व्यावसायिक परीक्षण रिपोर्ट

COMMERCIAL TEST REPORT

संख्या/ **No.: PS-531/3052/2023**

माह/**Month: July, 2023**

THIS TEST REPORT VALID UP TO : 31st July, 2028

CHARLIE, FIELD HAWK
SELF PROPELLED HIGH CLEARANCE BOOM SPRAYER

सत्यमेव जयते

भारत सरकार

Government of India

कृषि एवं किसान कल्याण मंत्रालय

Ministry of Agriculture and Farmers Welfare

कृषि एवं किसान कल्याण विभाग

Department of Agriculture and Farmers Welfare

उत्तरी क्षेत्र कृषि मशीनरी प्रशिक्षण एवं परीक्षण संस्थान

Northern Region Farm Machinery Training and Testing Institute

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[ISO 9001:2015 CERTIFIED]

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5. RUNNING-IN

The sprayer was run-in for 1.0 hours as recommended by the applicant before starting of test.

6. TEST FOR DISCHARGE RATE OF PUMP
[vide Clause 8.3 of IS:11313-2007]

1. Date of test : 18.05.2023
2. Atmospheric conditions
   a) Temperature : 40.5 °C
   b) Relative humidity : 34.6 %
   c) Pressure : 98.8 kPa
3. Data recorded

Avg. Speed of Pump (rpm)	Working pressure (kg/cm^2)	Test No.	Delivery from the discharge line (ml/min)	Overflow (ml/min)	Avg. over flow (ml/min)	Average discharge from the discharge line (ml/min)	Discharge rate of pump (ml/min)	Hydraulic power (kW)
477	12.0	1	35200	13140	12940.0	35642.5	48582.5	0.95
		2	35540	12820				
		3	35850	13000				
		4	35980	12800				
476	14.0	1	38870	8770	8700.0	38992.5	47692.5	1.09
		2	39150	8600				
		3	39000	8680				
		4	38950	8750				
473	16.0	1	42900	4150	3945.0	42962.5	46907.5	1.23
		2	43000	3880				
		3	42850	3950				
		4	43100	3800				
471	18.0	1	45000	1050	957.5	45507.5	46465.0	1.37
		2	45550	800				
		3	45800	980				
		4	45680	1000				

Minimum discharge rate : 46465.0 ml/min at 18 kg/cm^2
Maximum discharge rate : 48582.5 ml/min at 12 kg/cm^2
Discharge at rated pressure : 46465.0 ml/min at 18 kg/cm^2

7 TEST FOR VOLUMETRIC EFFICIENCY OF PUMP
(Vide clause 8.4 of IS:11313-2007)

Date of Test	:	18.05.2023
Rated pressure, kg/cm^2	:	18
Avg. discharge of water at rated pressure, ml/min	:	46.4650
Avg. discharge of water at no load, ml/min	:	49.0250
Avg. pump speed at no load, rev/min	:	479
Avg. pump speed at rated pressure, rev/min	:	471
Volumetric efficiency, %	:	96.38

8. PRESSURE ADJUSTMENT TEST
(Vide Clause 8.7.1 of IS: 11313-2007)

1. Date of test : 18.05.2023
2. Atmospheric conditions :
   a. Temperature : 40.5 °C
   b. Relative humidity : 34.6 %
   c. Pressure : 98.8 kPa
3. Data recorded

Sr. No.	Working pressure (kg/cm^2)	Fluctuation range (kg/cm^2)	Pressure drop (kg/cm^2)	Ratio
1.	12.0	NIL	NIL	--
2.	14.0	NIL	NIL	--
3.	16.0	NIL	NIL	--
4.	18.0	NIL	NIL	--

4. Resistance to different pressure: Yes

9. POWER REQUIREMENT

During the pump operation from minimum pressure range, the max. hydraulic power was observed as 1.37 kW against the declared net power output of engine 2.94 kW

10. ENGINE PERFORMANCE TEST

Dates of test (s)	:	09.06.2023 to 12.06.2023
Engine run before test, h	:	2.0
Type of dynamometer	:	Electrodyne, 70 EC3.6
Dynamometer constant	:	3000

The results of the engine performance tests are tabulated in **Table-1** are graphically represented in Fig. 2 to 4.

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					
17.70	2581	6.23	5.26	0.293	2.91
17.41	2541	6.09	5.10	0.293	2.85
b) Power at rated engine speed: (2700 rpm)					
17.01	2700	6.13	5.21	0.301	2.78
c) Varying load test :-					
i) Torque corresponding to maximum power:					
17.70	2581	6.23	5.26	0.293	2.91
ii) 85% of torque obtained at maximum power:					
16.16	2758	6.02	5.03	0.311	2.68
iii) 75% of torque defined in (ii):					
12.13	2765	4.83	4.04	0.333	2.51

11. TEST FOR NOZZLE
[vide Clause 5.15 of IS:11313-2007 & Annex F of IS: 3652-1995]

Date of test : 17.05.2023

Type of nozzle **(apa)** : Fixed, Hollow cone

11.1 TEST FOR DISCHARGE RATE OF NOZZLE

The discharge rate for fine cone spray pattern (Hollow cone) as 800 ml/min & fine cone spray pattern (Flat Fan) as 1200 ml/min at a pressure of 300 kPa was declared by the applicant. However, the discharge rate corresponding to 300 kPa was observed as below:-

-For fine cone spray pattern (Hollow cone) – 806.67 ml/min

-For fine cone spray pattern (Flat Fan) – 1205.73 ml/min

11.2 TEST FOR SPRAY ANGLE OF NOZZLE

The spray angle for fine cone spray pattern at the pressure of 300 kPa was declared by the applicant as 60 degree for fine cone spray pattern (Hollow cone) & 110 degree (Flat fan). However, the spray angle corresponding to 300 kPa pressure was observed as 61.6 degree for fine cone spray pattern (Hollow cone) and 107.6 degree (Flat fan).

11.3 ENDURANCE TEST OF NOZZLE

1. Date of test : 28.04.2023 to 16.05.2023
2. Total running hours : 48
3. Quantity of liquid collected and spray angle observed during endurance test.

Sr. No.	No. of Collection	Avg. discharge, ml/min. (Fine cone spray pattern)	Spray angle, degree.
a)	First collection	19387.5	60.8
b)	Second collection	19352.5	62.4
c)	Third collection	19360.0	61.6
d)	Fourth collection	19370.0	60.1
e)	Fifth collection	19327.5	60.8
f)	Sixth collection	19317.5	60.4
g)	Seventh collection	19282.5	60.8
h)	Eight collection	19527.5	62.0

Remark:

i) **Percentage variation of discharge at fine cone spray pattern from first to last collection is 0.72 %**

ii) **The variation in spray angle of nozzle at fine cone spray pattern from first to last collection is 1.2 degree.**

11.4 SPRAY DISTRIBUTION PATTERN OF NOZZLE

The liquid discharge from nozzle at 300 kPa pressure was collected in glass tube of patternator. The spray pattern as per the quantity of liquid collected is represented in tabular form in Fig. 5.

11.5 NOZZLE DESIGNATION : Not marked

Provision of strainer in nozzle : Provided

11.6 MARKING

Manufacturer's name or recognized trade mark : Marked as Lechler

Batch or code number : Marked as TR80-02C

12. AIR PRESSURE CHAMBER TEST
[vide Clause 8.7.2 of IS:11313-2007]

12.1

Date of test : 18.05.2023

Sr. No	Details	Condition
1.	Hydraulic pressure	45 kg/cm^2
2.	Duration of pressure application	30 second
3.	Result	No leakage or deformation of pressure chamber was found during the test

DATA OF SPRAY DISTRIBUTION PATTERNATOR TEST OF NOZZLE (HOLLOW CONE)

No. of tube	9	8	7	6	5	4	3	2	1	Centre	1	2	3	4	5	6	7	8	9
Discharge in ml.	08	21	36	49	61	70	78	62	50	56	56	71	90	74	54	35	21	10	05

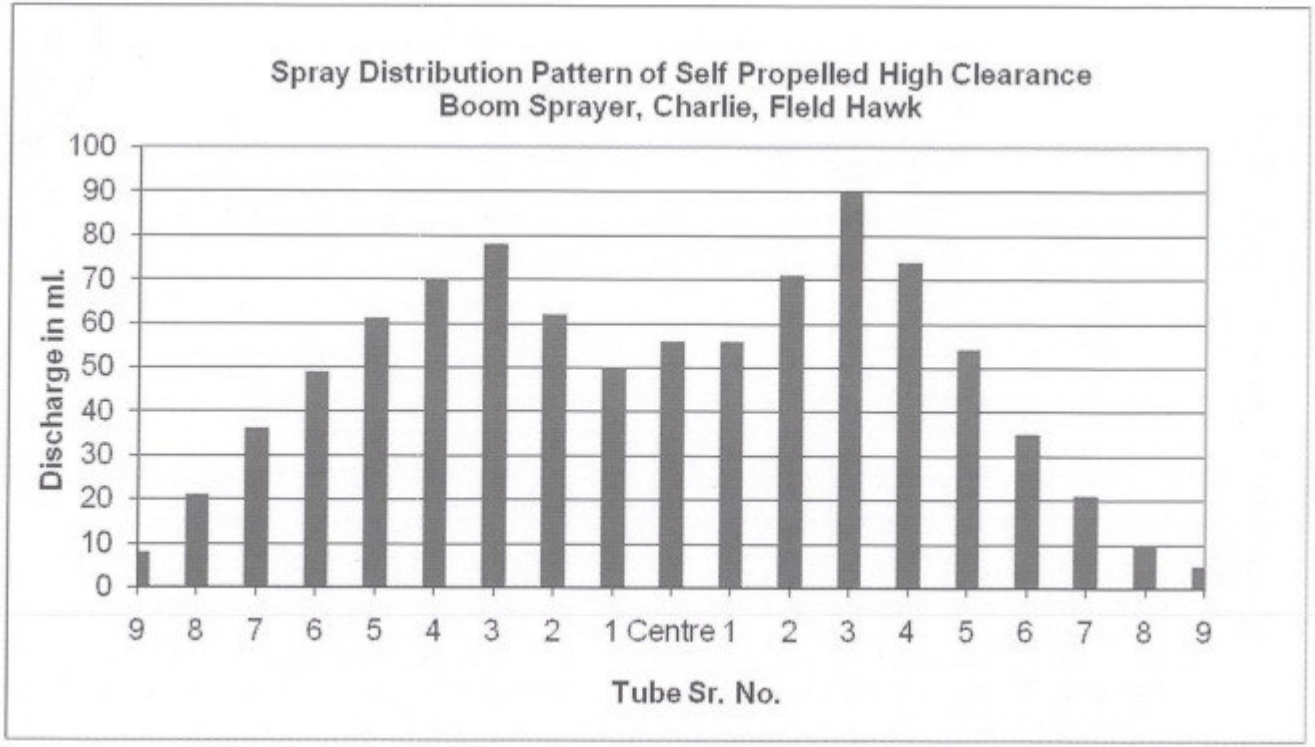

FIG. 5. SPRAY DISTRIBUTION PATTERN

DATA OF SPRAY DISTRIBUTION PATTERNATOR TEST OF NOZZLE (FLAT FAN)

No. of tube	12	11	10	9	8	7	6	5	4	3	2	1	Centre	1	2	3	4	5	6	7	8	9	10	11	12
Discharge in ml.	06	08	15	20	25	30	45	55	57	60	71	64	72	66	70	64	57	50	45	36	28	22	14	08	05

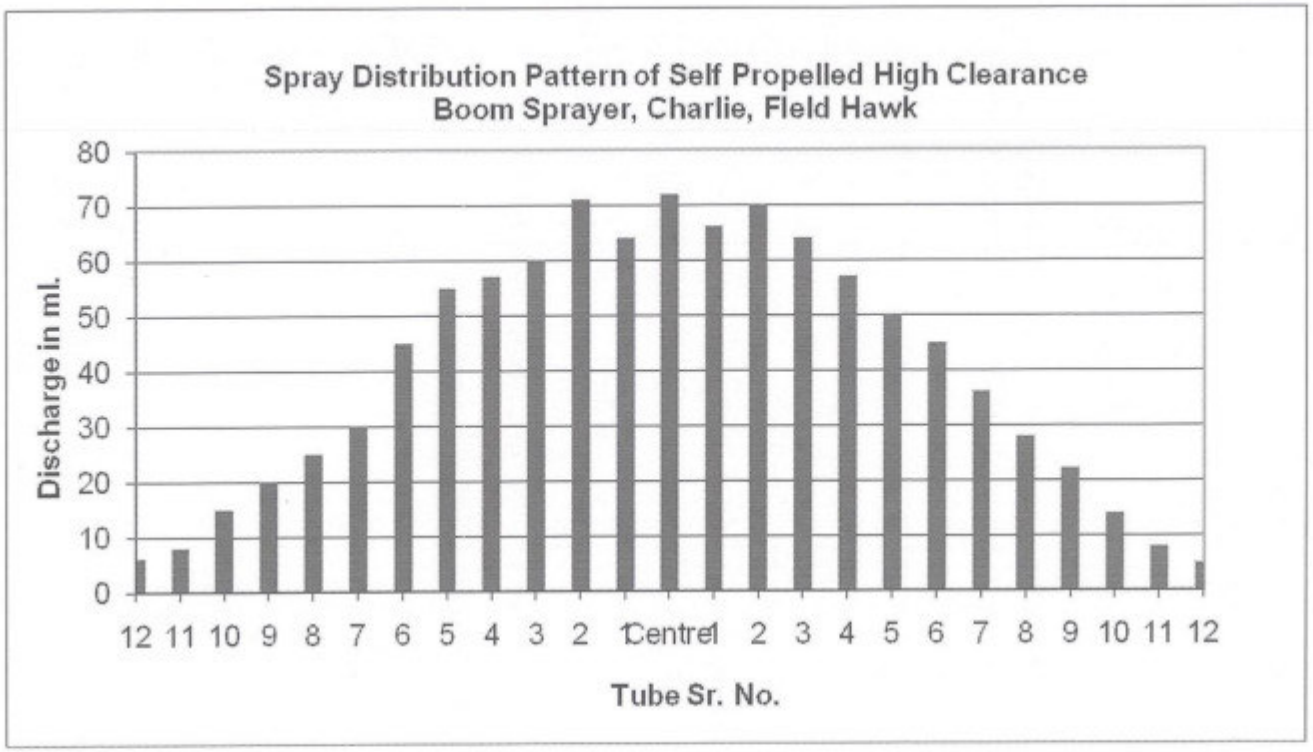

FIG. 6. SPRAY DISTRIBUTION PATTERN

13. ENDURANCE TEST OF SPRAYER
[vide Clause 8.8 of IS:11313-2007]

1. Date(s) of test : 20.04.2023 to 16.05.2023
2. Total running hours:-50
3. Quantity of liquid Collected (ml/min.):-
   a) First Collection - 46622.5
   b) Second Collection - 46207.5
   c) Third Collection - 46280.0
   d) Fourth Collection - 46470.0
   e) Fifth Collection - 46075.0
   f) Sixth Collection - 46412.5
   g) Seventh Collection - 46492.5
4. Percentage variation of discharge rate from first to last collection was observed to be 0.28 %.

14. TEST FOR HOSE AND HOSE CONNECTION
[vide Clause 5.14.3 of IS:11313-2007 & Clause 7.2 of IS:10134-1994]

Date of test – 18.05.2023		
Sr. No	Details	Condition
1	Test Condition	Hose outlet end closed
2	Hydraulic pressure applied	1.5 MPa
3	Duration of pressure	1 Minute
4	Result	No leakage, crack or breakage observed in hose and hose connection during the test.

15 NOISE MEASUREMENT

15.1 Noise at by-stander's position

Date of test	:	18.05.2023
Type of test track	:	Concrete
Background noise level, dB(A)	:	49.3
Atmospheric condition		
Temperature, °C	:	38.7
Relative humidity, %	:	34.5
Atmospheric pressure, kPa	:	98.6
Wind velocity, m/s	:	1.8 to 2.3
Height of microphone from the ground level, cm	:	120
Max. travel speed, km/h	:	15.92
Max. noise level at travel speed for field operation, dB(A)	:	82.1

15.2 Noise at operator's ear level:

Date of test	:	18.05.2023
Type of test track	:	Concrete
Background noise level, dB(A)	:	49.3

12	Safety wear	Mask, hand gloves, gum boots and goggles, aprons must be provided	Mask, hand gloves, gum boots, goggle and apron are provided	Conforms
13	Labeling plate sprayer	Metallic labeling plate should be riveted with following information manufactures name, make, model, serial number, month, & year of manufacture, rated speed, rated pressure and recommended tractors horse power	Provided	Conforms
14	Literature	Operator manual, service manual & parts catalogue should be provided	Operator manual, parts catalogue & service manual are provided	Conforms

	26. CONFORMITY TO INDIAN STANDARDS		
i)	IS:11313-2007 (Reaffirmed 2012)-Hydraulic power sprayer-specification	:	**Partially conform**
ii)	Spray nozzle and spray gun as per IS:3652-1995 (Reaffirmed 2011)	:	**Partially conform**
iii)	Hose and hose connection as per IS:10134-1994	:	Conforms
iv)	IS: 2643-2005-Pipe threads where pressure-tight joint are not made on the threads-dimensions, tolerance and designation.	:	**Partially conform**

27. COMMENTS AND RECOMMENDATIONS

27.1 The designation of spray nozzle is not marked. It **MUST** be looked into.

27.2 The engaged threaded length of inlet port does not meet the requirement of relevant code/Standards in toto, it **MUST** be looked into

27.3 The pressure gauge with full scale reading of 21 bar is provided. Thus, it does not conform the requirement of IS:11313-2007. It **MUST** be looked into.

27.4 Safety provision/safety wear

i) Safety instructions regarding handling poisonous agro-chemical before, during and after spraying operation should be provided on sprayer.

28. TECHNICAL LITERATURE

The following literatures were provided with sprayer for guidance to the user.

i) Operator manual
ii) Service manual
iii) Parts catalogue

However, the manuals of sprayers should be updated as per IS:8132-1999.

TESTING AUTHORITY

Er. SANJAY KUMAR **AGRICULTURAL ENGINEER**	
Dr. MUKESH JAIN **DIRECTOR**	05-07-2023

The draft test report is compiled by Sh. Abhishek Chourey, MTS (Technical)

29. APPLICANT'S COMMENTS

No specific comments received from the applicant.