eCube
Background and Technical Advantages

Background

The eCube was designed to fulfil two specific areas relating to refrigeration and food storage temperatures. It is a food simulant contained in an enclosure designed to be retrofitted to either a thermostat or thermometer sensor. The food simulant in the eCube will mimic food parcel temperature at around 10mm below the surface and in the event of a refrigeration breakdown it will warm up slightly quicker than the food itself, but will be within 2C of the food as verified by the US NSF P235 standard. The eCube has been granted a full Patent . Although there are no UK/EU standards for Food Simulants it is the only one that has achieved the US NSF P235 Food Mimicking Device Standard. It has been extensively tested both in-house and by independent organisations, all confirming significant reduction in electricity consumption without compromising food safety.

The two areas of use for the eCube are:

a) Fitted to the Temperature sensor, the fridge/freezer will display the actual food temperature, not the circulating air temperature. If fitted to the temperature probe of a monitoring system the recorded temperature will be that of the food as per the: Food Safety (Temperature Control) Guidelines 1995

b) Fitted to the Thermostat sensor, which controls the compressor, will significantly reduce the frequency of the refrigeration cycles as the fridge/freezer will cycle based on the food temperature rather than the fluctuating air temperature. This leads to a colder storage area as the plant operates more efficiently, and by re-adjusting the thermostat back to its normal temperature settings significant electricity savings will be made without compromising food safety and quality. A knock-on effect of this is lengthening the life expectancy of the equipment and also less noise pollution.

The importance and advantages of food temperature control and monitoring (not air temperature) is now not only an accepted principal but forms a vital part of HACCP procedures. We believe it is logical that if we are to rely and record actual food temperature we should have the refrigeration plant operate by the same method, especially as this leads to significant financial and environmental advantages.

Technical Advantages:

Energy Saving Advantages of the eCube

By using the eCube as a device to control food storage temperatures, a more efficient refrigeration cycle is attained. At the moment air cycles (on/off) typically produce a minimum of 12 cycles per hour, and in some open display cases 20 cycles per hour. By using the cube as a cycle control mechanism a reduction of refrigerated cycles can be lowered by as much as 80%. (Example: Dairy Case: air cycles 3 minutes on, 2 minutes off = 12 cycles per hour. With the cube fitted it changes its cycles to 8 minutes on and 7 minutes off = 4 cycles per hour. This example equates to a 66% reduction in starts).

As the start up of a refrigerator compressor uses 3 times more power (i.e. start up amp is 12 amps, run amps is 4 amps) this will result in a power consumption reduction of 16% to 22% (refrigeration is effectively switched on when the food demands it, and switched off when the food does not need it to operate!). This is further explained by the start period which, although very short, nevertheless produces excessive heat into the start winding, and because of the refrigeration process i.e. winding suction, this then has to be cooled by the refrigerant gases (i.e. the heat removed), affecting the efficiency of the compressor, and its energy consumption.

Below are the details of the advantages of having the eCube fitted to the thermostat probe..

1. Reasons for the benefit of longer on cycles on the food

Normal air cycles will operate as the air temperature attains the set point of the thermostat. This will generate several on/off-cycles, without having very much effect on the food temperature. i.e. several 3 min on-cycles. However with cube fitted, this changes to 8 min on-cycles, resulting in a positive food temperature reduction by cooling the food quicker, leading in turn to a safer food. It also leads to a cooler storage compartment allowing the operator to readjust the thermostat, resulting in an additional energy saving.

Thus installing the ecube leads to a more efficient use of the refrigerator system combined with a lower energy consumption and safer food.

The longer on-cycle will create a higher efficiency of the refrigeration cycle i.e. longer runs at a maximum advantage (compare it to fuel consumption and efficiency in a car on a stop start urban road, or a long stretch of motorway driving at a steady 70 miles an hour).