



SWARAJ 841 XM



भारत सरकार

GOVERNMENT OF INDIA

कृषि मंत्रालय (कृषि एवं सहकारिता विभाग, मशीनीकरण एवं प्रोद्योगिकी प्रभाग)
Ministry of Agriculture (Deptt. of Agri. & Co-op, Mechanization & Technology Division)

केन्द्रीय कृषि मशीनरी प्रशिक्षण एवं परीक्षण संस्थान

CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE

(An ISO : 9001-2008 Certified Institute)

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T- 863/1374/2013

SWARAJ 841 XM TRACTOR – Commercial (Initial)

Manufacturer : M/s. Mahindra & Mahindra Ltd.
Farm Equipment Sector,
Swaraj Division,
Phase-IV, Industrial Area, S.A.S.
Nagar, Distt. Mohali (Punjab)
Near Chandigarh – 160 055

Test requested by (applicant) : The manufacturer
Selected for test by : Applicant
Place of running-in : At manufacturer's works

Duration of said running-in, (h):
- Engine : 28
- Transmission : 32

METHOD OF SELECTION : The tractor was submitted directly by the applicant for test. Hence, method of selection is not known.

1. SPECIFICATIONS

- 1.1 Tractor:**
Make : Swaraj
Model : 841 XM
Variants if any : None
Brand name : Swaraj
Type : Four wheeled, rear wheel driven, Standard Agricultural Tractor.
Year of manufacture : 2012
Chassis number : WATD81614100001
Country of Origin : India
- 1.2 Engine:**
Make : M/s. Mahindra & Mahindra Ltd.
Model : MDI 2385S3A
Type : Four stroke, naturally aspirated, water cooled, direct injection, diesel engine.
Serial number : 3RS06081
Engine speed (Manufacturer's recommended production setting), (rpm) :
- Maximum speed at no load,(rpm) : 2075 to 2175
- Low idle speed, (rpm) : 750 to 850
- Speed at maximum torque, (rpm) : 1300 to 1500
Rated speed, (rpm):
- For PTO use : 1900
- For drawbar use : 1900
- 1.3 Cylinder & Cylinder Head:**
Number : Four
Disposition : Vertical, inline
Bore/stroke, (mm) : 88.9 / 110
Capacity as specified by the applicant, (cc) : 2730
Compression ratio, (apa) : 19.5 : 1
Type of cylinder head : Monoblock
Type of cylinder liners : Wet, replaceable



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- 15.6 **Steering system:**
Visual condition of the components of : Normal
complete steering assembly
- 15.7 **Starter motor & Alternator:**
Presence of soil/oil in housing : None
Condition of bearings and other Components : Normal

16. ADJUSTMENTS, DEFECTS, BREAKDOWNS AND REPAIRS

S. No.	Adjustments/Defects/Breakdowns and repairs	Tractor run hours
--	---None---	--

17. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

- 17.1 Evaluative (mandatory) / Non-evaluation (Non-mandatory) parameter applicable for qualifying Minimum Performance criteria as per Clause-4 (Table-1) of IS: 12207-2008 for acceptance of the tractor for the purpose of subsidies/NABARD financing are summarized as under:

S. No.	Characteristic	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2008	Values declared by the applicant(D) / Requirement (R)	As observed	Whether meets the requirements (Yes/No)
1	2	3	4	5	6	7
17.1.1 PTO Performance :						
a)	- Maximum power under 2 h test, (kW) (Natural ambient condition)	Evaluative	Declared value to be achieved with a tolerance of: -5 / +10% for PTO power >35hp. -7.5/+10% for PTO power ≤ 35 hp	28.0 (D)	28.6	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	-do-	28.0 (D)	28.2	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Non Evaluative	± 5%	251 (D)	246	Yes
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	± 8%	158 (D)	165.8	Yes
e)	Back-up torque, percent	Non Evaluative	7 percent, min.	15 (D)	21.5	Yes
f) Maximum operating temperature (°C):						
1)	Engine oil	Non Evaluative	The declared value should not exceed the max. value specified by the oil company and the observed value under high ambient condition should not exceed the declaration.	130 (D)	113	Yes



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1	2	3	4	5	6	7
	2) Coolant (water)	Evaluative	The declared value should not exceed the boiling temperature of coolant under the pressurized or otherwise and the observed value under high ambient condition should not exceed the declaration.	115 (D)	96	Yes
g)	Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at max. power under High ambient conditions	2.48 (R)	0.48	Yes
h)	Smoke level	Evaluative	Maximum light absorption coefficient of 3.25 per metre or equivalent BOSCH No. 5.2 or 75 Hatridge value (As per CMVR)	3.25 per meter	0.32 per meter	Yes
17.1.2 Drawbar performance :						
a)	Max. drawbar pull with ballast corresponding to 15 percent wheel slip, (kN)	Non Evaluative	Minimum 65% of static mass with ballast	21.00 (D) 16.83 (R)	21.52	Yes
b)	Max. drawbar pull without ballast corresponding to 15 percent wheel slip, (kN)	Evaluative	Minimum 65% of static mass of tractor without ballast	12.00 (D) 11.67 (R)	15.32	Yes
c)	Maximum drawbar power without ballast (kW).	Evaluative	Min. 80% of PTO power as referred in 16.1.1 (a) of PTO performance	22.4 (D) 22.9 (R)	24.7	Yes
d)	Max. transmission oil temperature (°C)	Non Evaluative	The declared value should not exceed the maximum value specified by oil company	110	78	Yes
17.1.3 Power lift and hydraulic pump performance :						
a) Maximum lifting capacity throughout the range of lift, (kN):						
1)	At hitch points	Non Evaluative	[Tolerance of minus 10%]	11.77 (D)	12.77	Yes
2)	With the standard frame	Evaluative	The lift capacity should at least be 18 kg/PTO hp. and it should be 16 kg/engine hp where the tractor is not provided with a PTO shaft	8.83 (D) 6.77 (R) Minimum (R)	11.03	Yes
b)	Maximum drop in the height of the point of application of the force after each 5 minutes interval for a total duration of 30 minute, (mm)	Non Evaluative	[Tolerance of plus 5 mm]	50 (D) 50 (R)	33	Yes
17.1.4 Brake performance at 25 kmph:						
a) Maximum stopping distance at a force equal to or less than 600 N on brake pedal with road ballast, (m):						
1)	Cold brake	Evaluative	10	10 (R)	8.27	Yes
2)	Hot brake	Evaluative	10	10 (R)	8.86	Yes



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1	2	3	4	5	6	7
b)	Maximum force exerted on the brake pedal to achieve a deceleration of 2.5 m/s ² (N)	Evaluative	600	600 (R)	314 to 363	Yes
c)	Whether parking brake is effective at a force of 600 N at foot pedal(s) or 400 N at hand lever	Evaluative	Yes	Yes	Yes	Yes
17.1.5	Noise measurement :					
a)	Maximum ambient noise emitted by the tractor dB(A)	Evaluative	As per CMVR	88 (R)	83	Yes
b)	Maximum noise at operator's ear level dB(A)	Evaluative	As per CMVR	98 (R)	95	Yes
17.1.6	Amplitude of mechanical vibrations at :					
1)	Left foot rest	Non Evaluative	100 microns (max)	100 (R)	40	Yes
	Right foot rest			100 (R)	90	Yes
2)	Seat (with driver seated)			100 (R)	130	No
3)	Steering wheel			100 (R)	170	No
17.1.7	Haulage requirements :					
a)	Gross mass of the trailers, (tonnes):					
1)	Two wheel	Non Evaluative	--	5.0 (D)	5.0	Yes
2)	Four wheel	Evaluative	--	6.0 (D)	6.0	Yes
b)	Distance travelled / litre of fuel consumption, (km):					
1)	Two wheel	Non Evaluative	--	5.0 to 7.0 (D)	5.51 to 5.63	Yes
2)	Four wheel		--	5.0 to 7.0 (D)	4.47 to 4.59	No
c)	Fuel consumption (ml/km/tonne):					
1)	Two wheel	Non Evaluative	--	25 to 35 (D)	35.5 to 36.3	No
2)	Four wheel		--	25 to 35 (D)	36.3 to 37.3	No
17.1.8	Wetland cultivation :					
	Sealing for the following assemblies:	Evaluative	The identified assemblies should essentially meet the requirement of IS: 11082. No water ingress in the identified assembly given in column-2.	There should be no ingress of water and/or mud (R)	No ingress of mud and / or water was observed	Yes
1)	Clutch assembly	-do-	If tractor does not meet the requirements of wetland cultivation, it may be recommended for dry land operation only.			
2)	Brake housings	-do-				
3)	Front axle hubs	-do-				
17.1.9	Safety features :					
a)	Guards against moving and hot parts	Evaluative	As per CMVR	At present no requirements	---	--
b)	Lighting arrangement	Evaluative	As per CMVR	--	Provided	Yes



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1	2	3	4	5	6	7
17.1.10	Labelling of tractors (Provision of labelling plate):					
1)	Make	Evaluative	Should conform to the requirements of CMVR along-with declared value of PTO HP	--	Swaraj	Yes
2)	Model	Evaluative		--	841 XM	Yes
3)	Year of manufacture	Evaluative		--	WA (2012)	Yes
4)	Engine number	Evaluative		--	3RS06081	Yes
5)	Chassis number	Evaluative		--	WATA81614100001	Yes
6)	Declaration of PTO power, (kW)	Evaluative		--	28.0	Yes
17.1.11	Discard limit for:					
(a)	Cylinder bore diameter, (mm)	Evaluative	To be specified by the manufacturer	89.13	89.90 to 89.92	Yes
(b)	Clearance between piston & cylinder liner at skirt, (mm)	Non Evaluative	-do-	1.10	0.100 to 0.116	Yes
(c)	Ring end gap (mm):					
-	Top comp. ring.	Evaluative	-do-	2.50	0.30 to 0.40	Yes
-	2 nd comp. ring.		-do-	2.50	0.60 to 0.65	Yes
-	Oil ring.		-do-	2.00	0.40	Yes
(d)	Ring groove clearance (mm):					
-	Top comp. ring.	Evaluative	-do-	0.30	Taper rings	--
-	2 nd comp. ring.		-do-	0.30	0.082 to 0.086	Yes
-	Oil ring.		-do-	0.20	0.049 to 0.052	Yes
(e)	Clearance of main bearings (mm):					
-	Diametrical clearance	Evaluative	-do-	0.20	0.046 to 0.057	Yes
-	Crankshaft end float	Evaluative	-do-	0.60	0.20	Yes
(f)	Clearance of big end bearings, (mm):					
-	Diametrical	Evaluative	-do-	0.20	0.076 to 0.088	Yes
-	Axial	Evaluative	-do-	0.75	0.20 to 0.25	Yes
(g)	Clearance between king pin and bush, (mm)	Non Evaluative	-do-	0.60	0.119 to 0.137	Yes
(h)	Clearance between center pin and bush, (mm)	Non Evaluative	-do-	0.80	0.146 to 0.160	Yes
17.1.12	CATEGORY OF BREAKDOWNS / DEFECTS :					
S. No.	Characteristic	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2008	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	None	Yes	



1	2	3	4	5	6
3.	Minor	Evaluative	Not more than five and frequency of each should not be more than two.	None	Yes
4.	Total breakdowns	Evaluative	In no case, the total number of breakdowns should exceed five, that is, (2 major + 3 minor) or 5 minor breakdowns	None	Yes

17.2 Optional requirements as per Clause-4 (Table-2) of IS:12207-2008:

S. No.	Characteristic	Requirements as per IS: 12207-2008	As observed	Whether meets the requirements (Yes/No)
1	2	3	4	5
1	Air cleaner oil pull over, max. oil pull over (%)	0.25% (max.)	0.03	Yes
2.	Seating requirements	Should meet the requirements of IS: 12343-1998	Meets the requirements	Yes
3.	Fitment of ROPS	With a provision for fitment of ROPS.	Provided	Yes
		If ROPS fitted it should meet the requirement of IS: 11821-1992	ROPS not fitted	Not applicable
4.	Technical requirements for PTO shaft	Should meet the requirements of IS: 4931 -1995	Does not meet the requirements	No
5.	Dimensions of three point linkage	Should meet the requirements of IS: 4468 (Part-I)-1997	Does not meet the requirements	No
6.	Specifications of linkage drawbar	Should meet the requirements of IS: 12953-1990.	Meet the requirements	Yes
	Specifications of swinging drawbar	Should meet the requirements of IS: 12362 Part 3-1994.	Not provided	Not applicable
7.	Accessories	Trailer hitch, front tow hook, linkage drawbar may be provided.	Provided	Yes

17.3 Conformity with following IS:

- i) Guidelines for declaration of power and specific fuel consumption and labeling of agricultural tractors (First revision) [IS 10273:1987 (Reaffirmed in March, 2009)] : **Conforms**
- ii) Agricultural tractors – Rear mounted power take-off - Types 1, 2 and 3 (third revision) [IS: 4931-1995 (Reaffirmed in March, 2009)] : **Does not conform**
- iii) Agricultural wheeled tractors - Rear mounted three-point linkage: Part 1 Categories 1, 2, 3 & 4 (fourth revision) [IS 4468 (Part-I):1997 (Reaffirmed in February, 2012)] : **Does not conform**
- iv) Drawbar for agricultural tractors – Link type [IS 12953:1990 (Reaffirmed in February, 2012)] : **Does not conform**



- v) Agricultural tractors - Operator's seat technical requirement [IS 12343 -1998 (First revision) (Reaffirmed in March, 2009)] : **Conforms**
- vi) Guide for safety & comfort of operator of agricultural tractors: Part 1 General requirements (first revision) : [IS 12239 (Part-1)-1996 (Reaffirmed in February, 2012) / ISO 4254-1:1989] : **Does not conform**
- vii) Tractors and machinery for agriculture and forestry – Technical means for ensuring safety Part 2: Tractors (first revision) IS 12239 (Part-2)-1999 (Reaffirmed in March, 2009)] : **Does not conform**
- viii) Tractors and machinery for agriculture and forestry, powered lawn and garden equipment – Symbols for operator controls and other displays – Symbols for Agricultural Tractors and Machinery [IS: 6283 (Part-2) – 2007(Reaffirmed in March, 2009) / ISO 3767-2:1991]] : **Conforms**
- ix) Guidelines for location and operation of operator controls on agricultural tractors and machinery (first revision) (IS: 8133 – 1983) (Reaffirmed in March, 2009) / ISO 3789: 1982] : **Conforms**
- x) Agricultural Tractor & Machinery Lighting device for travel on public roads [IS: 14683-1999 (Reaffirmed in March, 2009)] : **Conforms**

17.4 Salient Observations:

17.4.1 Laboratory tests:

17.4.1.1 Mechanical Vibration:

The amplitude of mechanical vibration on various assemblies marked as (*) in Chapter-9 of this test report are on higher side especially at the steering control wheel and seat (with driver seated). This calls for dampening down of vibrations to improve the operational comfort and service life of components.

17.4.1.2 Three point linkage:

- i) The diameter of hitch pin hole of upper hitch points & lateral distance from lower hitch point to center line of tractor does not meet the requirements of IS: 4468(Part I)-1997. This should be looked into for necessary corrective action.
- ii) Some of the parameters conform to Cat I and some of them conform to Cat. II. Keeping in view the spirit of standardization, necessary improvements may be incorporated.

17.4.1.3 Linkage Drawbar:

Some of the parameters conform to Cat I and some of them conform to Cat. II. Keeping in view the spirit of standardization, necessary improvements may be incorporated.

17.4.1.4 Power take-off shaft:

The dimension "BØ" & "AØ" of the Power Take-off shaft does not meet the requirements of IS: 4931-1995. This should be looked into for necessary corrective action.

17.4.1.5 Location and operation of operator's control:

The working clearance between the position control lever and draft control lever was observed as 50 mm against the minimum requirement of 70 mm as per IS: 12239 (Part 2)-1996 This should be looked into for necessary corrective action.

**17.4.2 Field Performance:****17.4.2.1 Wet land cultivation (Puddling Operation):**

No ingress of mud and / or water was noticed during puddling operation of the tractor and meet the requirements of IS: 11082-1984 (Technical requirements of agricultural tractors for wetland operation). Therefore, the tractor is recommended as suitable for wetland operation (Puddling).

17.4.2.2 Haulage performance:

- i) The distance travelled / litre of fuel consumption with four wheel trailer was observed as 4.47 to 4.59 km/l against the declaration of 5.00 to 7.00 km/l. This does not meet the requirement of IS: 12207-2008 and therefore, should be looked into for necessary corrective action.
- ii) The fuel consumption with two wheel and four wheel trailer was observed as 35.5 to 36.3 ml/km/tonne and 36.3 to 37.3 ml/km/tonne against the declaration of 25 to 35 ml/km/tonne for both trailers. This does not meet the requirement of IS: 12207-2008 and therefore, should be looked into for necessary corrective action.

17.5 Recommendation with regard to safety on tractor:

The following requirements, inter alia, may be considered for incorporation on the tractor:

- i) Provision for spark arresting device in exhaust system.
- ii) Provision of differential lock.
- iii) Provision of PTO shaft master shield.
- iv) Provision of vertical retainer on both side of clutch pedal.
- v) Provision of width of foot step as per IS: 12239 (Part-1)-1996.

17.6 Maintenance / Service Problems:

No noticeable maintenance or service problem was observed during the test.

17.7 Adequacy of Literature supplied with machine:**17.7.1** The following literature was supplied with the tractor for reference during the test.

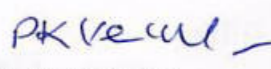
- i) Operator's manual (for Swaraj 841 XM Tractor)
- ii) Spare parts catalogue (for Swaraj 841 XM Tractor)

**18. CITIZEN CHARTER**

Time frame for Testing & Evaluation as per Citizen Charter	Duration of Test	Whether the Test Report is released within the time frame given in Citizen Charter	Remarks
10 Months	8 Months (July, 2012 to February, 2013)	Yes	None

TESTING AUTHORITY:


C. V. CHIMOTE
 TEST ENGINEER


P. K. VERMA
 SENIOR AGRICULTURAL ENGINEER


C.R. LOHI
 DIRECTOR

Test Report compiled by: **Shri. Pramod Yadav**, Senior Technical Assistant.



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19. APPLICANT'S COMMENTS

Para No.	Our Reference	Applicant's comments
19.1	17.3 (ii,iii),17.4.1.4, 17.4.1.2	Stringent checks are being introduced for ensuring supplier quality.
19.2	17.3(iv, vi, vii), 17.4.1.3, 17.4.1.5	These requirements are being revisited for necessary corrective action at our end.
19.3	17.4.2.2(i,ii)	Study and trials are under progress for necessary corrective action.
19.4	17.5(i,ii,iii,iv&v)	These requirements are being revisited for necessary corrective action at our end.

ANNEXURE - I**BRIEF SPECIFICATION OF IMPLEMENTS USED DURING FIELD TEST**

S. No.	Item	Disc Plough	Rotavator	Puddler
1.	Make	M & M	Howard	Not available
2.	Type	Mounted	Mounted	Mounted
3.	No. of bottom / blades	3	36,in 7 flange	12 (6 in each gang)
4.	Type of bottom / blades	Plane Concave	Hatchet	Notched
5.	Size of bottom / blades, (mm)	625	225x 50 x 10	460
6.	Spacing of bottom/blades, (mm)	455	250	164
7.	Lower hitch point span, (mm)	690	720	680
8.	Mast height, (mm)	455	481	680
9.	Overall dimensions, (mm):			
	- Length	1610	1750	1190
	- Width	850	1000	1810
	- Height	1080	980	1330
10.	Gross mass, (kg)	370	345	240



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ANNEXURE-II**BRIEF SPECIFICATION OF CAGE WHEEL**

S. No.	Items	Specification
1.	Type	Half cage wheel
2.	Diameter, (mm)	1085
3.	Width, (mm)	340
4.	No. and type of lugs	12, straight lugs made of MS angle section welded to angle iron frame
5.	Size of angle section, (mm)	50x50x5
6.	Length of lugs, (mm)	340
7.	Spacing of lugs, (mm)	275
8.	Weight of each cage wheel, (kg)	60

ANNEXURE-III**TRACTOR RUN HOURS DURING TEST**

A.	LABORATORY AND TRACK TESTS:	HOURS
1.	Running-in	---
2.	PTO performance test	14.0
3.	Power lift and hydraulic pump performance test	2.0
4.	Drawbar performance test	14.9
5.	Turning ability	0.2
6.	Location of centre of gravity	0.2
7.	Operator's field of vision	0.1
8.	Brake test	1.5
9.	Noise measurement	2.0
10.	Mechanical vibration test	1.0
11.	Theoretical speed test	0.4
12.	Air cleaner oil pull over	3.5
B.	FIELD TEST:	
1.	Disc ploughing	10.1
2.	Rotavation	10.9
3.	Puddling (including water proof test)	15.5
C.	HAULAGE TEST:	9.4
D.	Miscellaneous test and other run hours including idle run, transportation, trials and preparation for test	8.8
	TOTAL:	94.5