व्यावसायिक परीक्षण रिपोर्ट

COMMERCIAL TEST REPORT

संख्या / No. : Comb-92/1511

माह / Month: MAY, 2013

SELF PROPELLED COMBINE HARVESTER "JOHN DEERE W-70"

सत्यमेव जयते

भारत सरकार
कृषि मंत्रालय
(कृषि एवं सहकारिता विभाग)

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

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17.9 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 26.74hours of test (g)	Percent wear by weight (%)
a)	**Peg teeth of threshing cylinder:**		
1.	125.6	125.0	0.48
2.	121.3	120.2	0.91
3	128.7	127.7	0.78
4	124.7	123.9	0.64
5	124.5	122.8	1.37
6	123.6	122.4	0.97
7	122.4	121.4	0.82
8	120.4	119.7	0.58
b)	**Peg teeth of Concave:**		
1	132.0	131.6	0.30
2	119.5	119.2	0.25
3	121.8	119.2	2.13
4	127.2	125.5	1.34
5	128.1	127.2	0.70
6	126.7	124.6	1.66

18 SUMMARY OF OBSERVATIONS, COMMENTS AND RECOMMENDATIONS

18.1 Engine Performance Test:

Engine Brake power, kW (Ps)	Crankshaft torque, Nm(kgf-m)	Engine speed (rpm)	Hourly fuel consump-tion kg/h / (l/h)	Specific fuel consump-tion kg/kwh (kg/hph)	Specific energy, kWh/l (hph/l)
i) Maximum power - 2 hours test:					
71.8(97.6)	305.4(31.2)	2350	18.550 (22.520)	0.258(0.189)	3.186 (4.332)
ii) Power at rated engine speed (2400 ± 50 rpm)					
71.5 (97.3)	298.1(30.4)	2400	18.741(22.444)	0.262 (0.193)	3.187 (4.334)
66.7 (90.6)	277.8 (28.3)	2410	18.393 (22.321)	0.276 (0.203)	2.98 (4.061)*
iii) Maximum torque:					
64.1 (87.1)	355.9(36.3)	1800	15.425 (18.607)	0.241 (0.177)	3.443 (4.681)
60.1(81.7)	333.9(34.1)	1800	14.835 (18.047)	0.247(0.182)	3.330 (4.528)*
iv) Five hour rating test:					
a) Engine loaded to 90% of maximum power:					
60.1 (81.7)	248.9(25.4)	2417	17.145 (20.864)	0.28 (0.210)	2.882 (3.919)*
b) maximum power:					
63.5 (86.3)	275.9 (28.2)	2303	18.111 (22.052)	0.285 (0.210)	2.881 (3.917)*

* **Under high ambient condition.**

i) The maximum power output of the engine was observed as 71.8 kW (97.6 Ps) at 2350 rpm of engine at full throttle.

ii) The specific fuel consumption corresponding to maximum power at full throttle was measured as 0. 258 (0.189)Kg/kwh.

iii) The back-up torque of the engine was measured as 15.7 & 20.2 % in natural ambient at full throttle and in high ambient at full throttle setting respectively.

iv) The maximum smoke density was recorded as 2.71 (Bosch No.) which is within permissible limit

v) The maximum temperature of engine oil, coolant (water) and exhaust gas was observed as 105, 92 and 499.4 ^{0}C respectively.

vi) The lubricating oil & coolant consumption during five hours rating test were measured as 0.094(0.069) g/kWh (g/hph) and 0.08% of total coolant capacity respectively.

18.2 Turning ability:

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

18.3 Visibility:

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

18.4 Braking Performance:

i) The stopping distance and force corresponding to 2.50 m/sec^2 deceleration where observed as 10.2 m and 193.9 N respectively.

ii) The performance of parking brake was found satisfactory.

18.5 Mechanical Vibration:

The amplitude of mechanical vibration of components marked as (*) in chapter 13 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.

18.6 Noise measurement:

The ambient noise emitted by the machine at bistander and driver's ear level were measured as 83.0 & 92.8 dB (a) respectively which are within specified limits in relevant code.

18.7 Field Test:

18.7.1 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)	2.95 to 3.38	2.20 to 3.12	3.15	2.68
2.	Area covered (ha/h)	1.01 to 1.18	0.59 to 0.85	1.09	0.70
3.	Fuel consumption: - (l/h) - (l/ha)	 7.50 to 8.33 6.38 to 8.08	 8.22 to 9.87 10.03 to 16.68	 7.85 7.22	 8.70 12.76
4.	Crop throughput (tonne/h)	10.92 to 14.05	10.37 to 14.81	12.02	12.51
5.	Grain breakage in main grain outlet(%)	1.300 to 1.663	1.077 to 2.153	1.491	1.531
6.	Header losses(%)	0.573 to 2.885	0.509 to 1.894	1.281	1.299
7.	Total non-collectable losses(%)	0.585 to 2.994	0.620 to 2.216	1.359	1.648
8.	Total collectable losses(%)	0.070 to 0.498	0.397 to 0.993	0.272	0.639
9.	Total processing losses(%)	1.582 to 2.278	1.822 to 3.199	1.853	2.519
10.	Threshing efficiency(%)	99.5 to 99.9	98.9 to 99.6	99.7	99.3
11.	Cleaning efficiency(%)	97.1 to 97.8	95.4 to 97.1	97.5	96.3

18.7.1.1 Wheat Harvesting:

i) The grain breakage in all the varieties tested was measured as 1.300 to 1.663%.

ii) The total non collectable losses ranged from 0.585 to 2.944 percent .

iii) The total processing losses ranged from 1.582 to 2.278 % .

iv) The threshing efficiency ranged from 99.5 to 99.9%.

v) The cleaning efficiency ranged from 97.1 to 97.8% .

18.7.1.2 Paddy Harvesting:

i) The grain breakage ranged from 1.077 to 2.153 % .

ii) The total non-collectable losses ranged from 0.620 to 2.216% .

iii) The total processing losses ranged from 1.822 to 3.199 % .

iv) The threshing efficiency ranged from 98.9 to 99.6 %.

v) The cleaning efficiency ranged from 95.4 to 97.1%

18.7.2 Harvesting of any other crops:

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

18.7.3 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 provided in the engine exhaust system which is considered essential.

iv) Slip clutch / provision have been made for undershot conveyor, feeder auger and grain and tailing elevator.

v) An electronic switch is provided for reel speed control at RHS of operator sheet.

vi) A shear bolt is provided in unloading auger.

vii) The grain tank needs to be provided with suitable grain fill indicator device.

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 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.

18.7.5 Special features

i) To and fro movement of cutting platform.

ii) Setting of platform angle from 3 to 6 degree.

iii) Reel rpm control switch at operator platform panel board are provided.

iv) Wobble box assembly which allow the adjustment of platform.

v) Safety clutch in feed auger drive shaft.

vi) Posi torque assembly to maintain the jerk of ground speed.

vii) Self cleaning arrangement in radiator assembly.

viii) Mechanical variator pulley along with hand lever is provided for blower speed adjustment.

ix) Steering shaft can be tilted as per convenient of operator.

18.8 Hardness and Chemical composition:

18.8.1 Hardness of knife blade of remainder zone is higher and hardness of knife guard is lower than the limit specified in IS :6025-2004 & IS: 6024-2004 respectively. These should be looked into at regular production level.

18.8.2 Chemical composition of knife blade & knife back are conforming the limit as specified in relevant BIS code.

18.9 Labelling of Combine Harvester:

The labelling plate as per IS:10273-2004 is provided on the combine harvester.

18.10 Literature supplied with the Machine:

Following literatures have been provided by the manufacturer

i) Operator manual in English, Hindi & Punjabi with detailed information on machine operation, adjustments and maintenance schedule.

ii) Part catalogue in English

Although the literatures submitted were adequate but these should be modified as per IS:8132-1999 in Hindi & other regional languages to guide the users and operator of combine harvester.

19. 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 ±5% (100.6±5%)	71.8(97.6)	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.	74 ±5% (100.6±5%)	71.8(97.6)	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.	74 ±5% (100.6±5%)	71.8(97.6)	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.	225(±5%)	258(189)	**Does not conform**
	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	2.71	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.	340 -360	355.9	Conforms

	vii)	Back up torque, %	7% min.	--	15.7 %	Conforms
	viii)	Max. operating temp. To be declared by manufacturer	i) engine oil ii) Coolant	135⁰ C 110⁰ C	105 ⁰C 92.0 ⁰C	Conforms Conforms
	ix)	Lubrication oil consumption, g/kWh	1% of SFC at 5hr. max. power test during high ambient condition	2.85+10%	0.094	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≤ 0.15V + V^2/130 V=speed corresponding to 80% of design max. speed, kmph	10.0	5.16	Conforms
	ii)	Max. force exerted on brake pedal to achieve a deceleration of 2.5 m/sec^2.	≤ 600N.	600	193.5	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 µm max.	--	170	**Does not conform**
	ii)	Steering wheel	150 µm max.	--	230	**Does not conform**
	iii)	Seat with driver seated	120 µm max.	--	100	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 the dry type air cleaner is provided	--
5.	**Noise measurement**					
	i)	Max. ambient noise emitted by combine dB (A)	88 dB (A) as per CMVR	--	83.0	Conforms
	ii)	Max. noise at operator's ear level dB (A)	98 dB (A) as per CMVR,	--	92.8	Conforms

6.	**Discard limit**					
	i)	Cylinder bore diameter, mm	Should not exceed the values declared by the manufacture	106.77 mm	106.50	Conforms
	ii)	Piston diameter	-do-	106.30	106.37	Conforms
	iii)	Ring end gap	--do--	1st comp- 0.75 2nd comp- 2.0 Oil ring- 0.75	1st comp- 0.35 2nd comp- 1.35 Oil ring- 0.55	Conforms
	iv)	Ring groove clearance	--do--	1st comp- taper 2nd comp- 0.25 Oil ring- 0.25	--- 2nd comp- 0.07 Oil ring- 0.06	Conforms
	v)	Diametrical and axial clearance of big end bearing	-do-	0.32/0.38	Diametrical 0.11 Axial - 0.30	Conforms
	vi)	Diametrical and axial clearance of main bearings	--do--	0.32/0.50	Diametrical 0.10 Axial -0.05	Conforms
	vii)	Thickness of brake lining	--do--	Up to rivet head	1.1 to 1.3 mm over the rivet head	Conforms
	viii)	Thickness of clutch plate	--do--	Up to rivet head	2.1 to 2.2 mm over the rivet head	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- (1.300 to 1.663%) **Avg.=1.491%** Paddy- (1.077 to 2.153 %) **Avg.=1.531%**	Conforms for both wheat and paddy
	iii)	Non collectable losses	≤ 2.5% for wheat, paddy & gram ≤ 4.0% for soybean	--	Wheat- (0.585 to 2.944%) **Avg.=1.359%** Paddy- (0.620 to 2.216%) **Avg.= 1.648%**	Conforms for both wheat and paddy

	iv)	Threshing efficiency	≥ 98% wheat & paddy	--	Wheat- (99.5 to 99.9%) **Avg.=99.7%** Paddy- (98.9 to 99.6%) **Avg.=99.3%**	Conforms for both wheat and paddy
	v)	Cleaning efficiency	≥ 96 % wheat & paddy	--	Wheat- (97.1 to 97.8) **Avg.=97.5%** Paddy- (95.4 to 97.1) **Avg.=96.3%**	Conforms for both wheat and paddy
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 as per CMVR Test Report No. CMVR/Comb-SP/2010/ 60 dated 11.01.2011 from NFMT&TI, Hisar	Conforms
	iii)	Grain tank cover	Essential	--	Provided	Conforms
	iv)	Spark arrester in engine's exhaust	Essential	--	Not provided -	-- the turbo charged engine eliminates the requirement of the separate spark arrester)
	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	Conforms

9.	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
	Material of construction :					
	i)	Guard should conforms to IS: 6024 - 2004	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=0.45% Si=0.20% Mn=0.55% P=0.027% S=0.019%	Unascertainable as the relevant code does not specify the limit of content.
	ii)	Knife blade As per IS :6025 -2004	It must have Chemical composition as C= 0.70-0.95 % Mn =0.30-0.50 %	-	C=0.90% Mn=0.42%	Conforms
	iii)	Knife back Must meet the requirement of IS:10378-2006	The knife back shall be manufactured from Carbon Steel having minimum carbon content of 0.35 %	-	C=0.36%	Conforms
10.	**Labelling of combine harvester**					
	It should conforms to IS: 10273-2004		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