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व्यावसायिक परीक्षण रिपोर्ट
COMMERCIAL TEST REPORT

संख्या / No. : COMB-56/1271
माह/ Month : August, 2010



**SELF PROPELLED COMBINE HARVESTER
"GURDEEP-527"**



सत्यमेव जयते

भारत सरकार

कृषि मंत्रालय

(कृषि एवं सहकारिता विभाग)

GOVERNMENT OF INDIA

MINISTRY OF AGRICULTURE

(DEPARTMENT OF AGRICULTURE & COOPERATION)

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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:					
79.9(108.7)	360.3(36.8)	2220	21.85(26.29)	0.273(0.201)	3.042(4.136)
59.8 (81.3)	398.7(40.7)	1499	15.07(18.13)	0.252(0.185)	3.298(4.485)**
ii) Power at rated engine speed (2200 rpm)					
79.6(108.2)	362.0(36.9)	2200	21.84(26.28)	0.274(0.202)	3.029(4.118)
75.7(102.9)	344.2(35.1)	2200	21.08(25.58)	0.278(0.204)	2.959(4.024)*
iii) Maximum torque:					
44.7(60.8)	406.5(41.5)	1100	11.66(14.04)	0.260(0.191)	3.185(4.331)
48.3(65.7)	402.4(41.1)	1200	12.60(15.29)	0.261(0.192)	3.158(4.294)*
49.9(67.8)	415.7(42.7)	1200	12.94(15.57)	0.259(0.190)	3.204(4.356)**
iv) Five hour rating test:					
a) Engine loaded to 90% of maximum power:					
69.8(94.4)	308.4(31.5)	2265	18.17(22.05)	0.260(0.191)	3.167(4.306)*
b) maximum power:					
76.7(104.3)	345.4(35.2)	2220	21.02(25.52)	0.274(0.202)	3.006(4.087)*

* 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 79.9 kW (108.7 Ps) & 59.8 kW (81.3 Ps) at 2220 rpm and 1499 rpm of engine at full throttle and setting recommend for field operation respectively.
- ii) The specific fuel consumption corresponding to maximum power at full throttle and setting recommended for field operation was measured as 0.273 & 0.252 Kg/kwh (0.201 & 0.185 kg/hph).
- iii) The back-up torque of the engine was measured as 12.6 % in natural ambient at full throttle.
- iv) The maximum smoke density was recorded as 2.20 (Bosch No.).
- v) The maximum temperature of engine oil, coolant(water) and exhaust gas was observed as 123, 94 and 708°C respectively.
- vi) The lubricating oil & coolant consumption during five hours rating test were measured as 0.126 g/kWh and 6.21% of total coolant capacity respectively.

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18.2 Turning ability:

Turning ability of combine was observed as 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 228 N pedal force was measured as 2.50 m/sec² and 11.50 m 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:

- i) The ambient noise emitted by the machine was measured as 87.8 dB(A).
- ii) The noise at driver's ear level was measured as 96.8 dB(A).

18.7 Air cleaner oil pull over test

The maximum oil pull over was observed as 0.22 %.

18.8 Field Test:

18.8.1 Summary of field tests:

The results of the field test are summarized below:

Sl.No.	O b s e r v a t i o n	Wheat harvesting	Paddy harvesting
1.	Speed of operation (kmph)	2.94 to 3.77	3.03 to 3.21
2.	Area covered (ha/h)	0.91 to 1.18	0.75 to 1.19
3.	Fuel consumption: - (l/h) - (l/ha)	8.77 to 9.14 7.43 to 9.72	6.07 to 8.55 6.32 to 11.37
4.	Crop throughput (tonne/h)	10.19 to 15.97	5.89 to 19.89
5.	Grain breakage in main grain outlet(%)	0.302 to 0.996	0.609 to 1.182
6.	Header losses(%)	0.300 to 0.794	0.301 to 2.716
7.	Total non-collectable losses(%)	0.356 to 0.847	0.311 to 2.864
8.	Total collectable losses(%)	Nil to 0.400	0.401 to 2.087
9.	Total processing losses(%)	0.554 to 1.411	1.151 to 2.927
10.	Threshing efficiency(%)	99.59 to 99.99	97.9 to 99.6
11.	Cleaning efficiency(%)	97.87 to 98.97	95.6 to 97.7

18.8.1.1 Wheat Harvesting:

- i) The grain breakage in all the varieties tested was measured as 0.302 to 0.966 %.
- ii) The total non collectable losses ranged from 0.356 to 0.847 percent. The major constituent of non-collectable losses is header loss.
- iii) The total processing losses ranged from 0.554 to 1.411 %.
- iv) The threshing efficiency ranged from 99.59 to 99.99%.
- v) The cleaning efficiency ranged from 97.87 to 98.97%.

Necessary improvements to bring down grain breakage and processing losses are required to be incorporated.

18.8.1.2 Paddy Harvesting:

- i) The grain breakage ranged from 0.609 to 1.182 % .
- ii) The total non-collectable losses ranged from 0.311 to 2.864 %.
- iii) The total processing losses ranged from 1.151 to 2.927 %.
- iv) The threshing efficiency ranged from 97.9 to 99.6 %.
- v) The cleaning efficiency ranged from 95.6 to 97.7%.

Necessary improvements to reduce processing losses and increase cleaning efficiency are required to be incorporated.

18.8.2 Harvesting of any other crops:

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

18.8.3 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.
- iii) Spark arresting device is not 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 but it needs to be modified such that the same could be controlled from operators position.

- vi) The grain tank needs to be provided with suitable device to know the grain fill.

18.8.4 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 were observed as normal.
- v) The condition of the bearing, chains, sprockets and belts observed as 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.

18.9 Hardness and Chemical composition:

The Hardness & chemical composition of knife blade does not conform to IS:6825-1993. The improvement should be made to comply with BIS standard under reference at regular production level.

18.10 Maintenance/Service problems:

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

18.11 Labelling of Combine Harvester:

The labelling plate is provided on the combine harvester. But it needs to be modified as per IS:10273-1999.

18.12 Literature supplied with the Machine:

18.12.1

The following literature was supplied with the machine for reference during testing

A booklet for combine harvester which comprises of operation, maintenance and repair of combine harvester is provided. It should be brought out as per IS:8132-1983 in Hindi or English and other regional languages to guide users and operators of combine.

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)	79.9(108.7)	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.	Not specified	59.8(81.3)	Does not conform
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)	79.6(108.2)	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.	Not specified	273	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	--	2.20 Bosch No.	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.	400	415.7	Conforms

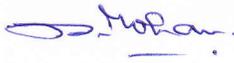
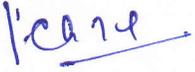
	vii)	Back up torque, %	7% min.	--	12.6	Conforms
	viii)	Max. operating temp. To be declared by manufacturer	i) engine oil	130° C	123° C	Conforms
			ii) Coolant	110° C	94° C	Conforms
	ix)	Lubrication oil consumption, g/kWh	1% of SFC at 5hr. max. power test during high ambient condition	2.6	0.126	Conforms
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	--	6.05	Conforms
	ii)	Max. force exerted on brake pedal to achieve a deceleration of 2.5 m/sec ² .	$\leq 600N$.	--	228	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.	--	317	Does not conform
	ii)	Steering wheel	150 μ m max.	--	658	Does not conform
	iii)	Seat with driver seated	120 μ m max.	--	410	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.	--	0.22	Conforms
5.	Noise measurement					
	i)	Max. ambient noise emitted by combine dB (A)	88 dB (A) as per CMVR	--	87.8	Conforms
	ii)	Max. noise at operator's ear level dB (A)	98 dB (A) as per CMVR,	--	96.8	Conforms

6. Discard limit						
i)	Cylinder diameter	bore	Should not exceed the values declared by the manufacture	107.546	107.26	Conforms
ii)	Piston diameter		-do-	Not specified	106.79	Does not conform
iii)	Ring end gap		--do--	0.55	0.50	Conforms
iv)	Ring groove clearance		--do--	0.254	0.05	Conforms
v)	Diametrical and axial clearance of big end bearing		--do--	Diametrical 0.178	0.09	Conforms
				Axial - Not specified	0.25	Does not conform
vi)	Diametrical and axial clearance of main bearings		--do--	Diametrical - 0.178	0.16	Conforms
				Axial - 0.254	0.10	Conforms
vii)	Thickness of brake lining		--do--	Up to rivet head	11.3	Conforms
viii)	Thickness of clutch plate		--do--	Up to rivet head	8.0	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- 0.302-0.996% (Avg. -0.670%)	Conforms
					Paddy- 0.609-1.182% (Avg. 0.785%)	Conforms
iii)	Non collectable losses		≤ 2.5% for wheat, paddy & gram ≤ 4.0% for soybean	--	Wheat- 0.356-0.847% (Avg. -0.623%)	Conforms
					Paddy- 0.311-2.864% (Avg. 1.176%)	Conforms
iv)	Threshing efficiency		≥ 98% wheat & paddy	--	Wheat- 99.59-99.99% (Avg.- 99.78%)	Conforms
					Paddy- 97.9-99.6% (Avg.- 98.9%)	Conforms

	v)	Cleaning efficiency	≥ 96 % wheat & paddy	--	Wheat- 97.87-98.97% (Avg. -98.5%) Paddy- 95.6-97.7% (Avg. 96.3%)	Conforms 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 as per CMVR report No. CMVR/Comb-SP/2009/24 dated 31.1.2010	Conforms
	iii)	Grain tank cover	Essential	--	Partially covered	Does not conform
	iv)	Spark arrester in engine's exhaust	Essential	--	Not provided	Does not conform
	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 shout conveyor drive c) Grain & tailing elevator	Essential	--	Only b) is 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	--	Not provided	Does not conform

Material of construction :						
9.	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 declared	Carbon= 0.40 Silicon= 0.23 Manganese= 0.65 Phosphorous=0.036 Sulphur= 0.039	Unascertainable 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 %	Not declared	Carbon= 0.83 Manganese=0.63	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 %	Not declared	Carbon= 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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(P. K. CHOPRA) SENIOR AGRICULTURAL ENGINEER	
A. N. MESHRAM -DIRECTOR-	

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Applicant's comments

Comments received and added in the final test report.