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## WATER BATH EFFICIENCY

NEW WATER BATH TECHNOLOGY AND LAB ARMOUR, ASTON UNIVERSITY

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## WATER BATH EFFICIENCY

### INTRODUCTION

Water baths are a widely used piece lab equipment. Commonly found in a life sciences laboratory, water baths heat samples and maintain them at a specific temperature. Recently, water bath technology has been reviewed and updated to reflect the drive for more sustainable research (figure 1).



Figure 1. The E3 water bath.

### THE NEW WATER BATH

For a water bath to be more efficient, improvements in unit controls and display have been combined with insulation to reduce the energy consumption. To establish what savings would be achieved by these improvements the new E3 water bath was compared to a current, traditional designed model. Both units have capacities of 12L. Each model was filled with 8L of water, set to a specific temperature then energy monitored for 24 hours. Both models were tested at two set temperatures, both common set points for water baths. Both sets of results are based on units being used 240 days per year for 8 or 12 hours per day. The first set point tested was 37C (figure 2)

The second set temperature tested was 65C. For this temperature a third data set was generated by replacing the water in the E3 drying cabinet with 8kg of Lab Armor Beads supplied by GPE Scientific.

## Water Baths

	Grant JB Academy (12L)	E3 Bath (12L)
kWh/day at 37C	0.600	0.390
Yearly kWh (8 Hours/day)	48.00	31.20
Yearly Cost (8 Hours/day)	£ 4.80	£ 3.12
Yearly TCO2 (8 Hours/day)	0.014	0.009
Yearly Carbon Tax (8 Hours/day)	£ 0.24	£ 0.16
Total Cost/Year	£ <b>5.04</b>	£ <b>3.28</b>
Yearly kWh (12 Hours/day)	72.00	46.80
Yearly Cost (12 Hours/day)	£ 7.20	£ 4.68
Yearly TCO2 (12 Hours/day)	0.020	0.013
Yearly Carbon Tax (12 Hours/day)	£ 0.37	£ 0.24
Total Cost/Year (12Hours/Day)	£ <b>7.57</b>	£ <b>4.92</b>

Figure 2. Water bath performance at 37C.

	Grant JB Academy (12L)	E3 Bath (12L)	E3 Bath (12L) Lab Armor
kWh/day at 65C	2.363	1.660	0.660
Yearly kWh (8 Hours/day)	189.04	132.80	52.80
Yearly Cost (8 Hours/day)	£ 18.90	£ 13.28	£ 5.28
Yearly TCO2 (8 Hours/day)	0.054	0.038	0.015
Yearly Carbon Tax (8 Hours/day)	£ 0.96	£ 0.68	£ 0.27
Total Cost/Year	£ <b>19.87</b>	£ <b>13.96</b>	£ <b>5.55</b>
Yearly kWh (12 Hours/day)	283.56	199.20	79.20
Yearly Cost (12 Hours/day)	£ 28.36	£ 19.92	£ 7.92
Yearly TCO2 (12 Hours/day)	0.080	0.056	0.022
Yearly Carbon Tax (12 Hours/day)	£ 1.44	£ 1.01	£ 0.40
Total Cost/Year (12Hours/Day)	£ <b>29.80</b>	£ <b>20.93</b>	£ <b>8.32</b>

Figure 3. Water bath performance at 65C.

## DISCUSSION

The new design of water bath had significantly lower running costs than the existing technology currently used. When heating 8L of water at 37C the E3 bath used **35%** less energy, whilst at 65C the E3 used **30%** less energy. When comparing heating water at 65C in the JB unit compared to heating lab armor in the E3 bath there was a **72%** reduction in energy consumption.

Although water baths do not use vast amounts of energy when compared to other items of lab equipment they are widely used. If pricing of the E3 bath is no different from that of existing water bath technology lab operators can continue to reduce their running costs without paying an associated premium.

Lab armor, although an extra cost does eliminate the use of water, lids and accessories for supporting and holding the vessels that are being heated.



Water Baths

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