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Freezer energy consumption report

Introduction

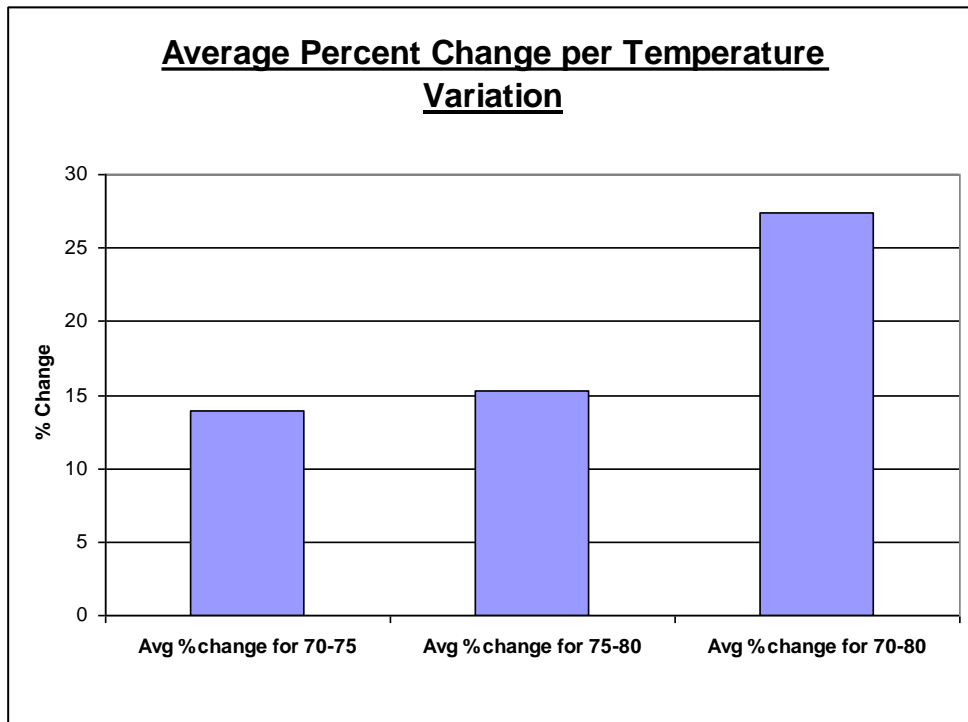
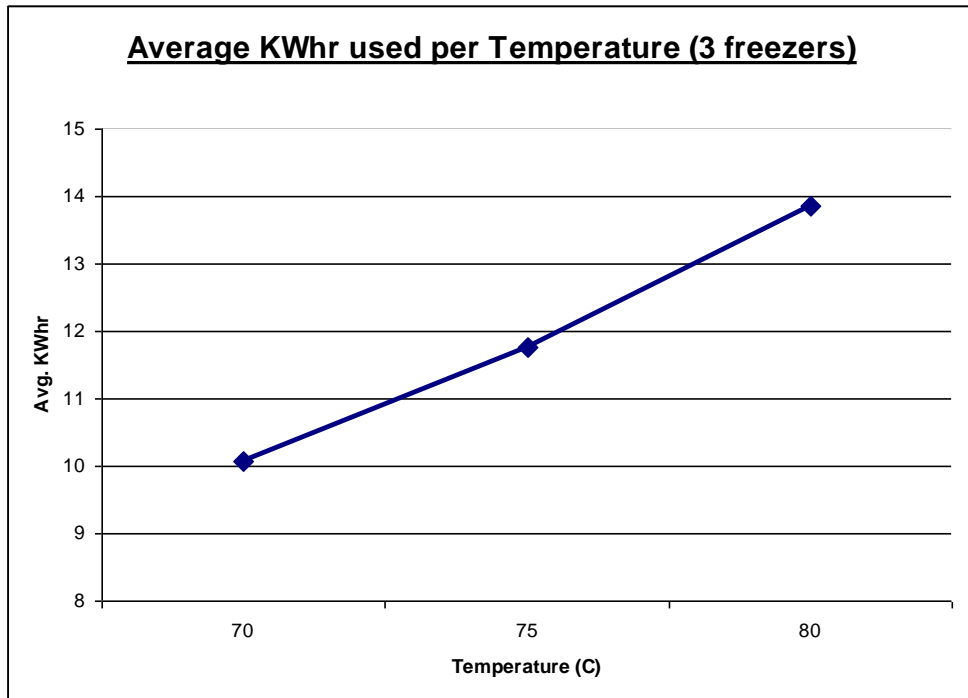
Research institutes today have immense requirements in terms of cold storage. Large quantities of freezers of varying temperatures are now a necessity for most research fields, and this requirement can put a large strain on universities in terms of energy consumption. There is much debate about how freezers may be efficiently managed in a manner that allows a maximum in savings while still providing necessary cold storage. To help address these concerns, I performed a set of meter readings on a variety of freezers/fridges at varying temperatures to elicit particularly if raising the temperature of -80 C freezers by intervals of 5 C results in significant energy savings.

Methods

Eliminating all possible variables for these measurements is impossible, but I took as many steps as possible.

- Energy meters were standardized on a single fridge to ensure they were giving similar readings over a course of 24 hours.
- All freezers and fridges were allowed a minimum of 24 hours to adjust to any temperature they were set to, and all readings were taken over 24 hours.
- 3 different -80 C freezers of the same make and model (New Brunswick U-725) were used for the primary readings. They were each set to 3 temperatures (70, 75, and 80 C) in differing orders in attempt to negate any possible effects of weather conditions on energy consumption as the ventilation of their space was partly natural and relied on outside conditions.
- All 3 freezers for primary readings were 75% full or more, and were all archive freezers indicating that they were not being opened on a daily basis.

Results



Temperature	Real Costs	Savings from -80 (£)
-70	354.78	114.975
-75	427.05	42.705
-80	469.755	0
-70	328.5	105.12
-75	341.64	91.98
-80	433.62	0
-70	308.79	154.395
-75	390.915	72.27
-80	463.185	0

Table 1: Energy consumption costs and savings over the course of one year, calculated at .09 £ per Kwh

Freezer	Temp Setting (C)	Kwh
(-20) sm. Beko (A+)	-20	0.2
(-20) lg. Ocean Frost Free	-20	1.5
(-20) Chest freezer	-20	1.6
(+4) Cryotechnics Lab fridge	4	2.01
(+4) Proline (food fridge)	4	0.74
(-80) NB U725 - efficient*	-80	14.4
(-80) Panasonic Sanyo	-75	10.3
(-20) Freezer Room	-20	25.1(*3)

Table 2: Further various freezer reading, -20 freezer room needs to be multiplied by 3 as we only measured one of its 3 phases

Conclusion

From the data gathered it seems clear that raising running temperatures by as little as 5 C should have significant effects on energy consumption.