TECHNICAL BULLETIN

PRODUCT: GREENSOURCE AND GREENSTORE HEAT PUMPS

RADIATOR SIZING FOR HEAT PUMPS:

For a Heat Pump to perform to its highest energy-efficiency, the emitter (radiators / underfloor heating) system should be designed so that the flow temperature is as low as possible.

Peak heating load design conditions in UK are based on a temperature range of -3°C outside (-5°C in Scotland) to 20-22°C inside, the heating system should be designed using the following **flow** temperatures;

- Underfloor heating: **40-45°C**
- Radiators: **50-55°C**

Low flow temperatures have the following benefits;

- **Comfort** – steady, consistent temperatures provide optimal comfort
- **Economy** – higher CoP of heat pump and lower system losses.
- **Health** – lower air velocity means less dust disturbance

Note : due to the weather compensated controls **(WCC)** these temperatures are only likely to be provided at design (peak load) conditions.

A well-designed underfloor heating system operates very effectively in the temperature range of 30-45°C and as a result is one of the most effective means of supplying heat to a dwelling.

When radiators are used either in new properties or existing situations a flow temperature of 50-55°C is our design figure, but again these will fluctuate due to the **WCC**. Therefore radiators with an increased output will be required to provide the same level of comfort that would have been obtained from a traditional Gas/Oil boiler system of say 80°C flow temperature to the system. Reference should be made to the radiator manufacturer's data to calculate the size required.

The sizing of heat emitters (radiators) should be carried out in accordance with the Domestic Heating Design Guide and BS 5449:1990.

Radiator outputs should be checked against any variation in the manufacturers' catalogue data with the mean water temperature and room temperature which applies.

Temperature difference (**ΔT**) °C	Conversion Factor
25	0.400
30	0.510
35	0.643
40	0.759
45	0.878
50	1.000
55	1.126
60	1.254

Table 1: Conversion Factors for different temperatures

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EXAMPLES OF RADIATOR SIZING;

Catalogue radiator outputs are based on a mean water to air temperature difference (**ΔT**) of 50°C

$$\Delta T = \frac{\text{Flow temp + Return temp}}{2} - \text{Room temp}$$

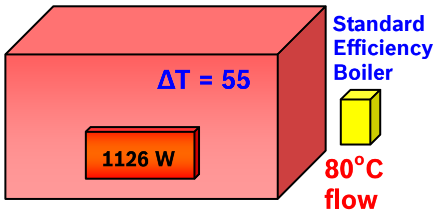
conditions

A room has a radiator installed, with a catalogue output of **1000 Watts** in order to raise the air temperature in the room to 20°C when the outside temperature is -3°C.

Standard Efficiency Boilers

If the radiator was heated by a standard efficiency boiler delivering a flow temperature of 80°C and a return temperature of 70°C, the **1000 Watt** radiator installed would actually deliver;

mean water to air temperature difference (ΔT) $= \frac{80 + 70}{2} - 20 = 55$



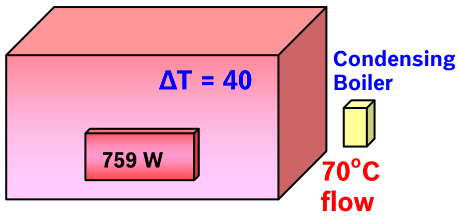
At **55**°C the conversion factor is **1.126** (**Fig 1**)

Therefore the radiator output is **1000** x **1.126** = **1126 Watts**

Condensing Boilers

If the radiator was heated by a condensing boiler delivering a flow temperature of 70°C and a return temperature of 50°C, the **1000 Watt** radiator installed would actually deliver;

$\Delta T = \frac{70 + 50}{2} - 20 = 40$



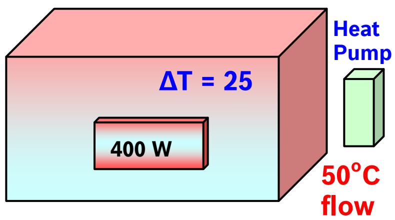
At **40**°C the conversion factor is **0.759** (**Fig 1**)

Therefore the radiator output is **1000** x **0.759** = **759 Watts** (33% less than for a standard boiler)

Heat Pumps

If this radiator was now being heated by a heat pump delivering a flow temperature of 50°C and a return temperature of 40°C, the **1000 Watt** radiator installed would actually deliver;

$\Delta T = \frac{50 + 40}{2} - 20 = 25$



At **25**°C the conversion factor is **0.400** (**Fig 1**)

Therefore the radiator output is **1000** x **0.400** = **400 Watts** (65% less than for a standard boiler and 47% less than for a condensing boiler)

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