



TRACTOR POWERED COMBINE HARVESTER
"SHAMSHER TDC - 412"



सत्यमेव जयते

भारत सरकार
कृषि मंत्रालय
(कृषि एवं सहकारिता विभाग)

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

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15.7 Wear of the Pegs:

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 in Table 3.

Table :3 : Wear of Pegs on mass basis

Sl. No.	Original mass before test (g)	Mass after 25hours of test (g)	Percent wear
a)	Peg teeth of threshing cylinder:		
1.	223.3	223.0	0.13
2.	224.1	223.5	0.27
3	212.0	211.5	0.24
4	214.4	213.9	0.23
5	209.1	208.5	0.29
6	216.0	215.3	0.32
7	216.4	215.7	0.32
8	216.1	215.8	0.14
b)	Peg teeth of Concave:		
1	211.4	211.2	0.09
2	222.3	222.0	0.13
3	215.9	215.6	0.14
4	209.0	208.6	0.19
5.	203.9	203.6	0.15
6.	209.7	209.1	0.29
7.	208.4	208.2	0.10
8.	216.8	216.5	0.14



16. SUMMARY OF OBSERVATIONS, COMMENTS AND RECOMMENDATIONS

16.1 Header lifting test :

During 1000 cycles, no leakage of hydraulic oil was observed and working of hydraulic system is normal.

16.2 Turning ability:

Radius of turning circle of LHS & RHS was found satisfactory.

16.3 Visibility:

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

16.4 Braking Performance:

- i) The stopping distance and force on brake pedal corresponding to 2.5 m/sec² was 9.58 m and 265.25N under hot condition.
- ii) The performance of parking brake was found satisfactory.

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16.5 Mechanical Vibration:

The amplitude of mechanical vibration of components marked as (*) in chapter 11 of this report are on higher side. This calls for providing suitable remedial measures to dampen the vibration to improve the operational comfort and service life of various components & sub assemblies.

16.6 Noise measurement:

- i) The ambient noise emitted by the machine was measured as 87.9 dB (A) which is within the specified permissible limit of 88 dB(A).
- ii) The noise at driver's ear level was measured as 96.9 dB(A) which is within the specified permissible limit of 98 dB(A).

16.7 Field Test:

Summary of field observation are tabulated in Table 4.

Table 4: The results of the field tests.

S. No	Parameters	Range of parameters		Average of parameters	
		Wheat Harvesting	Paddy Harvesting	Wheat Harvesting	Paddy Harvesting
1.	Speed of operation (kmph)	1.52 to 3.16	1.52 to 2.24	2.10	2.07
2.	Area covered (ha/h)	0.457 to 0.634	0.264 to 0.524	0.563	0.411
3.	Fuel consumption: - (l/h) - (l/ha)	4.835 to 6.465 9.244 to 12.312	5.100 to 5.714 10.210 to 20.284	5.151 10.506	5.447 13.979
4.	Crop throughput (tonne/h)	4.526 to 7.837	5.892 to 7.523	6.157	6.622
5.	Grain breakage in main grain outlet(%)	0.531 to 1.501	0.654 to 1.521	1.031	0.987
6.	Header losses(%)	0.434 to 1.268	0.314 to 1.726	1.001	0.874
7.	Total non-collectable losses(%)	0.485 to 1.797	0.373 to 1.815	1.153	1.047
8.	Total collectable losses(%)	0.000 to 0.801	0.682 to 1.041	0.338	0.962
9.	Total processing losses(%)	1.081 to 1.890	1.695 to 2.756	1.615	2.121
10.	Threshing efficiency(%)	99.18 to 99.99	97.92 to 99.27	99.65	98.42
11.	Cleaning efficiency(%)	96.20 to 97.73	95.80 to 96.40	96.77	96.14

16.7.1 Wheat Harvesting:

- i) The grain breakage in all the varieties tested ranged from 0.531 to 1.501% (Avg. 1.031) which is within the prescribed limit of 2.5% in relevant BIS Standard IS: 15806-2008.
- ii) The total processing losses varied 1.081 to 1.890% (Avg. 1.615%) which is within the specified limit of 2.5% in IS 8122 (Part 1) : 1994.
- iii) The total non collectable losses ranged from 0.485 to 1.797% (Avg. 1.153%) which is lesser than the maximum specified limit of 2.5 % in Indian Standard.
- iv) The threshing efficiency ranged from 99.18 to 99.99 % (Avg. 99.65%) which is above the specified limit of 98% in Indian standard.
- v) The cleaning efficiency ranged from 96.20 to 97.73 % (Avg. 96.77%) which is above the specified limit of cleaning efficiency in IS: 15806-2008.

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16.7.2 Paddy Harvesting:

- i) The grain breakage ranged from 0.654 to 1.521 % (Avg. 0.987%) which is with in the maximum limit of 2.5% specified in Indian Standard IS: 15806-2008.
 - ii) The total non-collectable losses ranged from 0.373 to 1.815% (Avg. 1.047%) which is with in the maximum specified limit of 2.5% in Indian Standard.
 - iii) The total processing losses varies from 1.695 to 2.756% (Avg. 2.121%). Average value of total processing losses is below the 2.5% the prescribed limit in IS 8122 (Part 1):1994
 - iv) The threshing efficiency ranged from 97.92 to 99.27 % (Avg. 98.42%). Average threshing efficiency is more than the minimum limit of 98% specified in Indian Standard.
 - iv) The cleaning efficiency ranged from 95.80 to 96.40% (Avg. 96.14%). Average of cleaning efficiency is more than the minimum specified limit of 96% in Indian Standard.
- The overall field performance of combine harvester is satisfactory in both the crops.

16.7.3 Harvesting of any other crops:

The performance of combine to harvest wheat and paddy was evaluated.

16.7.4 Ease of Operation and Safety Provision:

- i) The controls provided around the operator are within easy reach but not properly labelled with proper symbols and direction of operation of controls are not provided for the guidance of operator. Therefore it is recommended that the symbols as per the requirement of IS-6283-1998 may be provided.
- ii) Safety device/slip clutches in threshing drum drive, reel drive, cutter bar drive & feeder conveyor drive are also considered essential from safety point of view.
- iii) The grain tank needs to be provided with suitable device to know the grain fill and covered fully in order to avoid any accident while working on the the machine.
- iv) There is no provision for adjusting the threshing drum speed except the changing of pulley size which make it difficult to adjust the speed for harvesting different varieties of crop. Speed variation through suitable hydraulic variator pulley is recommended.
- v) The design of stone trap need to be modified for easy cleaning.
- vi) The safety provisions to protect the grain and tailing auger, blower body from damage while crossing the field bunds are considered essential and may be provided from safety point of view.

16.7.5 Assessment of Wear:

- i) The condition of the components of brake system and steering system was observed to be normal.
- ii) The condition of the bearing, chains, sprockets and belts was observed to be normal.
- iii) The components of starter motor and alternator were found in normal working condition.
- iv) The rate of wear of rasp bar and peg teeth of threshing cylinder & concave were observed to be normal.



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16.8 Hardness and Chemical composition:

- i) The hardness of knife blade in the remainder zone & hardened zone was measured as 44 & 52 HRC against the IS: 6025-1999 limits 20 to 35 HRC & 48 to 58 HRC at remainder zone & hardness zone respectively. The hardness at the remainder zone is on higher side.
- ii) Chemical composition of knife blade does not conform with the limit of Manganese specified in IS 6025:1999.
Blade conforming to Indian Standard should be used at production level.
- iii) The carbon contained of knife blade is also on lower side which needs to be looked at regular production level.

16.9 Maintenance/Service problems:

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

16.10 Labelling of Combine Harvester:

The labelling plate is provided on the combine harvester as per IS 10273:1999.

16.11 Literature supplied with the Machine:

The literature was not supplied with the machine. It is suggested to bring out technical literature for operation, maintenance & repairs of combine harvester in printed form in Hindi and other regional languages as per IS:8132-1999.

17. Selected performance and other characteristics of combine harvester as per IS: 15806-2008.

S. No.	Performance parameters	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 should not be less than -5% of the declared value.	--	Not applicable	--
		ii)	Max. power during field test after adjusting the no load engine speed as per declaration of the applicant, kW	Max. power observed must not be less in -5% of declared value.	--	Not applicable	--
		iii)	Power at rated engine speed, kW	The observed value must not be less -5% of the declared value by the applicant.	--	Not applicable	--

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		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 applicable	--
		v)	Max. smoke density, bosch no.	Max. smoke density 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 requirement which are as below - For tractor :- 5.2 bosch no. or 75 hartridge For engine :- Free declaration or natural aspirated or turbo charges -65 hartridge	--	Not applicable	--
		vi)	Max. crank shaft torque, N - m	Max. crank shaft torque observed during the test after no. load engine speed is adjusted as per manufacture's recommendation for field work must not be less than 8% of declare value by manufacturer.	--	Not applicable	--
		vii)	Back torque, %	7% min.	--	Not applicable	--
		viii)	Max. operating temp. i) engine oil ii) Coolant	To be declared by manufacturer. Not Specified 105°C	--	Not applicable	--



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		ix)	Lubrication oil consumption	1% of SFC at 5hr. max. power test during high ambient condition	--	Not applicable	--
2.	Brake performance	i)	Max. stopping distance at a force equal to or less than 600 N on brake pedal, m	10 m or $S \leq 0.15V + V^2/130$ V= speed corresponding to 80% of design max. speed, kmph	--	9.58 m	Conforms
		ii)	Max. force exerted on brake pedal to achieve a deceleration of 2.5 m/sec ² .	$\leq 600N$.	--	265.25N	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.	--	290 μ m	Does not Conform
		ii)	Steering wheel	150 μ m max.	--	210 μ m	Does not Conform
		iii)	Seat with driver seated	120 μ m max.	--	370 μ m	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.	-	Not applicable as dry air filter is provided	--
5.	Noise measurement	i)	Max. ambient noise emitted by combine db (A)	As per CMVR 88 db (A)	-	87.9 dB(A)	Conforms
		ii)	Max. noise at operator's ear level db (A)	As per CMVR, 98 db (A)	-	96.9 dB(A)	Conforms
6.	Discard limit			To be specified by manufacturer, mm	-		
		i)	Cylinder bore diameter	-do-	-	Not applicable	--
		ii)	Piston diameter	-do-	-	Not applicable	--

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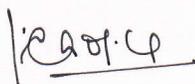
		iii)	Ring end gap	-do-	-	Not applicable	--
		iv)	Ring groove clearance	-do-	-	Not applicable	--
		v)	Diametral and axial clearance of big end bearing	-do-	-	Not applicable	--
		vi)	Diametral end axial clearance of main bearings	-do-	-	Not applicable	--
		vii)	Thickness of brake lining	-do-	-	Not applicable	--
		viii)	Thickness of clutch plate	-do-	-	Not applicable	--
7.	Field performance	i)	Suitability for crops	Wheat & paddy essential	-	Wheat and paddy	Conforms
		ii)	Grain breakage in grain tank	≤ 2.5%	-	Wheat 0.531 to 1.501 (Avg.1.031%) Paddy 0.654 to 1.521 (Avg.0.987 %)	Conforms
		iii)	Non collectable losses	≤ 2.5 % for wheat, paddy & gram ≤ 0.4 % for soybeans	-	Wheat 0.985 to 1.797% (Avg.1.153%) Paddy 0.375 to 1.815% (Avg.1.047 %)	Conforms
		iv)	Threshing efficiency	≥ 98% wheat & paddy	-	Wheat 99.18 to 99.99% (Avg.99.65%) Paddy 97.92 to 99.27% (Avg.98.42%)	Conforms
		v)	Cleaning efficiency	≥ 96 % wheat & paddy	-	Wheat 96.20 to 97.73% (Avg.96.77 %) Paddy 95.80 to 96.40% (Avg.96.14 %)	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 g) Work light	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 applicable	--
		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	-	Not provided	Does not conform
		viii)	Anti slip surfaces at operation 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)	Carbon-0.19% Manganes e-0.4% Silicon-0.17% Phosphorus-0.072% Sulphur-0.04%	No limits specified in IS 6024:1983	--
		ii)	Knife blade Must meet the requirement of IS: 6025-1999	It should have chemical composition as C=0.70 to 0.95% Mn=0.30 to 0.50%	-	Carbon 0.72% Manganese 0.69%	Conforms Does not conform
		iii)	Knife back Must meet the requirement of IS: 10378-1982 material requirement	The knife back shall be manufactured from Carbon Steel having minimum carbon content of 0.35 %	-	Carbon 0.15 %	Does not conform

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10.	Labeling of combine harvester	Essential as per IS: 10273	-	Provided	Conforms
11.	Break down (critical major & minor)	Essential as per IS: 15806-2008 Annexure A ₁ , A ₂ , A ₃	-	NIL	conforms

TESTING AUTHORITY

(R.M. TIWARI) AGRICULTURAL ENGINEER	
(P. K. CHOPRA) SENIOR AGRICULTURAL ENGINEER	
(HIMAT SINGH) -DIRECTOR-	



APPLICANT'S COMMENTS

No comments received