Fluctuation of Temperature Inside a Freezer of a Two-Door Refrigerator

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***Abstract* – A temperature profile inside the freezer compartment has been recorded over period of seven days. The fluctuation due to on-of cycle, as well as the effect of auto defrost, is indicated.**

Index Terms – Freezer, temperature, fluctuation, cycling, auto defrost.

INTRODUCTION

It seemed interesting to measure the temperature inside the freezer. As it turned out, it was discovered how the defrost cycle works. This is not to say the manufacturer does not know it. However, there seems to be paucity of data on the Internet that would discuss this. And since it does not show up on the Internet after a simple goggle search, it obviously does not exist. So here it is.

EXPERIMENTAL PART

An Amana Upright combination refrigerator/freezer with bottom mounted freezer was studied. Temperature was measured with xxxx xxxx connected to the laptop. Data were collected every 0.5 s and stored. This created a large set of data which, while in simple comma-separated format, was not due to its size readable in Excel. The data were imported into Origin, where, in addition to the time and temperature column, a third colum was enetered. Ithis column was filled with data of difference between two subsequent temperature values. This is achieved by using the function col(C)=col(B)[i]-col(B)[i+1]. Because most of the temperature results are steady within +/- 0.1 degree, the line of the data, if the difference in column C was zero, were discarded. This was achieved by using "Extract Worksheet Data" and condition if col(C)[i]!=0 (if value in C in not equal to zero) then write this line into another worksheet. This reduced the data tremendously.

RESULTS

The results are presented in the graph. The graph in fact is what everybody cares about, so here it is, labeled as Fig. 1. At some point maybe Fig. 2 will be added, which will show the detail, where the temperature is fluctuating only because of cycling of the compressor.

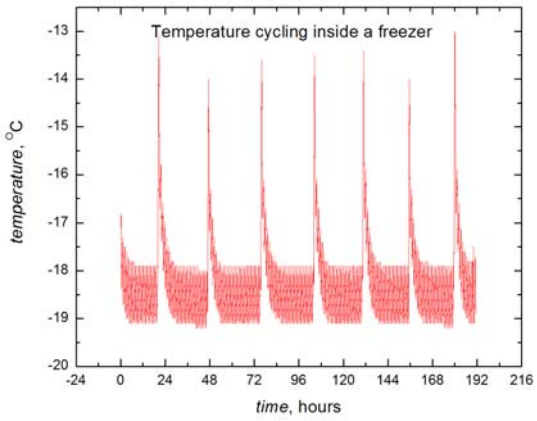

Fig. 1. Temperature inside the refrigerator.

DISCUSSION

What could be gleaned throughout the Internet and if I eve bother, I may reference it [1], is that every so often, depending on the system, the compressor is turned off and a heater around the evaporator coil is turned on. This reaises its temperature, melts any condensed//frozen water, which drips onto the collection, dispersal pan. At some point, in the simplest case just based on a timer, this heater is turned off, the compressor is turned on and the cooling cycle begins again. While all of this is going on, the fan that distributes air in the freezer and refrigerator also runs, so the temperature fluctuates and during defrost goes up.

Although not investigated, a reasonable conclusion can be made that with more material inside the freezer part, less temperature fluctuation would be observed. Hence, it might be more beneficial to have the freezer fully stocked.

Another observation made with this system was that the temperature, while the defrost is not active, fluctuates a bit more than one degree. So, to set the average (or even minimum) temperature to the desired –18 ^{o}C, requires somewhat lower setting.

Only after this experiment with a recording device it became obvious how an attempt to keep a thermometer inside the refrigerator, and attempting to read it, is not very useful. In particular, if the reading is made during the defrost cycle, it would be fairly useless or confusing. However, if one can make sure the defrost cycle is off, then a thermometer frozen in a larger piece of ice, to delay temperature fluctuation, may be probably used to spot check the inside temperature upon opening the door.

Having a recording device inside, connected via a cable squeezed in the door seal is not without its own problem. Throughout the duration of the experiments an air leak allowed moist air enter the cabined and lot of frost developed on that side of the door.

The experiment allowed, however, to set the temperature in the freezer to a lower value than previously. The previousl setting was aimed to keep the value at –18 degrees, but the temperature was possibly read while the system was cycling. It is also questionable what should be temperature inside the freezer. The value – 18 oC is not arbitrary is is (compare to 0 oF) the temperature at which a saturated solution of sodium chloride freezes, hence much of food products can be considered solid and presumably, no bacteria will move, no transport will occur, etc. But what about the interim during defrost? Is that enough to cause worry? I certainly never experienced problems with the food stored in the freezer related to spoilage. The most common problem is, that food dries out.

The other side note has to do with cleaning the cooling coils. In my refrigerator they are at the bottom, accessible through a kick panel, which I had no idea can be removed, so it was run for some 12 years without cleaning, albeit in relative clean (no children, pets, house plans or other pesky dependents living in the household) environment. What preceded the temperature measuring experiment was installation of a new fan and cleaning the coils. The temperature measurement was an afterthought to make sure all was working properly. It was interesting to see that the energy consumption decreased markedly. It even showed on subsequent electric bill.

REFERENCES

[1] Well, here should be a reference from the Internet, but it is not.

AUTHOR INFORMATION

Use this section to list author information. For example:

J. D. I. Sevycpat, Private Dozent, lives in Netherlands, where he writes occasional literary pieces.