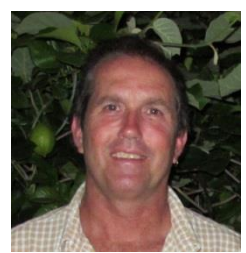


Title: Prediction of Energy Consumption of Refrigerators During Use

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Abstract: The aim of the research project is to develop a methodology to allow the prediction of energy consumption of household refrigerators under a range of normal use conditions. Such a methodology will combine key external parameters (ambient conditions and user interactions) with characteristics (attributes) of the refrigerators in order to provide an estimate of energy consumption. Research will document the range of indoor operating temperatures and quantify user interactions with their appliances. Prediction of energy consumption will require a mathematical tool that combines these elements in a dynamic manner under real usage conditions.

Introduction

Household refrigerators and freezers are now a ubiquitous appliance in the residential sector in Australia. As many as 17.5 million appliances are in continuous operation in Australia and about 100 million new products are made globally each year. These products are regulated for energy efficiency in many countries (including Australia), yet we have very poor understanding of the main factors that impact on energy consumption of refrigerators during normal use and what design characteristics can further reduce energy under these conditions.

Methodology

There are several important elements to quantify:

- Indoor temperatures in which household refrigeration appliances normally operate
- The nature and energy impact of user interactions with household refrigerators
- Characteristics of household refrigerators to be measured in a test laboratory

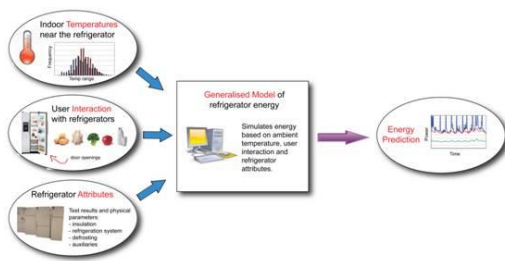
A key output will be to develop a generalised model that can combine these three exogenous variables to predict the energy consumption of a wide range of household refrigerators during use.

Discussion

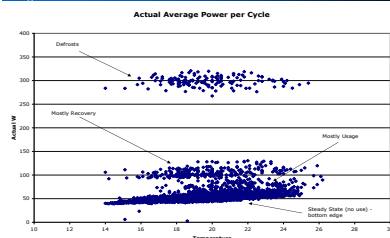
Over the past 3 years, field measurements of energy consumption of about 300 household refrigerators have been undertaken. Data was collected every minute and includes room temperature. A methodology to quantify the energy impact of user interactions has been developed. Analysis of data is under way to quantify user impacts and ambient temperatures for a wide range of household types. Measurements has been undertaken in Victoria, Sydney, Brisbane and Cairns. A literature search has revealed that user interactions and indoor temperatures are poorly documented. Most other studies have energy data that is poor quality.

Conclusion

Field work is now largely complete and the data analysis phase is under way. With some 250 years equivalent of 1 minute data, this is a significant task (150m records). The data collected is high quality and is yielding interesting results. Analysis of demographic and social data collected with field measurements is also being processed.



Characterising operation – 1 year of data



Impact of ambient temperature on energy (VIC)

