RECOHEAT PERFORMANCE TEST REPORT

FCP 7.8

RECOHEAT – HEATING FROM THE HEART

Recoheat Performance Test Report

Published November 2020

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Last Reviewed : 30/11/ 20
Next Review : 01/10/ 21

1.0 Introduction

These test processes were undertaken to determine the performance of the Recoheat heat recovery units produced for sale by Recoheat Ltd.

The heat recovery units comprise a 1900mm length of 316 stainless steel alloy coil with an external diameter of 10mm and internal diameter of 8mm. These are set in a standard rigid metal flue section with the input and output passing through holes in the sides of the flue and welded into position. The inlet and outlet of the coil thus sit outside the flue section. The flue section is fitted into the collar at the top of the stove, and the rest of the chimney is built up from it in the normal way. It is then sealed into position with fire clay, again in the normal way.

An electric pump is connected to the air inlet via a 10mm high-heat silicone tube. Air is then pumped into one side of the coil at a rate of 1 litre per second, through the coil and out the other side into the room.

These tests seek to determine the amount of heat produced by the Recoheat in relation to that produced by radiant heat output through the normal action of the stove.

We also measured how fast the stove began to circulate heated air with the Recoheat, and to compare that with the heat circulation via convection.

We also measured the period of time that the Recoheat transferred heat from the combustion cycle in comparison to the time radiant heat and convection transferred heat from the same combustion cycle.

Temperature readings were taken on the surface of the stove, 50mm from the flue collar, then at 30mm above the surface of the flue. They were then taken at the Recoheat outlet, which is 70mm above the stove surface, then at an access point in the flue that is 590mm above the surface of the stove. The flue draught was measured at the same point.

1.1 Description of set-up

The test was conducted on an Ecosys Ottawa 7kw stove with a 125mm outlet. It was fitted with a Recoheat unit adding 100mm height, a 1000mm single-skin flue section with access point, then 2000mm of double-skin sections, topped with a 300mm wind cowl.

A fire was prepared with 3 Woodsure-certified Homefire heat logs weighing a total of 2284g. 332g of Woodsure-certified Homefire kindling was used to start it and augmented at 8 minutes with a further 126g of the same material. A Valiant moisture detector detected no moisture in the wood.

2.0 Calibration of test equipment

The thermometer and manometer used in the tests are not professionally recalibrated after supply because their results are important as relative figures and variations rather than absolute measurements.

We used a Comark KM330 Thermometer and a Wohler DM2000 Draught Gauge.

3.0 Performance test

The times are recorded in minutes, and the temperatures are recoded in °C.

Time in mins from ignition.	Stove surface temp	30mm above stove surface	Recoheat outlet 70mm above stove	Flue gas 590mm above stove	Flue draw
1	9.7	9.5	26	156	10
3	12	85	243	312	13
5	22	95	288	328	15
10	26	187	365	482	17
20	65	384	385	462	18
30	71	332	448	482	19
45	68	234	344	391	16
70	41	155	166	208	11
90	35	107	139	188	9
120	32	111	114	141	8
150	29	89	92	121	8
180	25	76	77	93	8
210	26	66	62	85	6
240	21	50	59	76	6
270	22	53	51	71	4
300	22	48	42	53	3
330	20	37	32	41	3

4.0 Calculations based on the data

4.1 Air flow

The Recoheat achieved a calculated (not measured) peak air flow rate of approximately 4 litres per second, based on the temperature of the air expanding to four times its volume at 448°C

4.2 Heat output

The peak heat output is calculated at approximately .86kw
We use the following calculation to determine heat output from the device.

Area
Surface area is πDL
@100mm length of 8mm internal diameter stainless steel tube = 0.00251 m_2
@ 1900mm length of 8mm internal diameter stainless steel = .04769 m_2
Properties of Air
1 litre per second = 0.001 m3/sec = 3.6m_3/hour
Temperature in approx. 5 °C
Temperature out approx. 480°C
ΔT = Change in temperature ≈1.205 kg/m_3
Flue gas temperature ≈ 500°C - 600°C
U = for air to air heat exchanger 10-40 W/m_2 °C
Heat Transfer
Q = UAΔT
Q = Heat transfer (watts)
U = Overall Heat Transfer Co-efficient (w/m_2k) = 40 w/m_2k
A = Surface area = .04769 m_2
ΔT = Change in temperature = 475°C
Therefore:
Q = 40 x .04769 x 450 = 858.42w = 0.86kw

5.0 Interpretation of the data

We conclude from the data that the Recoheat achieves heat transfer much more quickly than the stove can achieve through radiant heat and convection alone.
The heat output of the Recoheat makes a significant contribution to the total peak output of the stove, particularly with small fires where it would contribute a larger percentage of the total output.
The Recoheat contributes to the heat output of the stove for a minimum of 5.5 hours after the stove has started cooling through lack of re-fuelling. This is theoretically more effective at transferring heat into the room because it continues to circulate at the same rate even when cooling reduces the convection flow of air around the stove.

6.0 Statement of performance

These tests were undertaken by Will Burrows on the 30th November 2020, and are declared by him to be true and accurate.

Signed: Will Burrows  Date: 30/11/20

Role: Managing Director, Recoheat Ltd