv)	Spark arrester in engine's exhaust	Essential	--	Not provided	Does not Conform (However the turbo charged engine eliminates the requirement of the separate spark arrester to great extend)
v)	Stone trap before concave	Essential	--	Provided	Conform
vi)	Rear view mirror	Essential	--	Provided	Conforms
vii)	Slip clutch at following drives - a) Cutting platform b) under shot conveyor drive c) Grain & tailing elevator	Essential	--	Not Provided	Does not Conform
viii)	Anti slip surfaces at operator platform & ladder & proper gripping for the control levers	Essential	--	Provided	Conforms
ix)	Working clearance around the controls	Essential 70 mm, min.	--	Provided	Conforms
x)	Labelling of control gauge	Essential	--	Provided	Conforms

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9.	Material of construction :				
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)	-	C: 0.36 Mn: 0.64 Si: 0.22 P: 0.028 S; 0.019	Limits are not specified in relevant test code
ii)	Knife blade As per IS :6025 -1982	It must have Chemical composition as Carbon 0.70-0.95 % Manganese 0.30-0.50 %	-	0.80% 0.75%	Conforms only for carbon
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 %	-	Carbon 0.15%	Does not conform
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 A ₁ , A ₂ , A ₃	--	None	Conforms

TESTING AUTHORITY

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APPLICANT'S COMMENTS

No comments received