Energy Saving Measures in Controlled Environments at Rothamsted Research

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The energy costs of running the Plant Growth Facilities at Rothamsted Research are currently in excess of £500,000 ($1 million) per year. With energy costs increasing at over 10% per year over the past few years and little prospect of a significant slow down in such costs measures have been taken to reduce these costs. Some of these are described.

Rothamsted Research benefits from being a large user of energy and can find competitive rates for its energy. In the past such competition has kept costs down. Currently Rothamsted Research pays from 5.5 pence (11 cents) to 17 pence (34 cents) per kWh of electricity dependant on the time of day. Lighting strategies exist to optimise the use of cheaper rates of energy. A combined heat and power unit (CHP) providing 1 MW helps reduce these costs as well as ensuring continuity of supply.

In 2004 we had to change the Main Air Circulation Fans (4 per room) in our large growth rooms(Photo.1). This was necessitated by the high failure rate of the original fans leading to unreliability of the rooms.

With help from the manufacturers of the Growth rooms an alternative make of fan was sourced and fitted(Photo .2).

Energy Measurements were made on one room before and after the change. These showed a significant saving in energy with the new fans (see Fig 1).

Photo 1. Original Fans.
FISCHBACH COMPACT,
Type D770/E 80

Photo 2. Replacement Fans.
ZIEHL-ABEGG, RG40A-4EK.41.1R

Fig 1. Average Night Time Current

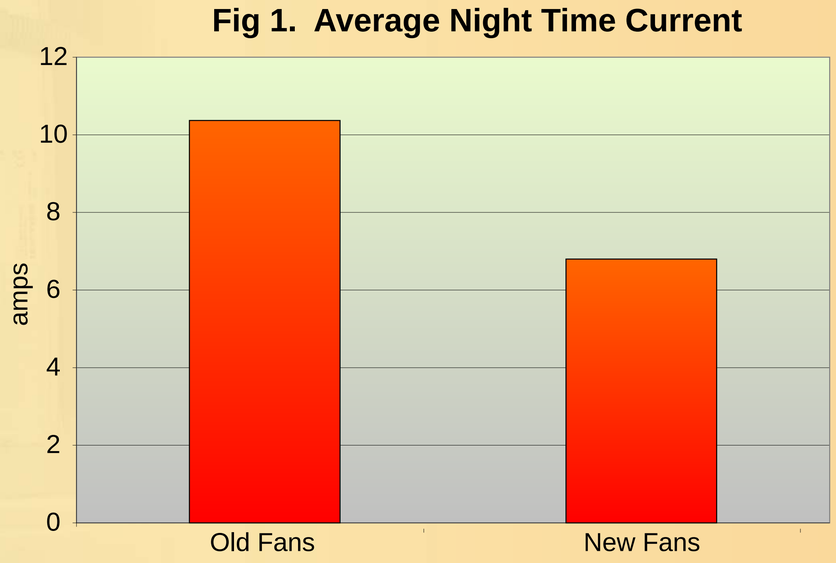
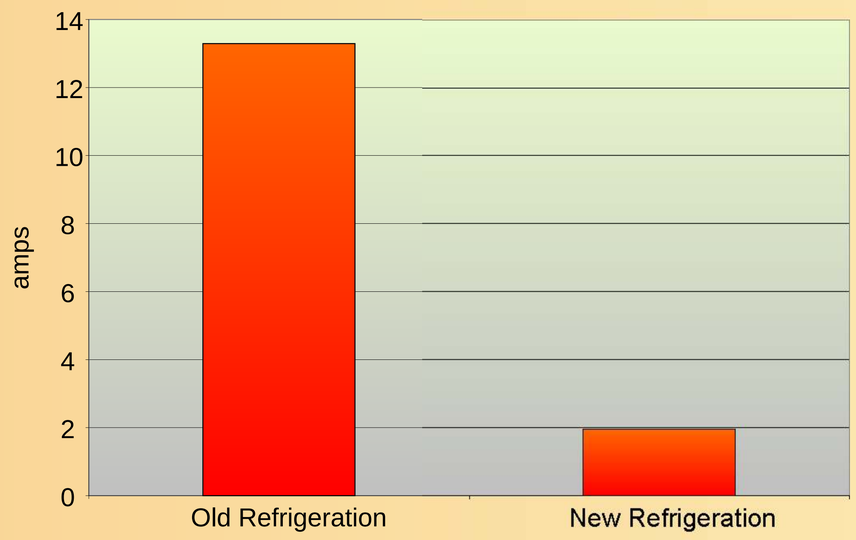


Photo 3. Original Cereal Donor Room.
6 Roller Benches.
56 x 400w HQI lamps

Photo 4. Cereal Donor Room after dividing into 3. 2 Roller Benches.
20 x 400w HQI lamps in each room

Fig 2. Average Night Time Current



In 2006 it was decided that the refrigeration systems on our large Cereal Donor Rooms (Photo 3) should be changed as they were becoming unacceptably unreliable.

A major breakdown could have led to the loss of 3 months work.

The original refrigeration package ran constantly using hot gas by-pass to regulate the load.

It was decided that splitting each room into 3, fitting split coils and a pair of Inverter driven compressors would improve reliability and reduce energy costs (Fig 2).

In the event of a compressor failure, we should be able to maintain temperature with only one compressor by reducing the light intensity in the rooms. In addition, as the plant material cycled through the rooms, the lights in the empty rooms could be switched off, saving electricity, reducing heat load and thus saving more electricity (Photo 4).