व्यावसायिक परीक्षण रिपोर्ट

COMMERCIAL TEST REPORT

संख्या/ **No.: COMB-200/2344/2019**

माह/**Month : August, 2019**

THIS TEST REPORT VALID UP TO : 31st AUGUST, 2026

SIMRAN 676, SELF PROPELLED COMBINE HARVESTER

सत्यमेव जयते

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

Northern Region Farm Machinery Training and Testing Institute

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b)	Peg teeth of concave		
1	211.8	210.3	0.71
2	212.6	211.5	0.52
3	222.8	221.5	0.58
4	213.6	212.0	0.75
5	210.0	209.1	0.43
6	211.8	210.4	0.66

18. SUMMARY OF OBSERVATIONS

18.1 ENGINE PERFORMANCE TEST

Table-1 : ENGINE PERFORMANCE TEST (NATURAL AMBIENT)

Brake Power kW	Engine speed (rpm)	Fuel consumption			Specific energy, kWh/l
		l/h	kg/h	Specific, kg/ kWh	
(1)	(2)	(3)	(4)	(5)	(6)
a) Maximum power – 2 hours test					
73.8	2299	21.87	18.05	0.245	3.37
68.8	1549	18.30	15.17	0.220	3.76*
b) Power at rated engine speed: (2200 rpm)					
73.1	2199	21.87	18.04	0.247	3.34

***High idle at no load was 1650 rpm recommended for field operation.**

Table-2 : ENGINE TEST (HIGH AMBIENT)

Brake power (kW)	Engine speed (rpm)	Fuel consumption			Specific energy, kWh/l
		l/h	kg/h	Specific, kg/kWh	
(1)	(2)	(3)	(4)	(5)	(6)
a) Maximum power -					
71.6	2299	21.92	17.93	0.250	3.27
b) Power at rated engine speed (2200 rpm)					
71.2	2199	21.51	17.62	0.247	3.31

18.2 Field test

18.2.1 Summary of field tests

The results of the field test are summarized below:-

S. No	Parameters	Observed range	
		Wheat harvesting	Paddy harvesting
1.	Range of average speed of operation (kmph)	2.42 to 2.48	2.61 to 2.79
2.	Range of average area covered (ha/h)	0.707 to 0.791	0.647 to 0.839
3.	Maximum average fuel consumption: - (l/h) - (l/ha)	 6.86 8.79	 9.22 13.53

4.	Range of average crop throughput (tonne/h)	5.76 to 8.84	11.77 to 20.89
5.	Reported average grain breakage in main grain outlet (%)	1.80	1.27
6.	Reported average header losses (%)	1.20	0.23
7.	Reported average total non-collectable losses (%)	1.6	0.4
8.	Reported average total collectable losses (%) (un threshed + broken from main outlet)	2.0	1.9
9.	Reported average total processing losses (%)	2.2	2.1
10.	Reported average threshing efficiency (%)	99.5	98.8
11.	Reported average cleaning efficiency (%)	97.1	97.5
Performance of straw chopper cum spreader			
12	Average percent of coefficient of variation for uniformity of spreading %	--	18.8
13	Average weighted chop size , cm	--	9.2

18.3 Conformity to Indian Standard

(i)	IS: 6025-1982 (Reaffirmed 2014)-Specification for knife section for harvesting machine.	:	**Does not conform in toto**
(ii)	IS: 6024-1983 (Reaffirmed 2014)-Specification for guards for harvesting machines.	:	**Does not conform in toto**
(iii)	IS: 10378-1982 (Reaffirmed 2016)-Specification of knife back for harvesting machine.	:	**Does not conform in toto**
(iv)	IS: 6283 (Part I & Part II)-2007(Reaffirmed 2014)-Tractors and machinery for agriculture and forestry-symbol for operator controls and other displays.	:	**Conforms**
(v)	IS: 8133-1983 (Reaffirmed 2014)-Guidelines for location & operation of operator controls on agricultural tractors and machinery.	:	**Conforms**
(vi)	IS: 15806-2018 (Combine Harvester recommendation on selected performance and other characteristics	:	**Does not conform in toto**

19. SELECTED PERFORMANCE AND OTHER CHARACTERISTICS AS PER IS 15806 : 2018

S. No		Characteristics	Category (Evaluative/ Non evaluative)	Requirement Declaration	Tolerance	Observed	Remarks
1		2	3	4	5	6	7
I.	**Prime mover performance**						
	a)	Max. Power (absolute) Average max. Power observed during 2 hrs. Max. Power test in natural ambient condition, kW	Evaluative	71.7	±5% of declared value	73.8	Conforms

1	2	3	4	5	6	7
b)	Max. Power observed during test after adjusting the no load engine speed as per recommendation of the manufacturer for field work, kW	Evaluative	68.0	±5% of declared value	68.8	Conforms
c)	Power at rated engine speed, kW (under natural ambient condition)	Evaluative	72.0	±5% of declared value	73.1	Conforms
d)	Specific fuel consumption corresponding to average maximum power under 2h maximum power test, g/kWh.	Evaluative	240	+5% of declared value	245	Conforms
e)	Max. Smoke density at 80% load between the speed at max. Power & 55% of speed at max. Or 1000 rpm whichever is higher	Evaluative	As pre CMV rules. Maximum smoke density Light absorption coefficient 3.25 per meter /Hartridge units 75	Nil	2.18 m^{-1}	Conforms
f)	Max. Crank shaft torque, (Nm) observed during the test after no load engine speed is adjusted as per manufacture's recommendation for field work	Evaluative	410	±8% of declared value	429.2	Conforms
g)	Back up torque, %	Evaluative	7 % min.	Nil	42.3	Conforms
h)	Max. Operating temperature, 0C i) Engine oil ii) Coolant	Evaluative	i) 120 ii) 108	Should not exceeds the declared value	i) 115 ii) 98	Conforms
i)	Lubrication oil consumption, g/kWh	Evaluative	Not exceeding 1 % of SFC at maximum power (high ambient)	Nil	0.387	Conforms

1		2	3	4	5	6	7
II. Brake performance at 24 km/h or maximum speed whichever is less							
	a)	Max. Stopping distance at a force equal to or less than 600 N on brake pedal (m)- (cold brake and hot brake)	Evaluative	As per requirement of CMVR	--	Cold: 4.10 Hot: 3.90	Conforms
	b)	Max. Force exert on brake pedal to achieve declaration of 2.5 m/sec^2 (N)	Evaluative	As per requirement of CMVR	--	Cold: 185 Hot: 185	Conforms
	c)	Effectiveness of parking brake at a force of 600 N at foot pedal or 400 N at hand lever	Evaluative	As per requirement of CMVR	--	Effective	Conforms
III. Mechanical vibration							
	a)	Operator's platform	Non evaluative	120 µm max.	Nil	1700	**Does not conform**
	b)	Steering control wheel	Non evaluative	150 µm max.	Nil	1400	**Does not conform**
	c)	Seat with driver seated	Non evaluative	120 µm max.	Nil	1400	**Does not conform**
IV. Air cleaner oil pull over							
	a)	Air cleaner oil pull over in % when tested in accordance with IS 8122 part (II) 2000	Evaluative	0.20 max.	Nil	Dry type air cleaner provided hence test is not applicable	--
V. Noise measurement							
	a)	Max. ambient noise emitted by combine at bystanders position dB (A)	Evaluative	88 dB (A) as per CMVR	Nil	85	Conforms
	b)	Max. noise at operator's ear level dB (A)	Evaluative	98 dB (A) as per CMVR	Nil	96	Conforms
VI. Header lifting Test							
	a)	Satisfactory completion of header lifting test	Evaluative	-	Nil	Satisfactory completed	Conforms
VII. Discard limit							
	a)	Cylinder bore diameter, mm	Evaluative	--	Should not exceed the values declared by the manufacture	104.03	Conforms

1		2	3	4	5	6	7
	b)	Piston diameter, mm	Evaluative	--	-do-	103.91	Conforms
	c)	Piston to cylinder liner clearance at skirt	Evaluative	--	-do-	0.11	Conforms
	d)	Ring end gap, mm i) Top compression ring ii) 2nd compression ring iii) Oil ring	Evaluative	i) 1.2 ii) 1.2 ii) 1.2	-do-	i) 0.40 ii) 0.45 ii) 0.25	Conforms
	e)	Ring groove clearance, mm 1. Top compression ring 2. 2nd compression ring 3. Oil ring	Evaluative	i) Tapered ii) 0.30 ii) 0.20	-do-	i) Tapered ii) 0.07 ii) 0.05	Conforms
	f)	Diametrical and axial clearance of big end bearing, mm Diametrical Axial	Evaluative	0.30 0.40	-do-	0.08 0.35	Conforms
	g)	Diametrical and axial clearance of main bearings, mm Diametrical Crank shaft end float	Evaluative	0.30 0.40	-do-	0.09 0.17	Conforms
	h)	Thickness of brake lining, mm	Evaluative	Up to Rivet head	-do-	4.5 to 4.8mm above rivet head	Conforms
	i)	Thickness of clutch plate, mm	Evaluative	Up to Rivet head	-do-	2.2 to 2.6 mm above the rivet head	Conforms

VIII. Field performance

	a)	Suitability for crops	Evaluative	Wheat & paddy (Wheel type) Paddy (Track type)			Nil	Wheat and paddy	Conforms
	b)	Average processing losses (%)	Evaluative	Wheat Barley Rice Sorgum Maize Oilseed-rape Soya-Beans	: : : : : : :	Max 3% Max 4% Max 4% Max 3% Max 5% Max 4% Max 5%	Nil	Wheat (max) 2.2% Rice (max) 2.1 %	Conforms Conforms

1		2	3	4	5		6	7
	c)	Threshing efficiency	Evaluative	≥98 percent for wheat & Paddy		Nil	99.5% for Wheat 98.8% for Paddy	Conform
	d)	Cleaning efficiency	Evaluative	≥96 percent for wheat & Paddy		Nil	97.1% for Wheat 97.5% for Paddy	Conform
	e)	Grain breakage in main grain tank	Evaluative	≤ 2.5 percent		Nil	1.80% for Wheat 1.27% for Paddy	Conform
	f)	Non collectable losses	Evaluative	*i)* ≤ 2.5 percent for wheat & Paddy & grain *ii)* ≤ 4.0 percent for Soybean		Nil	1.6 % For Wheat 0.4 % For Paddy	Conform
IX	**Field performance for straw management system (if fitted)**							
	a)	Uniformity of straw spread, C.V. (percent)	Evaluative		20, Max	--	18.8	Conforms
	b)	Weighted mean size of chopped straw , cm	Evaluative		20, Max	--	9.2	Conforms
X. Safety requirement								
	a)	Guards against all moving parts	Evaluative	Belt and chain drives, pulleys hydraulic pipes around operators work place	--		Provided	Conforms
	b)	Lighting arrangement	Evaluative	As per CMVR	-		Provided	Conforms
	c)	Grain tank cover	Evaluative	Essential	-		Provided	Conforms
	d)	Spark arrester in engine's exhaust in case naturally aspirated engine	Evaluative	Essential	-		Provided	Conforms
	e)	Stone trap before concave bars	Evaluative	Essential	-		Provided	Conforms

1	2	3	4	5	6	7
f)	Rear view mirror	Evaluative	Essential	-	Provided	Conforms
g)	Fire extinguisher	Evaluative	Essential	-	Provided	Conforms
h)	Slip clutch at following drives –					
	i) Cutting platform auger	Evaluative	Essential		Provided	Conforms
	ii) Undershot conveyor drive	Non evaluative	Essential	-	Provided	Conforms
	iii) Grain & tailing elevator	Non evaluative	Essential		**Not provided**	**Does not conform**
i)	Anti slip surfaces at operator platform & ladder & proper gripping for the control levers.	Evaluative	Essential	-	Provided	Conforms
j)	Working clearance around the controls	Non evaluative	Essential 70mm,min	-	Provided	Conforms
k)	Labelling of control and gauges	Evaluative	Essential	-	Not provided fully	**Does not conform in toto**
XI	**Material of construction :**					
i)	Knife guard should conforms to IS: 6024 - 1983	Non evaluative	Should have maximum hardness 163HB	-	214 to 226	**Does not conform**
ii)	Knife blade As per IS :6025 -1982	Non evaluative	It must have Chemical composition as C=0.70-0.95 %	-	C=0.5084	**Does not conform**
			Mn= 0.30-0.50%		Mn= 0.9771	**Does not conform**

1		2	3	4	5	6	7
	iii)	Knife back should meet the requirement of IS:10378-1982	Non evaluative	The knife back shall be manufactured from Carbon Steel having minimum carbon content of 0.35 %	--	C=0.3116	**Does not conform**
	iv)	Material of blades for straw management System (SMS)	Non evaluative	The flail and fixed blades shall be manufactured from steel having the following chemical composition or such other composition as shall be agreed to between the supplier and the purchaser. a) Carbon 0.70 to 1.0 percent. b) Manganese 0.6 to 0.97 percent. c) Chrome 0.1 percent. d) Nickel 0.1 percent	--	Flail blade C-0.6511 Mn-0.9560 Cr-0.0967 Ni-1.5059 Fixed blade C-0.6087 Mn-0.9372 Cr-0.1053 Ni -1.5367	As the code itself accommodate the variation in chemical composition, there is little scope for declaration of conformity or otherwise
	v)	Bushes for flail blades	Non evaluative	Mild steel	-	Mild steel	Conforms
	vi)	Hardness of flail blades for Straw management system (SMS)	Evaluative	Bush section 20 to 35 HRC	-	20.3 to 22.0	Conforms
				Edge section (Hardened zone) : 48 to 58 HRC	-	17.92 to 22.6	**Does not conform**
				Remainder zone : 20 to 35 HRC	-	17.9 to 22.6	**Does not conform**

1		2	3	4	5	6	7
	vii)	Hardness of serrated blades for Straw Management System (SMS) :	Evaluative	Bush section 20 to 35 HRC	-	18.4 to 24.4	**Does not conform**
				Edge section (Hardened zone) : 48 to 58 HRC	-	37.3 to 40.2	**Does not conform**
				Remainder zone : 20 to 35 HRC	-	20.1 to 21.0	Conforms
	viii)	**Safety Requirements for Straw Management system, (if Fitted) :**					
		a) Guards against all moving parts/ drives and hot parts	Evaluative	Essential	-	Provided	Conforms
		b) RPM indicator for rotor	Evaluative	Essential	-	Provided	Conforms
		c) Overlapping of final and fixed serrated blades	Evaluative	Essential	-	Provided	Conforms

XVII. Break down (critical, major & minor)

Sr. No.	Category of breakdowns	Category (Evaluative/ Non evaluative)	Requirements as per IS 15806:2018	As observed	Whether meets the requirements (Yes/No)
1.	Critical	Evaluative	No critical breakdown	None	Yes
2.	Major	Evaluative	Not more than two and neither of them should be repetitive in nature	One, (Mj-22)	Yes
3.	Minor	Evaluative	Not more than five and frequency of each should not be more than two	None	Yes
4.	Total breakdown	Evaluative	In no case total no of (major + minor) breakdowns exceed five	One, (Mj-22)	Yes

20. COMMENTS AND RECOMMENDATIONS

20.1 Mechanical vibration

The amplitude of mechanical vibration of components marked as (*) in chapter 12 of this report are observed 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.

20.2 Field performance test

No noticeable defect observed during field test.

20.3 The hydraulic pipe of RHS cylinder for Header assembly found leak. The pipe was replaced with new one. This is considered as major defect (Mj-22) and should be looked into.

20.4 Ease of operation and safety provision

i) No noticeable difficulties observed during operation of combine harvester.

ii) Slip clutch at Gain and tailing elevator is not provided. It **MUST** be provided as per the requirement of IS 15806 : 2018

iv) The first aid box is not provided on machine. It may be provided.

v)

20.5 Hardness and chemical composition

20.5.1 Hardness & chemical composition of knife blade, knife guard and knife back is not within the limits specified in their respective IS: 6025-1982. It should be looked into for corrective action at regular production level.

20.6 The harness of fixed & flail blade of SMS does not conforms to the requirement of IS 15806:2018. It MUST be looked into as it is evaluative requirement

20.7 Individual brake pedals for LHS & RHS brake is not provided. It may be provided.

20.8 Sediment bowl is not provided in fuel line. It should be provided.

20.9 Service schedule for air cleaner is not specified. It should be provided in literature.

20.10 Oil filter is not provided in hydraulic oil circuit. It should be provided.

20.11 There is no provision for varying oscillation of sieve. It should be provided.

The grade of Hydraulic oil, transmission & final drive oil is not specified. It MUST be specified for the guidance of user.

20.12 Drive safety for grain elevator, upper grain auger, bottom tailing auger, grain conveying auger and grain unloading auger is not provided. It should be provided.

20.13 Literature supplied with the machine

The following literature was submitted by applicant during testing.

i) Operator's cum service manual for combine harvester
ii) Operator's manual for engine
The following literature MUST be provided for guidance of user.

i) Part's catalogue

The operator manual should be updated as per IS:8132-1999.

TESTING AUTHORITY

R. K. NEMA SENIOR AGRICULTURAL ENGINEER	
P. K. PANDEY **DIRECTOR**	

Draft test report compiled by : V.S. Shinde, Senior Technical Assistant

21. APPLICANT'S COMMENTS

Para No	Our reference	Applicant's comments
21.1	20.1 to 20.12	We will look into all the recommendation/ requirement in our regular production.