

व्यावसायिक परीक्षण रिपोर्ट
COMMERCIAL TEST REPORT

संख्या / No. : COMB-53/1242
माह/ Month : May, 2010



**DASMESH - 726 (TRACK TYPE)
SELF PROPELLED COMBINE HARVESTER**



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)	Specific energy
i) Maximum power - 2 hours test:						
50.5 (68.7)	252 (25.7)	2002	15.87	13.15	0.261 (0.192)	3.18 (4.33)
49.9 (67.8)	262 (26.7)	1792	13.98	11.61	0.248 (0.182)	3.57 (4.85)**
ii) Power at rated engine speed (2000 rpm)						
50.5 (68.7)	252 (25.7)	2002	15.87	13.15	0.263 (0.193)	3.18 (4.33)
49.6 (67.4)	248 (25.3)	2000	15.70	12.95	0.261 (0.192)	3.16 (4.30)*
iii) Maximum torque:						
38.1 (51.8)	272 (27.7)	1400	11.61	9.65	0.253 (0.186)	3.28 (4.66)
24.6 (47.0)	266 (27.1)	1298	11.02	9.08	0.263 (0.193)	3.14 (4.27)
39.09 (54.0)	274 (28.0)	1448	12.16	10.09	0.254 (0.187)	3.21 (4.37)
iv) Five hour power rating test:						
a) Engine loaded to 90% of maximum power:						
45.5 (61.9)	223 (22.8)	2040	14.23	11.77	0.259 (0.190)	3.20 (4.35)
b) maximum power:						
49.5 (67.3)	247 (25.2)	2001	15.72	13.00	0.263 (0.193)	3.14 (4.27)

* 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 50.5 kW (68.7 Ps) & 49.9 kW (67.8 Ps) at 2002 rpm and 1792 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 setting and setting recommended for field operation was measured as 0.261 & 0.248 Kg/kwh (0.192 & 0.182 kg/hph) respectively. The specific fuel consumption is considered to be slightly on higher side at full throttle setting.

- iii) The back-up torque of the engine was measured as 7.94 %.
- iv) The maximum smoke density was recorded as 3.72 (Bosch No.) which is within the permissible limit.
- v) The maximum temperature of engine oil, coolant(water) and exhaust gas was observed as 108°C and 96°C respectively.
- vi) The lubricating oil & coolant consumption during five hours rating test were measured as 0.691 (0.508) g/kWh and 17.9% 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:

The maximum stopping distance when stopped with ground speed control lever was recorded as 2.90 m.

18.5 Mechanical Vibration:

The amplitude of mechanical vibration of components 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 83.4 dB(A). The noise at driver's ear level was measured as 88.2 dB(A). The noise emitted by the machine is well within the limits as specified under CMVR.

18.7 Air cleaner oil pull over test

The maximum oil pull over was observed as 0.23 which is normal.

18.8 Field Test:**18.8.1 Summary of field tests:**

The results of the field test are summarized at Table-1:

Table-I

S. No.	Observation	Paddy harvesting
1.	Speed of operation, kmph	2.37 to 3.08
2.	Area covered, ha/h	0.402 to 0.475
3.	Fuel consumption: - l/h - l/ha	6.65 to 8.05 15.60 to 19.03
4.	Crop throughput, tonne/h	3.4 to 6.7
5.	Grain breakage in main grain outlet, %	0.407 to 1.257
6.	Header losses, %	0.558 to 2.126
7.	Total non-collectable losses (%)	0.815 to 3.690
8.	Total collectable losses, %	0.713 to 1.865
9.	Total processing losses, %	1.605 to 3.920
10.	Threshing efficiency, %	97.8 to 99.1
11.	Cleaning efficiency, %	91.4 to 95.7

18.8.1.1 Paddy Harvesting

- i) The grain breakage ranged from 0.407 to 1.257 % which is considered to be normal.
- ii) The total non-collectable losses ranged from 0.815 to 3.690 %.
- iii) The total processing losses varied from 1.605 to 3.920 % which is considered to be on higher side against max. limit of 2.50% specified by BIS.
- iv) The threshing efficiency was recorded as 97.8 to 99.0 %.
- v) The cleaning efficiency varied from 91.4 to 95.7 %.

Necessary improvements are required to be incorporated to reduce the total processing losses and to improve cleaning & threshing efficiency.

18.8.2 Harvesting of any other crops:

The performance of combine to harvest paddy crop was evaluated as the same were recommended by the applicant. The manufacturer did not recommend harvesting of any other crop.

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) Spark arresting device is not provided in the engine exhaust system which is considered essential.
- iii) Slip clutch / safety device in knife drive, crop auger drive and threshing drum 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 operators position.

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

18.8.4 Assessment of Wear:

- i) The discard limit for engine components i.e. cylinder liner, piston, Valves have not been specified by the applicant. It is therefore, not possible ascertain their wear with reference to discard limit.
- ii) The big end bearing diametrical clearance has exceeds the maximum permissible wear limit.
- iii) The transmission gears and components were found in normal working condition.
- iv) The timing gears, clutch lining, release bearing were found in normal working condition.
- v) The condition of the components of hydraulic system and steering system was observed to be normal.
- vi) The condition of the bearing, chains, sprockets and belts was observed to be normal.
- vii) The components of starter motor and alternator were found in normal working condition.
- viii) The rate of wear of peg teeth bar of threshing cylinder & concave were observed to be normal.

18.9 Hardness and Chemical composition:

The Hardness and chemical composition of knife blade are not within the prescribed limit of IS :6025-1999.

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 as per requirement of IS:10273-1999.

18.11.1 Literature supplied with the Machine:

The following literature in English were supplied with the machine for reference during testing and these were found adequate, however, it needs to be developed in Hindi and other regional languages for the guidance of the users,

1. Operator manual.
2. Service manual.

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.	48.49(65.9)	50.5(68.7)	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.	51.0	49.9(67.8)	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.	48.49(65.9)	50.4(68.5)	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.	218	261	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	--	3.7	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.	259	272(27.7)	Conforms

	vii)	Back up torque, %	7% min.	--	7.9	Conforms
	viii)	Max. operating temp. To be declared by manufacturer	i) engine oil	110° C	108° C	Conforms
			ii) Coolant	95° C	96° C	Does not conform
	ix)	Lubrication oil consumption, g/kWh	1% of SFC at 5hr. max. power test during high ambient condition	2.63	0.691	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	--	No separate braking system is provided	Not applicable
	ii)	Max. force exerted on brake pedal to achieve a deceleration of 2.5 m/sec ² .	≤ 600N.	--	-do-	Not applicable
	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	--	-do-	Not applicable
3.	Mechanical vibration					
	i)	Operator's platform	120 µm max.	--	689	Does not conform
	ii)	Steering wheel	150 µm max.	--	Not applicable	--
	iii)	Seat with driver seated	120 µm max.	--	561	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.	--	0.23	Conforms
5.	Noise measurement					
	i)	Max. ambient noise emitted by combine dB (A)	88 dB (A) as per CMVR	--	83.4	Conforms
	ii)	Max. noise at operator's ear level dB (A)	98 dB (A) as per CMVR,	--	88.2	Conforms

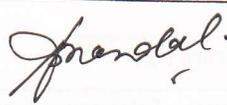
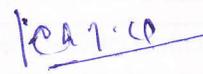
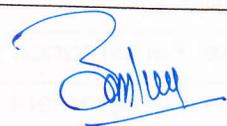
6. Discard limit						
i)	Cylinder diameter bore	Should not exceed the values declared by the manufacture	104.50	104.02	Conforms	
ii)	Piston diameter	-do-	103.9	103.79	Conforms	
iii)	Ring end gap	--do--	1.2	0.55	Conforms	
iv)	Ring groove clearance	--do--	0.7	0.05	Conforms	
v)	Diametrical and axial clearance of big end bearing	--do--	Diametrical= 0.15	0.13	Conforms	
vi)	Diametrical and axial clearance of main bearings	--do--	Axial =0.25	0.15	Conforms	
			0.13 (for both Diametrical as well as axial)	0.09	Conforms	
				0.11	Conforms	
vii)	Thickness of brake lining	--do--	Not applicable	Not applicable	--	
viii)	Thickness of clutch plate	--do--	Not applicable	Not applicable	--	
7. Field performance						
i)	Suitability for crops	Wheat & paddy essential	Paddy	Suitable for paddy	Does not conform	
ii)	Grain breakage in grain tank	≤ 2.5 %	--	Paddy- 0.407-1.257% (Avg. 0.751%)	Conforms	
iii)	Non collectable losses	≤ 2.5% for wheat, paddy & gram ≤ 4.0% for soybean	--	Paddy- 0.815-3.69% (Avg. 1.886%)	Conforms	
iv)	Threshing efficiency	≥ 98% wheat & paddy	--	Paddy-97.8-99.1% (Avg.- 98.5%)	Conforms	
v)	Cleaning efficiency	≥ 96 % wheat & paddy	--	Paddy- 91.4-95.7% (Avg. 94.2%)	Does not conform	
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	--	N.A.	--	

	iii)	Grain tank cover	Essential	--	Provided	Conforms
	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 Essential Essential	-- -- --	Provided Provided Not provided	Conforms Conforms 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	--	Provided	Conforms
	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 specified	C=0.43 Mn=0.75	Unascertainable (as no specific limit of these elements are specified in IS: 1030-1974 code)
	ii)	Knife blade As per IS :6025 -1982	It must have Chemical composition as C= 0.70-0.95 % Mn =0.30-0.50 %	--do--	C=0.81 Mn=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 %	--do--	C=0.12 Mn=0.50 Si=0.17 P=0.037 S=0.052	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

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11.	Break down (critical major & minor)				
	Essential as per IS: 15806-2008 Annexure A1, A2, A3	--	None	Conforms	

TESTING AUTHORITY

(J. P. MANDAL) AGRICULTURAL ENGINEER	
(P. K. CHOPRA) SENIOR AGRICULTURAL ENGINEER	
(A. N. MESHARAM) -DIRECTOR-	

APPLICANT'S COMMENTS

Reference para of Test Report	
18.1(i)	Problem in SFC at full throttle setting, will be informed to Engine manufacture "Ashok Leyland".
18.5	Manufacturer will take the measures to rectify mechanical vibrations by proper setting of Axial flow thresher, blower, front auger and other parts.
18.8.1.1	The processing losses will reduced and threshing and cleaning efficiencies will be improved by modifying the design of axial flow thresher sieves and other relevant parts of the combine under production.
18.8.3.(i)	Levers will be provided with lever grip. The symbols and label will be provided as per IS 6283-1998.
18.8.3(iii)	The combine under production will be provided with slip clutch at crop auger and threshing drum.
19.9	The knife blade conforming to IS 6025-1999 will be used at regular production level.