व्यावसायिक परीक्षण रिपोर्ट संख्या / No. : IMP- 599/1478

COMMERCIAL TEST REPORT माह / Month : January,2013

STRAW REAPER COMBINE "HARVINDERA"

सत्यमेव जयते

भारत सरकार

कृषि मंत्रालय

(कृषि एवं सहकारिता विभाग)

GOVERNMENT OF INDIA

MINISTRY OF AGRICULTURE

(DEPARTMENT OF AGRICULTURE & COOPERATION)

उत्तरी क्षेत्र कृषि मशीनरी प्रशिक्षण एवं परीक्षण संस्थान

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3.	Idler pulley baring of beater belt.	1
4.	Idler pulley bearing of thresher belt.	1
5.	Idler pulley bearing of reel drive belt.	1
6.	Chain idler auger bearing	1
	Total	6
A-2	Grease cups: (to be greased once in season)	
1.	Grease cup of wheel bearings	2
	Total	2
B.	Oiling points:	
1.	Reel moving bushes	12
2.	Sieve drive mechanism pulley	4
	Total	16

7. LABOTATORY TESTS :

Material Analysis : The hardness and chemical analysis with respect to critical components are given in Table-3 & 4 respectively.

Table-3 : Hardness of critical parts :-

S.No.	Component	Material	Hardness observed	
			Hardened zone	Remainder zone
1	Cutter bar	High carbon steel	53	42
2	Knife guard	High carbon steel	30	30
3	Cylinder blade	High carbon steel	51	40
4	Concave blade	High carbon steel	55	40

Table-4 : Chemical analysis of critical components

S.No.	Component	Primary element				
		Carbon	Manganese	Phosphorous	Sulphur	Silicon
1	Knife blade	0.72	0.71	0.010	0.002	0.24
2	Knife guard	0.25	0.51	0.045	0.038	0.15
3	Cylinder blade	0.78	0.72	0.012	0.004	0.20
4	Concave blade	0.66	0.63	0.017	0.004	0.16

8. FIELD TEST

The straw reaper fitted with Swaraj-855 FE tractor at engine throttle setting corresponding to 1700 rpm was tested in the field for 35.7 hours for harvesting of wheat straw left over by grain combine harvester. During tests field performance of straw reaper combine was assessed with regard to quality of work, rate of work, fuel consumption, safety and soundness of construction etc. The crop and field conditions during field tests are given in **Annexure-II & III** and summarized as under in Table-5 & 6. The detail of the tractor used for field operation are given in **Annexure-I**

Table-5 : Summary of field crop conditions

S.No.	Parameters	Range of parameters
1.	Plant population, No./m^2	212 to 425
2.	Available straw, kg/m^2	0.650 to 0.880
3.	Moisture content of straw, %	7.9 to 8.2
4.	Weight of loose straw, kg/m^2	0.335 to 0.427

5.	Height of stubbles before harvesting, mm	251 to 330
6.	Height of stubbles after harvesting, mm	49 to 76
7.	Straw mass density recovered manually at 8% moisture and at a height of 35 mm, kg/m^2	0.067 to 0.099

Table -6 : Summary of field performance test

S.No.	Observations	Range of observations
1.	Speed of operation, kmph	2.74 to 3.48
2.	Width of cut, m	1.98 to 2.02
3.	Overlap percent	3.77 to 5.66
4.	Rate of work, ha/h	0.466 to 0.529
5.	Fuel consumption l/h l/ha l/tonne	 5.90 to 6.84 11.49 to 14.46 2.95 to 4.34
6.	Power consumption, kW (Ps)	21.0 to 26.4 (27.2 to 35.8)
7.	Average length of straw, mm	12.9 to 25.2
8.	Straw split percent	97.0 to 98.0
9.	Straw recovery percent	78.2 to 82.5
10.	Grain recovery percent	59.8 to 76.0
11.	Awn percentage	N.R

8.1 **Quality of work :**

It refers to average length of straw, split straw & straw recovery percentage, dust and awn percentage in wheat straw produced by straw combine. Average length of straw ranged from 12.9 to 25.2 mm. Straw split & straw recovery percentage ranged from 97.0 to 98.0. Recovery of grain from the left over wheat straw in field by straw reaper combine ranged from 59.8 to 76.0 %.

8.2 **Rate of work:**

Rate of work of straw reaper combine consists of two main points: (a) Area covered per unit, time and (b) straw recovery. Area covered ranged from 0.466 to 0.529 ha/h. Straw recovery ranged from 78.2 to 82.5%. Overlap percentage ranged from 3.77 to 5.66%. Fuel consumption of tractor to operate the straw reaper combine combination (reaper and tractor trolley) ranged from 2.95 to 4.34 litters per tonne of straw recovered. Power required to operate straw reaper combine is 21.0 to 26.4 (27.2 to 35.8 hp).

9. EASE OF HANDLING DURING OPERATION.

No specific problem was observed in maneuvering of straw reaper.

Chaffer cylinder	1	79.8	34.0	56.80	79.0	33.0	55.00	1.00	2.94	3.16
	2	80.0	33.9	55.95	79.6	32.9	55.0	0.50	2.94	1.70
	3	80.3	34.0	55.90	79.6	33.0	54.6	0.87	2.94	1.97
	4	80.4	33.4	55.96	79.8	32.6	55.0	0.75	2.40	1.72
	5	80.3	33.8	55.90	79.0	32.8	54.6	1.66	3.20	2.32
	6	80.40	33.8	55.80	78.4	32.8	54.8	2.48	3.20	1.80
	7	80.40	34.0	55.80	78.4	33.0	54.20	2.48	2.37	2.86
	8	80.3	34.0	55.80	78.8	34.0	54.20	1.86	3.16	2.86

Wear of cutter bar, concave & chaffer cylinder blades on mass basis has ranged from 1.07 to 3.08 %, 0.54 to 1.16% and 0.58 to 1.98% respectively whereas the wear on dimensional basis are as follows:-

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Blade Assembly	Lengthwise (%)	At tip (%)	At 50 mm from base (%)
Cutter bar	0.23 to 0.59	9.80 to 11.70	1.15 to 9.22
Concave	0.36 to 1.08	2.81 to 5.75	1.44 to 4.86
Chaffer cylinder	0.50 to 2.48	2.37 to 3.20	1.70 to 3.16

13 SOUNDNESS OF CONSTRUCTION

No breakdown was observed during 35.7 hrs. of field operation under test.

14 SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS:

14.1. Rate of work and fuel consumption:

On the basis of field tests, output of the machine varied from 0.446 to 0.529 ha/h. The forward speed of tractor Swaraj-855 FE varied from 2.74 to 3.48 Kmph in L-1 & L-2 gear. Fuel consumption of tractor varied from 5.90 to 6.84 h, 11.49 to 14.46 1/ha and 2.95 to 4.34 l/tonne.

14.2 Quality of work:

Quality of straw is expressed in terms of split straw, straw recovery percentage and length of straw. The split straw & straw recovery were observed as 97.0 to 98.0 & 78.2 to 82.5 % respectively. The average length of straw observed from 12.9 to 25.2 mm. The grain recovery was from 59.8 to 76.0%.

14.3 COMMENTS AND RECOMMENDATIONS.

1. Quality of wheat straw was observed to be satisfactory and is considered to be satisfactory as animal feed.
2. It is recommended to incorporate the safety device in drive shaft.
3. The straw split percentage, straw recovery were observed from 97.0 to 98.0% & 78.2 to 82.5% which is normal.
4. Hardness of cutter bar, concave and chaffer cylinder blade was observed as 51 to 55 and 30 to 42 HRC at hardened and remainder zone respectively.
5. An identification plate should be provided on each unit at regular production level.

6. The safety devices should be provided in power transmitted to propeller shaft, chopping drum, knife blade etc. and V belt and pulley system should be fully covered. This needs to be looked into at regular production level.
7. The total power consumption has been observed as 62.1 to 78.1 % of the rated pto power of tractor.

15. LITERATURE

A literature in form of booklet was provided with machine. It is recommended to modify the same as per IS: 8132-1999 for guidance of users & service personnel.

TESTING AUTHORITY

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(P. K. CHOPRA) SENIOR AGRICULTURAL ENGINEER	12.01.04
(A. N. MESHRAM) DIRECTOR	

APPLICANT'S COMMENT

No comment received