Thermal Performance Tests on a Fan Assisted Radiator

Report Number 55763/1

Carried out for
Energy Remedies Ltd.

By Alf Russell

20 December 2011

Thermal Performance Tests on a Fan Assisted Radiator

Carried out for:

Energy Remedies Ltd.
6 Brookfields
Shannon
Co Clare
Ireland

Contract: **Report Number 55763/1**

Date: **20 December 2011**

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Signature	Signature	Signature

SUMMARY

A fan assisted radiator from Energy Remedies Ltd. was submitted for testing against the requirements contained in BS EN 442-2 : 1997.

The following thermal outputs were determined:

PRODUCT REFERENCE	MEASURED OUTPUT AT 50ΔT (W)
SOLO 3 (low fan speed)	754
SOLO 3 (high fan speed)	954
SOLO 3 (boost fan speed)	1750

Full details of the test and products can be found in the main body of this report.

CONTENTS

APPENDICES

1 INTRODUCTION

Thermal performance tests were carried out on a fan assisted radiator in accordance with the procedures contained in BS EN 442-2 : 1997, using low pressure hot water in the BSRIA radiator test room, described within section 3 of this report. The work was requested by Energy Remedies Ltd. of 6 Brookfields, Shannon, Co. Clare, Ireland and was carried out during the period 21 to 28 November 2011.

The test sample was received in good condition on 10 November 2011.

The above tests were conducted under our UKAS accreditation in accordance with ISO17025. Comments and opinions are outside the scope of the UKAS accreditation.

This report refers only to the items tested and no others.

2 DESCRIPTION OF SAMPLE

The test samples consisted of a fan assisted radiator supplied by Energy Remedies Ltd.

The sample was designated as follows: SOLO 3

The sample was a two tapping, fan assisted radiator, plumbed with same end connections (S.E.).

Further details of the test samples can be found in Appendix A.

3 TEST FACILITY

The test facility consists of a test room 4.0 m (l) x 4.0 m (w) x 3.0 m (h), which is constructed to the requirements contained in BS EN 442-2 : 1997, i.e. five water cooled surfaces and one insulated surface against which the test radiator is installed.

When steady state conditions are achieved the appliance output is determined from measurements of the water flow rate and inlet / outlet water temperature difference.

A standard test consists of three test points. For all appliances a first test is carried out with water supply temperature that produces a mean water temperature of 70°C with the water flow rate such that for radiators the inlet/outlet water temperature difference is 10°C. Two further tests are carried out at the water flow rate established in the first test but with different supply water temperatures.

For all tests the enclosure air temperature is controlled to maintain 20°C at the inner room reference point, which is 0.75 m from the floor in the centre of the room.

4 ADDITIONAL TEST PROCEDURES

The test procedure outlined above in section 3 was conducted at the middle fan speed, (high). Additional thermal performance tests were then conducted at a mean water temperature of 70°C (50ΔT°C) with the other two fan speed settings, low and boost. The exponent (n) derived from the initial test was then used to calculate a constant (K_M) for each fan speed at 50ΔT°C.

The performance equation: Output (W) = K_M(mean water temperature – room air temperature)$^{\wedge n}$ was then used to extrapolate outputs for a range of mean water temperature, from 20 to 70ΔT°C for the low and boost fan speeds.

5 INSTRUMENTATION

TEST RECORD SHEET TP21/7 : TEST EQUIPMENT / INSTRUMENTS

Contract Number FS55763

Test Engineer(s) Alf Russell

	Instrument No.	Calibration expiry date
Weigh scales	332, 333	14/02/12
Resistance thermometer (air) reference & radiant shield	329	12/10/12
Resistance thermometers (water) reference	435 - 438	12/10/12
Digital voltmeter 7½ digit (resistance thermometer measurement)	331	26/11/11
Barometer	334	30/11/11
Electronic timer within PC	588	03/12/11
Steel rule (0 –2.0m)	400	14/12/15
Vernier caliper (0 – 1.5m)	359	12/03/12
Digital caliper (0 – 300mm)	385	12/03/12
Spring balance (0 – 100Kg)	393	10/02/12
Standard test gauge (0 – 25 bar)	623	08/02/12
Weigh scales (water content)	332	14/02/12

Comments: None

Test Engineer (signature) Alf Russell

6 TEST RESULTS

TEST REPORT

Date of Test:	10-Nov-11
Manufacturer:	Energy Remedies Ltd.
Model Reference:	SOLO 3 (high fan speed)
Test Reference Number:	55763A1AR
Type of Heater:	Fan assisted radiator
Pipework Connections:	S.E.

HEATER DIMENSIONS

Overall Height:	(mm)	420
Overall Length:	(mm)	610
Overall Depth:	(mm)	105
Convector Height:	(mm)	80
Convector Depth:	(mm)	80
Height above floor:	(mm)	110
Distance from wall:	(mm)	60
Radiated heat factor	Sk	0.50
Barometer exponent	np	0.50

MEAN TEST VALUES		TEST 1	TEST 2	TEST 3
Fan Speed	(rpm)	650.0	480.0	1140.0
Fan Power	(W)	10.0	10.0	10.0
Room air temperature 0.75m:	(°C)	19.9	19.7	19.8
Flow rate	(g/s)	22.0	22.0	22.0
Flow enthalpy	(J/g)	315.7	220.2	359.0
Return enthalpy	(J/g)	272.0	195.5	306.0
Flow temperature	(°C)	75.4	52.6	85.8
Return temperature	(°C)	65.0	46.7	73.1
Output	(W)	958.3	543.8	1164.3
Mean water temperature	(°C)	70.2	49.7	79.4
Temperature difference	(°C)	50.3	29.9	59.6
Barometric pressure	(mbar)	1020.0	1020.0	1020.0
Corrected output	(W)	956.6	542.9	1162.3
Estimated output	(W)	961.2	541.6	1158.6

PERFORMANCE EQUATION

Output (W) = K_M (mean water temperature - room air temperature) ^n

From test results K_M = 12.6479
n = 1.1052

VARIATION OF OUTPUT WITH TEMPERATURE DIFFERENCE

TEMPERATURE DIFFERENCE °C	HEAT OUTPUT W
20	347
30	543
40	746
50	954
60	1167
70	1384

TEST REPORT

Date of Test:	23-25/11/11
Manufacturer:	Energy Remedies Ltd.
Model Reference:	SOLO 3 (@ 50ΔT)
Test Reference Number:	55763A1, 2 & 3AR
Type of Heater:	Fan assisted radiator
Pipework Connections:	S.E.

HEATER DIMENSIONS

Overall Height:	(mm)	420
Overall Length:	(mm)	610
Overall Depth:	(mm)	105
Convector Height:	(mm)	80
Convector Depth:	(mm)	80
Height above floor:	(mm)	110
Distance from wall:	(mm)	60
Radiated heat factor	(Sk)	0.50
Barometer exponent	(np)	0.50

MEAN TEST VALUES		TEST 1	TEST 2	TEST 3
Fan Speed	(rpm)	650.0	480.0	1140.0
Fan Power	(W)	10.0	8.0	19.0
Room air temperature 0.75m:	(C)	19.9	19.8	20.2
Flow rate:	(g/s)	22.0	17.8	42.4
Flow Enthalpy:	(J/g)	315.7	315.1	319.2
Return Enthalpy:	(J/g)	272.0	272.2	277.0
Flow temperature:	(C)	75.4	75.3	76.3
Return temperature:	(C)	65.0	65.0	66.2
Output:	(W)	958.2	761.8	1791.6
Mean water temperature:	(C)	70.2	70.2	71.2
Temperature difference:	(C)	50.3	50.4	51.0
Barometric pressure:	(mbar)	1020.0	1018.0	1019.0
Corrected output:	(W)	956.6	760.8	1788.9

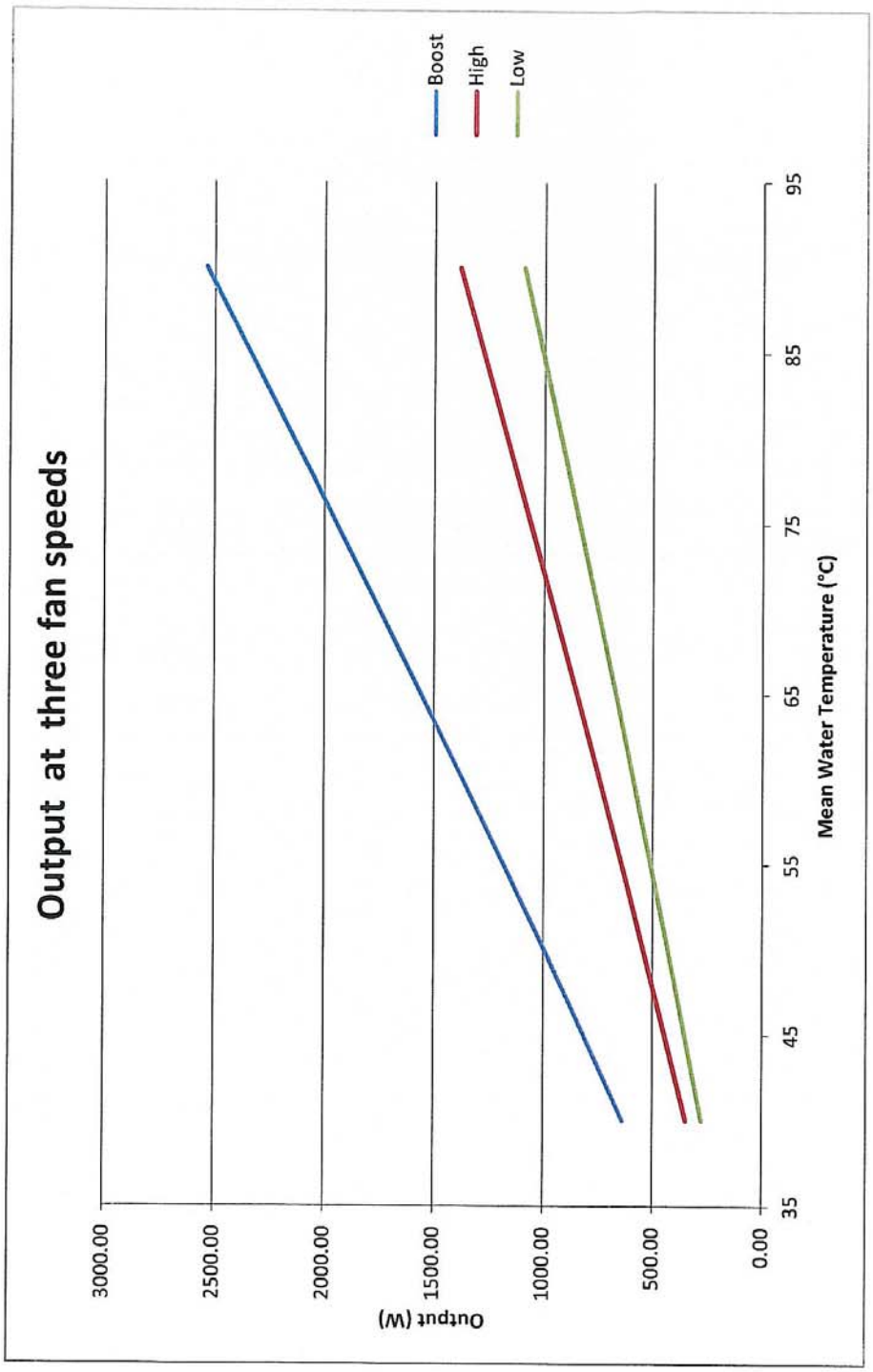
PERFORMANCE EQUATION

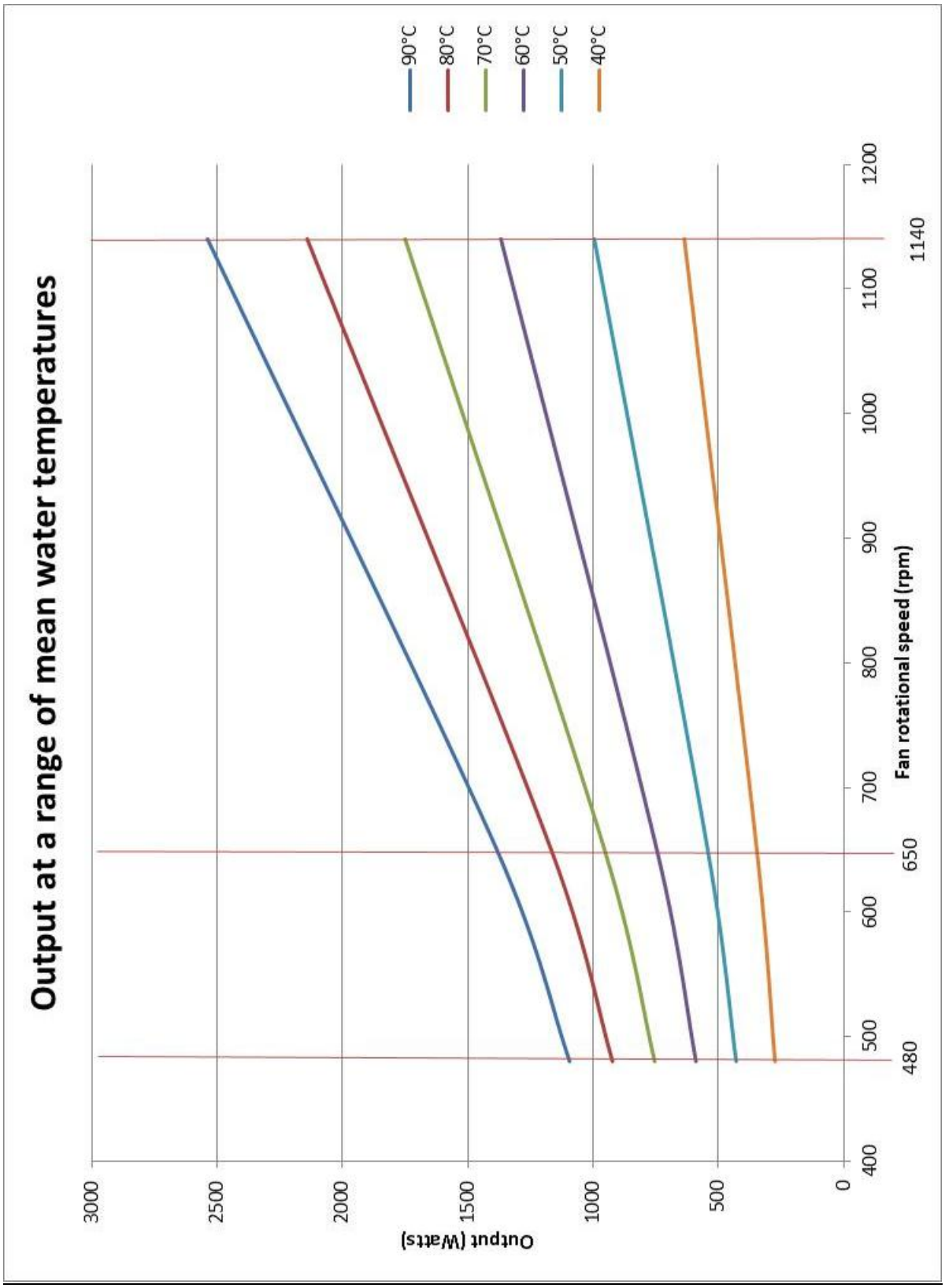
Output (W) = K_M (mean water temperature minus room air temperature)^n

From test results				
	K_M =	12.6479	9.9941	23.1942
	n =	1.1052	1.1052	1.1052

VARIATION OF OUTPUT WITH TEMPERATURE DIFFERENCE

TEMPERATURE DIFFERENCE °C	HEAT OUTPUT W	HEAT OUTPUT W	HEAT OUTPUT W
20	347	274	636
30	543	429	995
40	746	589	1368
50	954	754	1750
60	1168	923	2141
70	1384	1094	2539


Output at three fan speeds
Boost
High
Low
Output (W)
3000.00
2500.00
2000.00
1500.00
1000.00
500.00
0.00
35
45
55
65
75
85
95
Mean Water Temperature (°C)


Output at a range of mean water temperatures
90°C
80°C
70°C
60°C
50°C
40°C
Output (Watts)
3000
2500
2000
1500
1000
500
0
Fan rotational speed (rpm)
400
500
600
700
800
900
1000
1100
1200
480
650
1140

APPENDIX: A TEST ITEMS

TEST RECORD SHEET TP21/1: TEST ITEMS

Contract number FS55763A Sheet number 1 of 1

Date of receipt	Test Engineer initials	Full description of test item	Test item reference number
10/11/2011	AR	Fan assisted radiator with a three speed fan. 420 x 610 x 105mm	55763A1AR, 2AR & 3AR

Comments:- None

Test Engineer (signature) Alf Russell

TEST RECORD SHEET TP21/2 : PRODUCT INFORMATION

BSRIA test reference number		55763A1AR, 55763A2AR & 55763A3AR
Client		Energy Remedies Ltd.
Manufacturer		Energy Remedies Ltd.
Product reference number		SOLO 3
Product style		Fan assisted radiator
Material of construction		Various
Date of receipt		10/11/2011
Product or packaging markings		Model
Test start date		23/11/2011
Weight (dry)	(kg)	N/A
Water content	(kg)	N/A

DIMENSIONAL MEASUREMENTS

Measurement Parameter	Measured value (mm)	Manufacturer's stated value (mm)	EN 442-2 dimensional tolerance	Pass / Fail
Overall height	420			
Overall depth	105			
Overall length	610		See comment	
Convector height	80			
Convector depth	80			

Number of columns per panel		N/A
Distance installed from the wall	(mm)	60
Distance between centres	(mm)	35
Panel thickness	(mm)	N/A
Convector overall length	(mm)	535
Convector thickness	(mm)	N/A
Spot weld horizontal pitch	(mm)	N/A
Additional information		S.E. Height from floor 110

Comments : Not required for audit tests.

TEST ENGINEER (Signature) Alf Russell

Front view with cover fitted

Front without cover

Rear