

व्यावसायिक परीक्षण रिपोर्ट
COMMERCIAL TEST REPORT

संख्या / No. : COMB-75/1428
माह/ Month : August, 2012



**SELF PROPELLED COMBINE HARVESTER
'GURBAAZ-652'**



सत्यमेव जयते

भारत सरकार
कृषि मंत्रालय
(कृषि एवं सहकारिता विभाग)

GOVERNMENT OF INDIA
MINISTRY OF AGRICULTURE
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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 consumption kg/h / (l/h)	Specific fuel consumption kg/kwh (kg/hph)	Specific energy, kWh/l (hph/l)
i) Maximum power - 2 hours test:					
78.9(107.4)	347.5(35.4)	2273	24.96(20.77)	0.263(0.193)	3.16(4.30)
62.3(84.7)	383.7(39.1)	1624	18.77(15.63)	0.250(0.184)	3.32(4.51)**
ii) Power at rated engine speed (2200 rpm)					
78.5(106.8)	357.0(36.4)	2200	24.64(20.57)	0.262(0.193)	3.18(4.33)
73.7(100.2)	335.0(34.2)	2200	23.16(19.10)	0.259(0.190)	3.18(4.33)*
iii) Maximum torque:					
50.4(68.5)	403.2(41.1)	1250	15.07(12.5)	0.248(0.182)	3.34(4.54)
46.4(63.1)	386.6(39.4)	1200	14.11(11.64)	0.250(0.184)	3.29(4.47)*
48.2(65.5)	401.5(40.9)	1202	14.34(11.96)	0.248(0.182)	3.36(4.57)**
iv) Five hour rating test:					
a) Engine loaded to 90% of maximum power:					
68.7 (93.3)	297.5 (30.3)	2307	21.48(17.72)	0.258(0.190)	3.19(4.34)
b) maximum power:					
74.9 (101.8)	330.0 (33.7)	2269	24.36(20.10)	0.268(0.197)	3.07(4.18)

* Under high ambient condition.

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

Remarks:

- The maximum power output of 2hrs test of the engine was observed as 78.9 kW (107.4 Ps) & 62.3 kW (84.7 Ps) at 2273 rpm and 1624rpm of engine at full throttle and setting recommend for field operation respectively.
- The specific fuel consumption corresponding to maximum power 2hrs test at full throttle and setting recommended for field operation was measured as 0.263 & 0.250 Kg/kwh (0.193 & 0.184 kg/hph).
- The back-up torque of the engine was measured as 15.2 % in natural ambient at full throttle.
- The maximum smoke density was recorded as 2.06 (Bosch No.) which is within permissible limit
- The maximum temperature of engine oil, coolant(water) and exhaust gas was observed as 133, 110 and 715° C respectively.
- The lubricating oil & coolant consumption during five hours rating test were measured as 0.0458(0.337) g/kWh (g/hph) and 6.67% of total coolant capacity respectively.



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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 mean deceleration and stopping distance corresponding to 253 N pedal force was measured as 2.50 m/sec² and 7.5 m respectively. The performance is in line with the IS:12207-1987.
- 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:

- i) The ambient noise emitted by the machine was measured as 87.8 dB(A) which is within warning and danger limit of 88dB(A) and as per IS:12180 part-1
- ii) The noise at driver's ear level was measured as 95.2 dB(A) which is as per IS:12180 part-1 when compared with warning and danger levels of 98dB (A) .

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)	2.96 to 3.86	2.63 to 2.95	3.44	2.79
2.	Area covered (ha/h)	0.872 to 1.180	0.737 to 0.875	1.027	0.817
3.	Fuel consumption: - (l/h) - (l/ha)	7.41 to 8.51	7.25 to 8.56	8.03	7.98
		7.00 to 9.09	8.29 to 11.61	7.88	9.90
4.	Crop throughput (tonne/h)	8.7 to 12.7	14.5 to 18.9	11.0	16.6
5.	Grain breakage in main grain outlet(%)	0.297 to 0.600	0.404 to 0.801	0.433	0.650
6.	Header losses(%)	0.330 to 0.664	0.327 to 0.603	0.451	0.429
7.	Total non-collectable losses(%)	0.450 to 1.655	0.726 to 1.053	0.806	0.871
8.	Total collectable losses(%)	0.099 to 0.498	0.499 to 0.837	0.309	0.737

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9.	Total processing losses(%)	0.722 to 1.460	1.491 to 2.047	1.098	1.836
10.	Threshing efficiency(%)	99.3 to 99.8	98.7 to 99.2	99.5	99.0
11.	Cleaning efficiency(%)	98.1 to 98.8	96.6 to 97.9	98.3	97.1

18.7.1.1 Wheat Harvesting:

- i) The grain breakage in all the varieties tested was measured as 0.297 to 0.600 % which is normal.
- ii) The total non collectable losses ranged from 0.450 to 1. 655 percent which is normal.
- iii) The total processing losses ranged from 0.722 to 1.460 % .
- iv) The threshing efficiency ranged from 99.3 to 99.8%.
- v) The cleaning efficiency ranged from 98.1 to 98.8% .

18.7.1.2 Paddy Harvesting:

- i) The grain breakage ranged from 0.2404 to 0.801 % .
- ii) The total non-collectable losses ranged from 0.726 to 1.053% .
- iii) The total processing losses ranged from 1.49 to 2.047 % .
- iv) The threshing efficiency ranged from 98.7 to 99.2 %.
- v) The cleaning efficiency ranged from 96.6 to 97.9%



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 / safety device in knife drive and threshing drum drive are considered essential from safety point of view which needs to be provided.
- v) The mechanical arrangement for adjusting the reel speed though provided, needs to be modified such that the same could be controlled from operators position.
- vi) The grain tank needs to be provided with suitable grain fill indicator device.

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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.

18.8 Hardness and Chemical composition:

18.8.1 Hardness of knife blade in reminder zone does not conform with the limits as specified in IS:6025-1999 and hardness of knife guard does not conform with the limits as specified in IS:6024-1999. These should be looked into at regular production level

18.8.2 The chemical composition of knife blade does not conform to Indian Standard. It should be incorporated at regular production level.

18.10 Labelling of Combine Harvester:

The labelling plate as per IS:10273-1999 is not provided on the combine harvester.

18.11 Literature supplied with the Machine:

Operator manual for prime mover (engine) for repair and maintenance is provided. However, a manual in respect of combine harvester as a whole should be brought out in Hindi and other regional languages also as per relevant Indian standards to guide to users and operator of combine.

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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.	81.0(110.0)	78.9(107.4)	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.	63(1600-1700)	62.3(84.7)	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.	81.0(110.0)	78.5(106.8)	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.	260	2.63	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	2.06	Conforms
vi)	Max. crank shaft torque, (N-m) observed during the test after no load engine speed is adjusted as per manufacture's	It must not be less than 8% of declare value by manufacturer.	400	401.5	Conforms



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		recommendation for field work				
	vii)	Back up torque, %	7% min.	--	15.2%	Conforms
	viii)	Max. operating temp. To be declared by manufacturer	i) engine oil	140° C	133° C	Conforms
			ii) Coolant	120° C	110° C	Conforms
	ix)	Lubrication oil consumption, g/kWh	1% of SFC at 5hr. max. power test during high ambient condition	2.7	0.458	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	10.0	6.28	Conforms
	ii)	Max. force exerted on brake pedal to achieve a deceleration of 2.5 m/sec ² .	$\leq 600N$.	600	262	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.	--	255	Does not conform
	ii)	Steering wheel	150 μ m max.	--	225	Does not conform
	iii)	Seat with driver seated	120 μ m max.	--	619	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.	0.25	0.20	Conforms
5.	Noise measurement					
	i)	Max. ambient noise emitted by combine dB (A)	88 dB (A) as per CMVR	88	87.8	Conforms

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	ii)	Max. noise at operator's ear level dB (A)	98 dB (A) as per CMVR,	98	95.2	Conforms
6.	Discard limit					
	i)	Cylinder bore diameter, mm	Should not exceed the values declared by the manufacture	107.546 mm	107.26	Conforms
	ii)	Piston diameter	--do--	107.07	107.05	Conforms
	iii)	Ring end gap	--do--	2.032mm	0.50(Max.)	Conforms
	iv)	Ring groove clearance	--do--	0.254mm	0.100(max.)	Conforms
	v)	Diametrical and axial clearance of big end bearing	--do--	0.178/0.254	Diametrical 0.10 Axial - 0.20	Conforms
	vi)	Diametrical and axial clearance of main bearings	--do--	0.178/0.254	Diametrical 0.11 Axial - 0.15	Conforms Conforms
	vii)	Thickness of brake lining	--do--	16 - 18	17	Conforms
	viii)	Thickness of clutch plate	--do--	10 - 12	11.4	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- (0.297 to 0.600%) Avg. 0.433% Paddy- (0.404 to 0.801%) Avg.0.650%	Conforms for both wheat and paddy
	iii)	Non collectable losses	≤ 2.5% for wheat, paddy & gram ≤ 4.0% for soybean	--	Wheat- (0.0450 to 1.655%) Avg. 0.806 Paddy- (0.726 to 1.053%) Avg. 0.871%	Conforms for both wheat and paddy
	iv)	Threshing efficiency	≥ 98% wheat & paddy	--	Wheat- (99.3 to 99.8%) Avg.99.5% Paddy- (98.9 to 99.2%) Avg.99.01%	Conforms for both wheat and paddy



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	v)	Cleaning efficiency	≥ 96 % wheat & paddy	--	Wheat- (98.1 to 98.8) Avg. 98.3% Paddy- (96.6 to 97.9) Avg.97.1%	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 42/2002-2003-03.10.2002 from CFMT&TI, Budni.	Conforms
	iii)	Grain tank cover	Essential	--	provided	Conforms
	iv)	Spark arrester in engine's exhaust	Essential	--	Not provided	Does not Conforms
	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	--	Not Provided Not Provided Not Provided	Does not Conforms
	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
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=0.42 Si=0.25 Mn=0.65 P=0.042 S=0.045	Unascertainable as the relevant code does not specify the content limit.

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	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=0.82 Mn=0.68	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 %	-	Carbon content is 0.12%	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



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Applicant' comments : Nil comments received