व्यावसायिक परीक्षण रिपोर्ट
COMMERCIAL TEST REPORT

संख्या / No. : Comb – 101/1528
माह / Month: August, 2013

SELF PROPELLED COMBINE HARVESTER (TRACK TYPE) "KARTAR 360 TAF"

सत्यमेव जयते

भारत सरकार
कृषि मंत्रालय
(कृषि एवं सहकारिता विभाग)

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

उत्तरी क्षेत्र कृषि मशीनरी प्रशिक्षण एवं परीक्षण संस्थान
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5.	2104	2066.6	1.78
6.	2092	2057.0	1.67
7.	1956	1921.4	1.77
b)	**Peg teeth of threshing cylinder**		
1.	444.0	438.9	1.15
2.	448.0	444.2	0.85
3.	444.0	439.7	0.97
4.	444.0	437.8	1.40
C)	**Peg tooth bar of concave**		
1.	2470	2432.7	1.51

17 SUMMARY OF OBSERVATIONS, COMMENTS AND RECOMMENDATIONS

17.1 Engine Performance Test

Engine Brake power, kW (Ps)	Crankshaft torque, Nm(kgf-m)	Engine speed (rpm)	Hourly fuel consump-tion kg/h (l/h)	Specific fuel consump-tion kg/kWh (kg/hph)	Specific energy, kWh/l (hph/l)
i) Maximum power - 2 hours test					
54.2 (73.7)	279 (28.4)	1942	12.629 (15.402)	0.233 (0.171)	3.519 (4.786)
ii) Power at rated engine speed(2200 rpm)					
42.9 (58.4)	195.2 (19.9)	2200	10.149 (12.376)	0.236 (0.174)	3.470 (4.719)
42.2 (57.4)	191.8 (19.6)	2200	10.227 (12.472)	0.242 (0.178)	3.384* (4.602)
iii) Maximum torque					
40.4 (55.0)	288.2 (29.4)	1403	9.287 (11.325)	0.230 (0.169)	3.570 (4.856)
44.3 (60.2)	275.7 (28.1)	1605	10.281 (12.538)	0.232 (0.171)	3.529* (4.800)
iv) Five hour rating test*					
a) Engine loaded to 90% of maximum power load					
48.6 (66.2)	229.6 (23.4)	2119	11.583 (14.120)	0.238 (0.175)	3.445 (4.685)
b) Engine loaded to maximum power load					
51.7 (70.3)	255.4 (26.0)	2024	12.426 (15.148)	0.240 (0.177)	3.411 (4.640)

* **Under high ambient condition.**

\- **No load speed corresponding to rated speed specified for field work is full throttle speed by engine-2400 rpm**

Remarks:

i) The maximum power output of the engine was observed as 54.2 kW (73.7 Ps) at 1942 rpm of engine at full throttle setting which is also recommend for field operation.

ii) The specific fuel consumption corresponding to maximum power at full throttle setting measured as 0.233 Kg/kWh (0.171 kg/hph).

iii) The back-up torque of the engine was measured as 3.45 % which is not within the limit specified in IS 15806:2008.

iv) The maximum smoke density was recorded as 5.32 (Bosch No.) which is on higher side of the limit specified is IS:15806-2008

v) The maximum temperature of engine oil, coolant(water) and exhaust gas were observed as 108.7, 101.0 and 590.0°C respectively.

vi) The lubricating oil & coolant consumption during five hours rating test were measured as 0.15 g/kWh (0.11 g/hph) 1.70% of total coolant capacity respectively.

17.2 Turning ability

The radius of turning circle at LHS and RHS was observed satisfactory.

17.3 Visibility

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

17.4 Mechanical Vibration

The amplitude of mechanical vibration of components in para 12 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.

17.5 Noise measurement

i) The ambient noise emitted by the machine was measured as 87.1 dB(A) which is with in specified limit when compared to warning levels of 88 dB(A) in IS 15806:2008.

ii) The noise at driver's ear level was measured as 95.8 dB(A) which is within the specified of 98 dB(A) in IS 15806:2005

17.6 Field Test

The results of the field test for paddy harvesting are summarized below:

S. No.	Observation	Range of observations	Average of observations
1.	Speed of operation, kmph	1.45 to 2.10	1.85
2.	Area covered (ha/h)	0.225 to 0.374	0.291
3.	Fuel consumption: - (l/h) - (l/ha)	 6.091 to 8.976 17.158 to 39.111	 7.776 27.245
4.	Crop throughput (t/h)	2.524 to 5.400	3.640
5.	Grain breakage in main grain outlet(%)	0.311 to 1.078	0.730

6.	Header losses(%)	0.152 to 2.233	0.452
7.	Total non-collectable losses(%)	0.196 to 2.388	0.027
8.	Total collectable losses(%)	0.418 to 3.388	1.288
9.	Total processing losses(%)	1.212 to 4.619	2.095
10.	Threshing efficiency(%)	98.19 to 99.58	98.88
11.	Cleaning efficiency(%)	95.87 to 96.87	96.22

17.6.1 Paddy Harvesting

i) The grain breakage ranged from 0.311 to 1.078% (Avg. 0.73%) which is with in the specified limit of 2.5% in IS 15806:2008.

ii) The total non-collectable losses ranged from 0.196 to 2.388% (Avg. 0.027%) which is with in the specified limit of 2.5% in IS 15806:2008.

iii) The total processing losses ranged from 1.212 to 4.619% (Avg. 2.095). Average value is with in the specified limit of 2.50% in IS8122(part 1) :1998.

iv) The threshing efficiency ranged from 98.19 to 99.58% (Avg. 98.88%) which is more than the 98% the limit specified in IS 15806:2008

v) The cleaning efficiency ranged from 95.87 to 96.87% (Avg. 96.22%). Average value is more than the 96% the limit specified in IS 15806:2008

Losses are below the specified limit and efficiencies are more the specified limit in Indian standard.

17.6.2 Harvesting of any other crops

The performance of combine to harvest paddy crop was evaluated as the same was recommended by the applicant.

17.6.3 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, crop auger 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 is 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 device to know the grain fill.

vii) Air cleaner service indicator has not been provided for operator's ease and safety of engine, this provision seems essential, may be provided in future models.

17.6 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 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 peg teeth bar of threshing cylinder & concave were observed to be normal.

17.7 **Hardness and Chemical composition**

i) The Hardness of knife blade at remainder zone is higher than the prescribed limit of IS :6025-1999.

ii) Percentage of Manganese in knife blade is higher than the limit specified in IS:6025-1999.

Components with material conforming to the Indian Standard should be used at manufacturing level.

17.8 **Maintenance/Service problems**

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

17.9 **Identification plate of combine Harvester**

Identification plate is not provided on the combine harvester. It should be provided with all information as specified in IS: 10273-1999.

17.10 **Literature supplied with the Machine**

The following literature should be provided with machine in Hindi and other regional languages for the guidance of the users in accordance with IS:8132-1983

1. Operator manual.
2. Service manual

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(Ps)	It should not be less than 5% of the declared value.	56.0(76.1)	54.2 (73.7)	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.	56.0(76.1)	54.2(73.7)	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.	56.0(76.1)	42.9(58.4)	**Does not conform**
	iv)	Specific fuel consumption g/kWh.	The average observed value during 2 hr. max. power test must be within +5% of the declared value by applicant/ manufacturer.	229	233	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		5.32	**Does not conform**
	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.	250.0	288.2	Conforms
	vii)	Back up torque, %	7% min.	--	3.45	**Does not conform**
	viii)	Max. operating temp. To be declared by manufacturer	i) engine oil	120° C	108.5° C	Conforms
			ii) Coolant	95° C	101° C	**Does not conform**

	ix)	Lubrication oil consumption, g/kWh	1% of SFC at max. power during high ambient condition+10% tolerance	2.40+10%	0.15	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≤ 0.15V + V^2/130 V=speed corresponding to 80% of design max. speed, kmph	--	Not applicable for track type combine	-
	ii)	Max. force exerted on brake pedal to achieve a deceleration of 2.5 m/sec².	≤ 600N.	--	Not applicable for track type combine	-
	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	--	Not applicable for track type combine	-
3.	**Mechanical vibration**					
	i)	Operator's platform	120 µm max.	--	330	**Does not conform**
	ii)	Steering wheel	150 µm max.	--	N.A	-
	iii)	Seat with driver seated	120 µm max.	--	440	**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 type air cleaner is provided	--
5.	**Noise measurement**					
	i)	Max. ambient noise emitted by combine dB (A)	88 dB (A) as per CMVR	--	87.1	Conforms
	ii)	Max. noise at operator's ear level dB (A)	98 dB (A) as per CMVR,	--	95.8	Conforms
6.	**Discard limit**					
	i)	Cylinder bore diameter	Should not exceed the values declared by the manufacture	104.15 (max)	104.0	Conforms
	ii)	Piston diameter	-do-	103.0 (min)	103.72	Conforms

	iii)	Ring end gap	--do--		0.55 (max)	Conforms
	iv)	Ring groove clearance	--do--	1.2	0.55(max)	Conforms
	v)	Diametrical and axial clearance of big end bearing	--do--	Diame-trical - 0.12 Axial - 0.60	Diame-trical – 0.10 Axial - 0.25	Conforms
	vi)	Diametrical and axial clearance of main bearings	--do--	0.13 max (diametric al) 0.50 (Axial)	Diame-trical – 0.09 Axial - 0.10	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	Recommended for paddy only	Conforms
	ii)	Grain breakage in grain tank	≤ 2.5 %	--	Paddy 0.311 to 1.078% (Avg.0.730%)	Conforms
	iii)	Non collectable losses	≤ 2.5% for wheat, paddy & gram ≤ 4.0% for soybean	--	Paddy 0.196 to 2.388% (Avg.0.27%)	Conforms
	iv)	Threshing efficiency	≥ 98% wheat & paddy	--	Paddy 98.19 to 99.58% (Avg.98.88%)	Conforms
	v)	Cleaning efficiency	≥ 96 % wheat & paddy	--	Paddy 95.87 to 96.87% (Avg.96.22%)	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	--	CMVR is not applicable for track type combine, However, lightning arrangement is provided as per 3.2.10.8 of the test report	--
	iii)	Grain tank cover	Essential	--	Not Provided	**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	--	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	Conforms
	x)	Labelling of control gauge	Essential	--		
9.	i)	Guard should conforms to IS: 6024 -2004	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 applicable as knife guard is not provided	--
	ii)	Knife blade As per IS :6025 -2004	It must have Chemical composition as C= 0.70-0.95 % Mn =0.30-0.50 %	--	C=0.77% Mn=0.70%	Conforms **Does not conform**
	iii)	Knife back Must meet the requirement of IS:10378-2006	The knife back shall be manufactured from Carbon Steel having minimum carbon content of 0.35 %	--	Carbon=0.13%	**Does not conform**
10.	**Labelling of combine harvester**					
	It should conforms to IS: 10273-2004		Essential, It should mention make & model, Engine No.	--	Not Provided	**Does not conform**

		Chassis No., Year of manufacture, Power & SFC of engine			
11.	**Break down (critical major & minor)**				
	**	Essential as per IS: 15806-2008 Appendix A_1, A_2, A_3	--	None	Conforms

TESTING AUTHORITY

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

APPLICANT'S COMMENTS

S.No.	Our Reference	Applicant's Comments
1.	18.1 (V)	Engine manufacturer agreed to take action on this matter.
2.	18.1 (viii)	We shall take care of grade as well as temperature of coolant in our future production.
3.	18.3 Mechanical vibration	The matter has been taken up by our R and D section to reduce mechanical vibration.
4.	18.8 (iii) Grain tank cover, (iv) spark arrester, (vii) slip clutches	We shall provide slip clutches and take care of safety norms in our future production.
5.	18.9 (ii) Knife blade 18.9 (iii) Knife back and 18.10 labelling of combine harvester	We shall provide labelling plate and knife blades and knife backs with modified chemical composition as per specifications given.