

व्यावसायिक परीक्षण रिपोर्ट
COMMERCIAL TEST REPORT

संख्या/ No. : COMB-159/1885/2016
माह/Month : July, 2016



**PANESAR SC-410
SELF PROPELLED COMBINE HARVESTER**



भारत सरकार

Government of India

कृषि एवं किसान कल्याण मंत्रालय

Ministry of Agriculture and Farmers Welfare

कृषि, सहकारिता एवं किसान कल्याण विभाग

Department of Agriculture, Cooperation and Farmers Welfare

उत्तरी क्षेत्र कृषि मशीनरी प्रशिक्षण एवं परीक्षण संस्थान

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5	212.4	211.0	0.66
6	214.6	212.9	0.79
7	207.2	206.2	0.48
8	223.5	222.7	0.36
b)	Peg teeth of concave:		
1	226.9	225.6	0.57
2	218.6	217.1	0.69
3	213.3	212.5	0.38
4	224.4	223.2	0.53
5	224.4	223.0	0.62
6	226.6	225.2	0.62
7	226.7	225.2	0.66
8	221.8	220.3	0.68

17. SUMMARY OF OBSERVATIONS, COMMENTS AND RECOMMENDATIONS

17.1 Engine Performance Test:

Engine Brake power, kW	Engine speed (rpm)	Hourly fuel consumption l/h (kg/h)	Specific fuel consumption kg/kwh	Specific energy, kWh/l
i) Maximum power - 2 hours test:				
67.94	2300	19.98 (16.27)	0.239	3.401
51.68	1550	13.30 (10.90)	0.211	3.886**
ii) Power at rated engine speed (2200 rpm)				
69.94	2200	19.75 (16.10)	0.230	3.541
65.82	2200	19.49 (15.80)	0.240	3.377*
iii) Maximum torque:				
63.60	1700	16.51 (13.49)	0.212	3.852
62.24	1725	16.45 (13.39)	0.215	3.784*
51.36	1525	13.18 (10.84)	0.211	3.897**
iv) Five hour rating test:				
a) Engine loaded to 90% of maximum power:				
59.53	2338	18.31 (14.84)	0.248	3.251*
b) maximum power:				
64.49	2300	19.49 (15.78)	0.245	3.308*

* 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 67.94 kW & 51.68 kW at 2300 rpm and 1550 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 0.239 and 0.211 Kg/kwh.
- iii) The back-up torque of the engine was measured as 22.9 % under normal ambient at full throttle condition.
- iv) The maximum smoke density was recorded as 5.2 (Bosch No.) which is within permissible limit.

- v) The maximum temperature of engine oil, coolant (water) and exhaust gas was observed as 117, 81 and 381°C respectively.
- vi) The lubricating oil & coolant consumption during five hours rating test were measured as 0.463 g/kWh and 0.68 % of total coolant capacity respectively.

17.2 Braking Performance:

- i) The pedal force and minimum stopping distance corresponding to mean deceleration of 2.5 m/sec² were observed 340 N and 4.73 m.
- ii) The performance of parking brake was found satisfactory.

17.3 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.

17.4 Noise measurement:

The ambient noise emitted by the machine at bystanders and driver's ear level were measured as 91 & 99 dBA respectively. The noise at bystanders and driver's ear level exceeds the limit of 88 & 98 dB(A) specified by IS: 15806:2007.

17.5 Field test:

17.5.1 Summary of field tests:

The results of the field test are summarized below:

S. No.	Parameters	Range of parameters	
		Wheat Harvesting	Paddy Harvesting
1	Speed of operation, (kmph)	3.03 to 3.38	2.83 to 2.94
2	Area covered, (ha/h)	0.688 to 0.807	0.442 to 0.542
3	Fuel consumption:		
	(l/h)	5.629 to 6.803	4.272 to 7.420
	(l/ha)	7.446 to 9.856	8.648 to 16.640
4	Crop throughput (tonne/h)	7.88 to 13.93	6.38 to 13.09
5	Grain breakage in main grain outlet, (%)	0.201 to 0.370	0.398 to 0.889
6	Header losses, (%)	0.152 to 0.282	0.035 to 0.841
7	Total non-collectable losses, (%)	0.213 to 0.377	0.410 to 1.681
8	Total collectable losses, (Un-threshed from main outlet), (%)	0.470 to 0.703	0.130 to 0.795
9	Total processing losses (%)	0.875 to 1.042	0.880 to 2.640
10	Threshing efficiency, (%)	99.29 to 99.57	97.02 to 99.87
11	Cleaning efficiency, (%)	98.43 to 98.90	96.0 to 98.90

17.5.1.1 Wheat Harvesting:

- i) The average grain breakage in all the varieties tested was measured as 0.201 to 0.370 %.
- ii) The average total non collectable losses ranged from 0.213 to 0.377 %.
- iii) The average total processing losses ranged from 0.875 to 1.042 %.
- iv) The average threshing efficiency ranged from 99.29 to 99.57 %.
- v) The average cleaning efficiency ranged from 98.43 to 98.90 %.

17.5.1.2 Paddy Harvesting:

- i) The average grain breakage ranged from 0.398 to 0.889 %.
- ii) The average total non-collectable losses ranged from 0.410 to 1.681 %.
- iii) The average total processing losses ranged from 0.880 to 2.640 %.
- iv) The average threshing efficiency ranged from 97.02 to 99.87 %.
- v) The average cleaning efficiency ranged from 96.0 to 98.90 %.

17.5.2 Harvesting of any other crops:

The performance of combine to harvest Wheat and Paddy crops were evaluated as the same were recommended by the applicant.

17.5.3 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) Spark arresting device is not provided in the engine exhaust system which is considered essential.
- iii) Slip clutch/safety device in cutting platform auger drive, grain and tailing auger drive and undershot conveyor drive are considered essential from safety point of view which needs to be provided.
- iv) 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.
- v) Grain tank cover is not provided in the machine, this should be looked into for necessary action.
- vi) A fire extinguisher may be provided for safety
- vii) Safety signs and hazard pictorials are not provided on the machine. it should be provided on the machine to alert person to and existing or potential hazard, identify the hazard, describe the nature of hazard, explain the consequences of potential injury from the hazard and instruct the persons about how to avoid the hazard.
- viii) The air cleaner maintenance schedule is not declared by applicant. It should be declared.
- ix) The lub. oil relief valve opening pressure and lubrication system minimum permissible pressure is not declared by applicant. It should be declared in operator's manual.
- x) There is not provision for speed adjustment of threshing drum which is necessary requirement. It should be looked into.

17.5.4 Assessment of wear

- i) The fuel injector opening pressure & injection timing is not declared by applicant. It should be declared.

17.6 Hardness and chemical composition:

- 17.6.1** Hardness of knife blade does not conform with the limits as specified in IS: 6025-1999. It should be looked into at regular production level.

17.6.2 The carbon content of knife back does not conform the prescribed limit of IS:10378-1982.

17.7 Literature supplied with the machine:

No literatures are submitted by the applicant during test. It is recommended to develop operator's manual, parts catalogue and service manual as per IS: 8132 for operation adjustments, maintenance, service & repair of machine.

17.8 Conformity to Indian Standard

- | | | |
|-------|--|-------------------------|
| (i) | IS:6025-1982 (Reaffirmed 2009)-Specification for knife section for harvesting machine. | Does not conform |
| (ii) | IS:6024-1983 (Reaffirmed 2009)-Specification for guards for harvesting machines. | Does not conform |
| (iii) | IS:10378-1982 (Reaffirmed 2011)-Specification for knife back for harvesting machine. | Does not conform |
| (iv) | IS: 15806-2008-Combine harvester thresher selected performance and other characteristics recommendations. | Does not conform |
| (v) | IS:6283 (Part II)-2007-Tractors and machinery for agriculture and forestry-symbol for operator controls and other displays. | Does not conform |
| (vi) | Labelling plate as per CMVR GSR-212 (E) March 2015 Rule 122 (1B) | Does not conform |
| (vii) | IS:8133-1983(Reaffirmed 2009)-Guidelines for location & operation of operator controls on agricultural tractors and machinery. | Does not conform |

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	It should not be less than 5% of the declared value.	74.30	67.9	Does not conform
ii)	Max. power observed during test after adjusting the no load engine speed as per recommendation of the manufacturer for field work, kW	Max. power observed must not be less than 5% of declared value.	Not Specified	51.7	--
iii)	Power at rated engine speed, kW	The observed value must not be less than 5% of the declared value by the applicant.	74.30	69.9	Does not conform

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.	218	239	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	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.	310	268	Does not conform
vii)	Back up torque, %	7% min.	--	25.7	Conforms
viii)	Max. operating temp. To be declared by manufacturer	i) engine oil	120	117	Conforms
		ii) Coolant	95	81	Conforms
ix)	Lubrication oil consumption, g/kWh	1% of SFC at 5hr. max. power test during high ambient condition	2.45	0.463	Conforms
2.	Brake performance				
i)	Max. stopping distance at a force equal to or less than 600 N on brake pedal, m	10	--	4.73	Conforms
ii)	Max. force exerted on brake pedal to achieve a deceleration of 2.5 m/sec^2 .	$\leq 600\text{N}$.	--	340	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.	--	94	Conforms
ii)	Steering wheel	150 μm max.	--	149	Conforms
iii)	Seat with driver seated	120 μm max.	--	54	Conforms

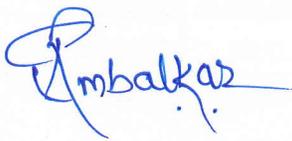
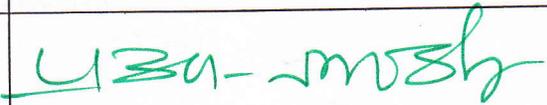
4.	Air cleaner oil pull over					
	i)	Max. oil pull over in % age when tested in accordance with IS: P8122 pt. (II)-2000	0.25% max.	--	Not applicable as the engine has dry type air cleaner.	--
5.	Noise measurement					
	i)	Max. ambient noise emitted by combine dB (A)	88 dB (A) as per CMVR	--	91	Does not conform
	ii)	Max. noise at operator's ear level dB (A)	98 dB (A) as per CMVR,	--	99	Does not conform
6.	Discard limit					
	i)	Cylinder bore diameter, mm	Should not exceed the values declared by the manufacture	104.15	104.03	Conforms
	ii)	Piston diameter	-do-	103.858	103.93	Conforms
	iii)	Ring end gap	--do--	Top ring-Taper 2 nd ring-1.2 Oil ring-1.2	Top ring-Taper 2 nd ring-0.05 Oil ring-0.05	-- Conforms Conforms
	iv)	Ring groove clearance	--do--	Top ring-Taper 2 nd ring-0.2 Oil ring-0.2	Top ring-Taper 2 nd ring-0.05 Oil ring-0.05	-- Conforms Conforms
	v)	Diametrical and axial clearance of big end bearing	-do-	Diametrical - 0.082 Axial-0.52	Diametrical- 0.12 Axial-0.35	Does not conform Conforms
	vi)	Diametrical and axial clearance of main bearings	--do--	Diametrical -0.09 Axial- 0.22	Diametrical- 0.12 Axial-0.20	Does not conform Conforms
	vii)	Height over the rivet of brake lining	--do--	Up to rivet head	2.25 to 3.92 over the rivet head	Conforms
	viii)	Height over the rivet of clutch plate	--do--	Up to rivet head	1.40 to 1.67 over the rivet head	Conforms
7.	Field performance					
	i)	Suitability for crops	Wheat & paddy essential	--	Wheat & Paddy	Conforms
	ii)	Grain breakage in grain tank	≤ 2.5 %	--	Wheat Avg. 0.201 to 0.370% Paddy Avg. 0.398 to 0.889%	Conforms Conforms

iii)	Non collectable losses	$\leq 2.5\%$ for wheat, paddy & gram $\leq 4.0\%$ for soybean	--	Wheat Avg. 0.213 to 0.377% Paddy Avg. 0.410 to 1.681%	Conforms Conforms
iv)	Threshing efficiency	$\geq 98\%$ wheat & paddy	--	Wheat Avg. 99.29 to 99.57% Paddy Avg. 97.02 to 99.87	Conforms Conforms
v)	Cleaning efficiency	$\geq 96\%$ wheat & paddy	--	Wheat Avg. 98.43 to 98.90% Paddy Avg. 96.0 to 98.90%	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	Conforms
iii)	Grain tank cover	Essential	--	Not provided	Does not conform
iv)	Spark arrester in engine's exhaust	Essential	--	Not provided, however turbo charger eliminates the turbo charger requirement of 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	--	Not provided	Does not conform
			--	Not Provided	Does not conform
			--	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	Partial conforms
x)	Labelling of control/gauge	Essential	--	Not provided	Does not conform
9.	Material of construction :				
i)	Knife guard should conform to IS: 6024 -1983	The knife 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= 0.46% Si= 0.53% Mn= 0.44% P= 0.02% S= 0.02%	Unascertainable as the relevant code does not specify the content limits.
		Hardness of knife guard	163 (Max.)	477 to 492	Does not conform
ii)	Knife blade As per IS :6025 -1999	It must have Chemical composition as C= 0.70-0.95 % Mn =0.30-0.50 %	--	C= 0.83% Mn= 42%	Conforms Conforms
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= 0.19%	Does not conform
10.	Labelling of combine harvester				
	It should conform requirements of CMVR GSR 212 (E) March 2015 Rule 122 (1B)	--	--	Not provided, as per requirements of CMVR	Does not conform

11. Break down (critical, major & minor)					
Sr. No	Category of breakdowns	Category (evaluative/ Non evaluative)	Requirements as per IS: 15806-2008	As observed	Whether meets the requirements (Yes/No.)
1.	Critical	Evaluative	No critical breakdown	None	Yes
2.	Major	Evaluative	Not more than three and neither of them should be repetitive in nature	None	Yes
3.	Minor	Evaluative	Not more than five and frequency of each should not be more than three	None	Yes

TESTING AUTHORITY

G. R. AMBALKAR AGRICULTURAL ENGINEER	
R. K. NEMA SENIOR AGRICULTURAL ENGINEER	
P. K. PANDEY DIRECTOR	

19.

APPLICANT'S COMMENTS

No specific comments received from applicant.