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व्यावसायिक परीक्षण रिपोर्ट
COMMERCIAL TEST REPORT

संख्या / No. : Comb - 127/1634
माह / Month: July, 2014



SELF PROPELLED COMBINE HARVESTER
'FARMLINE MAXX 4900 S'



सत्यमेव जयते

भारत सरकार
कृषि मंत्रालय
(कृषि एवं सहकारिता विभाग)



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

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16.9 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 hours of test 28.09 (g)	Percent wear by weight (%)
a)	Peg teeth of threshing cylinder:		
1.	213.2	212.7	0.23
2.	219.3	218.6	0.32
3	225.8	225.1	0.31
4	232.6	231.8	0.34
5	225.9	225.2	0.31
6	218.2	217.3	0.41
7	217.5	217.0	0.23
8	213.0	212.4	0.28
b)	Peg teeth of Concave:		
1	216.5	216.0	0.23
2	219.7	218.8	0.41
3	218.0	216.3	0.78
4	217.1	216.4	0.32
5	225.3	224.6	0.31
6	222.8	222.3	0.22
7	208.3	207.1	0.58
8	218.1	217.4	0.32
9	212.6	212.0	0.28

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:					
71.44(97.13)	321.1(32.74)	2225	19.544/23.524	0.273(0.201)	3.037(4.130)
49.93(67.89)	317.0(32.33)	1575	11.503/13.806	0.230(0.169)	3.616(4.917)**

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ii) Power at rated engine speed (2200 rpm)					
71.30(96.40)	324.1(33.05)	2200	19.452/23.352	0.273(0.202)	3.053(4.128)
68.27(92.82)	310.3(31.64)	2200	18.818/22.837	0.276(0.203)	2.989(4.064)**
iii) Maximum torque:					
60.25(81.92)	388.7(39.64)	1550	13.934/16.707	0.231(0.170)	3.606(4.903)
55.35(75.25)	357.1(36.41)	1550	12.945/15.710	0.234(0.172)	3.523(4.790)*
49.59(67.42)	348.0(35.49)	1425	11.306/13.540	0.228(0.168)	3.662(4.979)**
iv) Five hour rating test:					
a) Engine loaded to 90% of maximum power:					
64.08(87.12)	275.0(28.04)*	2330	18.565/22.557	0.290(0.213)	2.841(3.857)**
b) maximum power:					
68.60(93.27)	304.9(31.09)	2250	19.130/23.231	0.279(0.205)	2.953(4.015)*

* Under high ambient condition.

** At no load speed corresponding to rated speed specified for field work.

Remarks:

- i) The maximum power output of the engine was observed as 71.44(97.13) & 49.93(67.89) kW(Ps) at 2225 rpm and 1575 rpm respectively of engine at full throttle and setting recommend for field operation respectively, under during 2 hrs maximum power test, under natural ambient condition.
- ii) The specific fuel consumption corresponding to maximum power at full throttle and settings recommended for field operation was measured as 0.273(0.201) and 0.230(0.169) kg/kWh (kg/hph), during 2 hrs maximum power test, under natural ambient condition.
- iii) The back-up torque of the engine was observed as 21.09 % in natural ambient at full throttle where at field speed setting of 1700 engine rpm it was 9.33 %.
- iv) The maximum smoke density was recorded as 2.1 (Bosch No.) which is within the permissible limit as specified in IS:15806-2008.
- v) The maximum temperature of engine oil, coolant (water) and exhaust gas was observed as 113.2, 98.0 and 283.0 respectively.
- vi) The lubricating oil & coolant consumption during five hours rating test were measured as 0.210 g/kWh (0.154 g/hph) and 0.93% of total coolant capacity respectively.

17.2 Turning ability:

The radius of turning circle at LHS and RHS was observed satisfactory. Combine is provided with single foot pedals for right and left brake.

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17.3 Visibility:

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

17.4 Braking Performance:

- i) The minimum stopping distance observed is 5.09 m and pedal force corresponding to mean deceleration of 2.5 m/sec² observed is 286 N.
- ii) The performance of parking brake was found satisfactory.

17.5 Mechanical Vibration:

The amplitude of mechanical vibration of components marked as (*) in chapter 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:

- i) The ambient noise emitted by the machine was measured as 90.7 db(A) as against the maximum specified limit of 88 db(A) with relevant BIS
- ii) The noise at driver's ear level was measured as 100.8 dB(A) as against the maximum specified limit of 98 db(A) in relevant BIS code.

17.7 Air cleaner oil pull over test

This test is not applicable due to dry type air cleaner.

17.8 Field Test:

17.8.1 Summary of field tests:

The results of the field test are summarized below:

S. No	Parameters	Wheat Harvesting	Paddy Harvesting	Average	
				Wheat	Paddy
1.	Speed of operation (kmph)	2.67 to 2.85	2.68 to 2.77	2.76	2.73
2.	Area covered (ha/h)	0.610 to 0.696	0.558 to 0.631	0.670	0.594
3.	Fuel consumption: - (l/h) - (l/ha)	5.710 to 6.978 8.405 to 10.481	5.632 to 6.528 9.165 to 11.216	6.153 9.211	5.952 10.043
4.	Crop throughput (tonne/h)	3.87 to 7.96	6.04 to 11.31	6.10	8.15
5.	Grain breakage in main grain outlet(%)	0.270 to 0.988	0.265 to 1.738	0.577	1.132
6.	Header losses(%)	0.396 to 1.113	0.154 to 0.371	0.689	0.288

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7.	Total non-collectable losses(%)	0.538 to 1.186	0.191 to 0.494	0.846	0.347
8.	Total collectable losses(%)	0.040 to 0.471	0.102 to 1.276	0.244	0.846
9.	Total processing losses(%)	0.498 to 1.425	0.380 to 3.152	0.978	2.037
10.	Threshing efficiency(%)	99.53 to 99.96	98.71 to 99.90	99.76	99.15
11.	Cleaning efficiency(%)	98.40 to 98.93	96.03 to 97.57	98.56	96.71



17.7.1.1 Wheat Harvesting:

- i) The grain breakage in all the varieties tested was measured as 0.270 to 0.988% (Avg. 0.577%) which is within specified limit of 2.5% as specified in IS: 15806-2008.
- ii) The total non collectable losses ranged from 0.538 to 1.186% (Avg. 0.846%) which is within specified limit of 2.5% as specified in IS: 15806-2008.
- iii) The total processing losses ranged from 0.498 to 1.425% (Avg. 0.978 %).
- iv) The threshing efficiency ranged from 99.53 to 99.96% (Avg. 99.76%) which is within the specified limit of 98% as specified in IS : 15806-2008.
- v) The cleaning efficiency ranged from 98.40 to 98.93% (Avg. 98.56%) which is within limit of 96% as specified in IS: 15806-2008.

17.7.1.2 Paddy Harvesting:

- i) The grain breakage ranged from 0.265 to 1.738 % (Avg. 1.132%) which is within specified limit of 2.5% as per specified in IS: 15806-2008.
- ii) The total non-collectable losses ranged from 0.191 to 0.494 % (Avg. 0.347%) which is within specified limit of 2.5% as specified in IS: 15806-2008.
- iii) The total processing losses ranged from 0.380 to 3.152 % (Avg. 2.037%).
- iv) The threshing efficiency ranged from 98.71 to 99.90 % (Average 99.15%) which is with in specified limit of 98% as per specified in IS: 15806-2008.
- v) The cleaning efficiency ranged from 96.03 to 97.57% (Avg. 96.71%) which is within the limit of 96% as specified in IS: 15806-2008.

17.7.2 Harvesting of any other crops:

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

17.7.3 Ease of Operation and Safety Provision:

- i) The controls provided around the operator are within easy reach, but not labelled with symbols as per Indian standard. Therefore it is recommended that the symbols as per the requirement of IS-6283-1998 may be provided.
- 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 grain elevator and tailing elevator drive are considered essential from safety point of view which needs to be provided.
- v) The mechanical arrangement for adjusting the reel speed should have to provide and needs to be modified such that the same could be controlled from operators position by a hydraulic system.

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17.7.4 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.
- 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.

17.9 Hardness and Chemical composition:

17.9.1 Hardness of knife guard and rasp bar are not conforming to IS:6024-999 and both IS:10378-1982 .

17.9.2 Manganese and carbon content of knife blade and knife back do not complying to IS: 6025-1982 and IS:10378-1982 respectively.

17.10 Maintenance/Service problems:

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

17.10 Defects & Problems:

No noticeable defect or problem was observed during entire test of the combine harvester.

17.11 Labelling of Combine Harvester:

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

17.12 Literature supplied with the Machine:

No any literature are submitted by manufacturer However, a manual in respect of combine harvester as a whole should be brought out in Hindi and other regional languages as per relevant Indian standards IS:8132-1999 to guide to users and operator of combine.

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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.	74.3 (101.0)	71.44 (97.13)	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.	N.A	49.93 (67.89)	Unascertainable
iii)	Power at rated engine speed, kW(Ps)	The observed value must not be less than 5% of the declared value by the applicant.	74.3 (101.0)	71.30 (96.40)	Conforms
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.	265	273	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	2.1	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.	390	348.0	Conforms
vii)	Back up torque, %	7% min.	-	21.09	Conforms

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	viii)	Max. operating temp. To be declared by manufacturer	i) engine oil	120	113.2	Conforms
			ii) Coolant	100	99	Conforms
	ix)	Lubrication oil consumption, g/kWh	1% of SFC at 5hr. max. power test during high ambient condition	2.73	0.210	Conforms
2.	Brake performance					
	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	-	5.09	Conforms
	ii)	Max. force exerted on brake pedal to achieve a deceleration of 2.5 m/sec ² .	$\leq 600N$.	-	286	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.	Mechanical vibration					
	i)	Operator's platform	120 μ m max.		250	Does not conform
	ii)	Steering wheel	150 μ m max.		290	Does not conform
	iii)	Seat with driver seated	120 μ m max.		140	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	Not applicable		Machine is provided with dry type air cleaner hence test is avoided	-
5.	Noise measurement					
	i)	Max. ambient noise emitted by combine dB (A)	88 dB (A) as per CMVR	-	90.7	Does not conform
	ii)	Max. noise at operator's ear level dB (A)	98 dB (A) as per CMVR,		100.8	Does not conform

6.	Discard limit				
i)	Cylinder bore diameter, mm	Should not exceed the values declared by the manufacture	104.15	104.02	Conforms 
ii)	Piston diameter	-do-	103.88	103.88	Conforms
iii)	Ring end gap	--do--	1 st comp - 1.2 2 nd comp-1.2 Oil control-1.2	0.55 0.60 0.60	Conforms Conforms Conforms
iv)	Ring groove clearance	--do--	1 st comp-0.7 2 nd comp-0.2 Oil control-0.2	NA 0.05 0.04	- Conforms Conforms
v)	Diametrical and axial clearance of big end bearing	-do-	Diametrical-0.12 Axial- NA	0.11 0.15	Conforms for Diametrical clearance only
vi)	Diametrical and axial clearance of main bearings	--do--	Diametrical- 0.10 Axial- 0.05	0.10 0.05	Conforms
vii)	Height over the rivet of a brake lining	Not applicable	Up to rivet head	2.80 mm over the rivet head	Conforms
viii)	Height over the rivet of a clutch plate	-do-	Up to rivet head	2.04 mm over the rivet head	Conforms
7.	Field performance				
i)	Suitability for crops	Wheat & paddy essential		Provided	Conforms
ii)	Grain breakage in grain tank	≤ 2.5 %		Wheat (0.270 to 0.988)% Avg.0.577% Paddy (0.265 to 1.738) Avg.1.132%	Conforms
iii)	Non collectable losses	≤ 2.5% for wheat, paddy & gram ≤ 4.0% for soybean		Wheat (0.538 to 1.186%) Avg. 0.846% Paddy (0.191 to 0.494%) Avg.0.347%	Conforms
iv)	Threshing efficiency	≥ 98% wheat & paddy		Wheat (99.53 to 99.96%) Avg. 99.76% Paddy (98.71 to	Conforms

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					99.90%) Avg.99.15%	
	v)	Cleaning efficiency	≥ 96 % wheat & paddy		Wheat (98.40 to 98.93%) Avg.98.56% Paddy (96.03 to 97.57%) Avg.96.71%	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	--	Provided with CMVR certification No. CMVR/ COMB— SP/2012-13/115	Conforms
	iii)	Grain tank cover	Essential	--	Provided	Conforms
	iv)	Spark arrester in engine's exhaust	Essential	--	Not provided	Does not conform however the turbocharger is provided in engine.
	v)	Stone trap before concave	Essential	--	Provided	Conforms
	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	Provided Provided Not Provided	Not Provided Provided Not provided	Conforms for b) only
	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	--	Labelled with symbols	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= 0.41% Si= 0.19% Mn= 0.67% P= 0.035% S= 0.23%	Unascertain-able as the relevant code does not specify the content limit.
	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= 0.76% Mn= 0.74%	Conforms Does not conform
	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= 0.18%	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 A1, A2, A3	--	None	Conforms

TESTING AUTHORITY

	G.R. AMBALKAR Agricultural Engineer	
Sn	R.K. NEMA Agricultural Engineer	
	HIMAT SINGH Director	

Tests report compiled by: **Sh. S.A. Hinge, Assistant Agricultural Engineer**

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