INTELLIDYNE®
Smart ways to save energy™

Electricity Reduction Pilot Program

CONDUCTED AT

FRIENDSHIP VILLAGE

LOCATED IN

Tempe, AZ

TEST RESULTS
FOR
RESIDENTIAL AIR CONDITIONING SYSTEMS

A Confidential Report
Prepared by
Intellidyne LLC

EXECUTIVE SUMMARY

Friendship Village Pilot Study

The attached technical report summarizes the Energy Saving Performance of the *IntelliCon*® "AC" energy saving control which was installed on a Trane 3-Ton Rooftop Heat Pump located on and serving cottage #37 at Friendship Village in Tempe Arizona. The *IntelliCon*® control was installed on June 12th, 2004 and test data was collected until July 11, 2004. The test data was collected using "alternating day" methodology which is further describe later in this report. Detailed data on solar load, outdoor temperature and indoor temperature was also collected and is part of this final report.

The system was programmed to operate at a set point of 78 degrees and was controlled by a standard residential thermostat. The test data in this report reflects **12.1%** more run time for the compressor on those days when the *IntelliCon*® control **was not in the circuit** .The run time differences are as follows: On the days when the *IntelliCon*® was in the circuit, the compressor ran a total of 106 hrs, 54 minutes and 15 seconds. On the days when the *IntelliCon*® was not in the circuit the compressor ran a total of 119 hrs, 50 min and 36 sec. This is a difference of 12 hrs. 56 min. and 21 sec. less run time when the *IntelliCon*® control was in the circuit

The reduction in run time on this unit was achieved with no change in temperature or comfort in the space. The outside temperature data collected during the test period shows that the cooling degree days and solar load were comparable to slightly warmer on the "on" days. The respective reduction in total run time was achieved **without any compensating adjustment for the warmer temperatures on the "On" days...**

The test data also reflects that the compressor **cycling was reduced by 4.6%** as a result of the *IntelliCon*® control.

The Report contains the documentation that supports the summary results and further details the specific length of the test as well as documenting the overall temperature performance during the test and the predictability of the system performance *after the IntelliCon*® *affect.*

This validation analysis clearly shows the *IntelliCon*® control delivers above the minimum guaranteed savings of 10%... This improvement in operational efficiency was achieved while providing consistent and predictable space comfort.
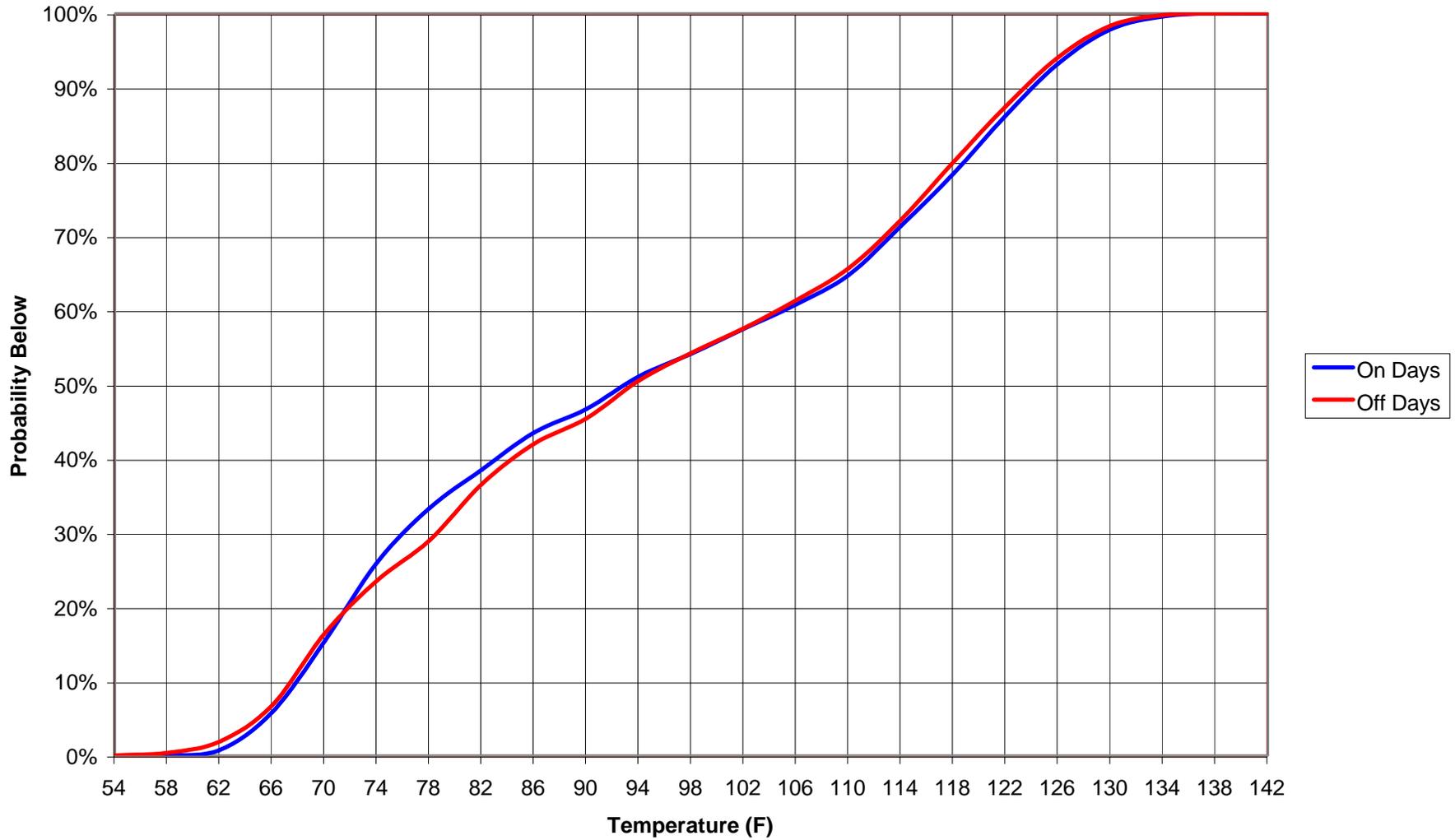
The *IntelliCon*® Energy Saving Control will deliver the following benefits to Friendship Village and comes with a 15 year warranty against manufacturing defects.

- Guaranteed Energy Consumption Reductions
- Reduced Wear and Tear from excessive on/off cycling
- Consistent Temperature Performance
- No Maintenance or Programming
- Low Upfront Cost

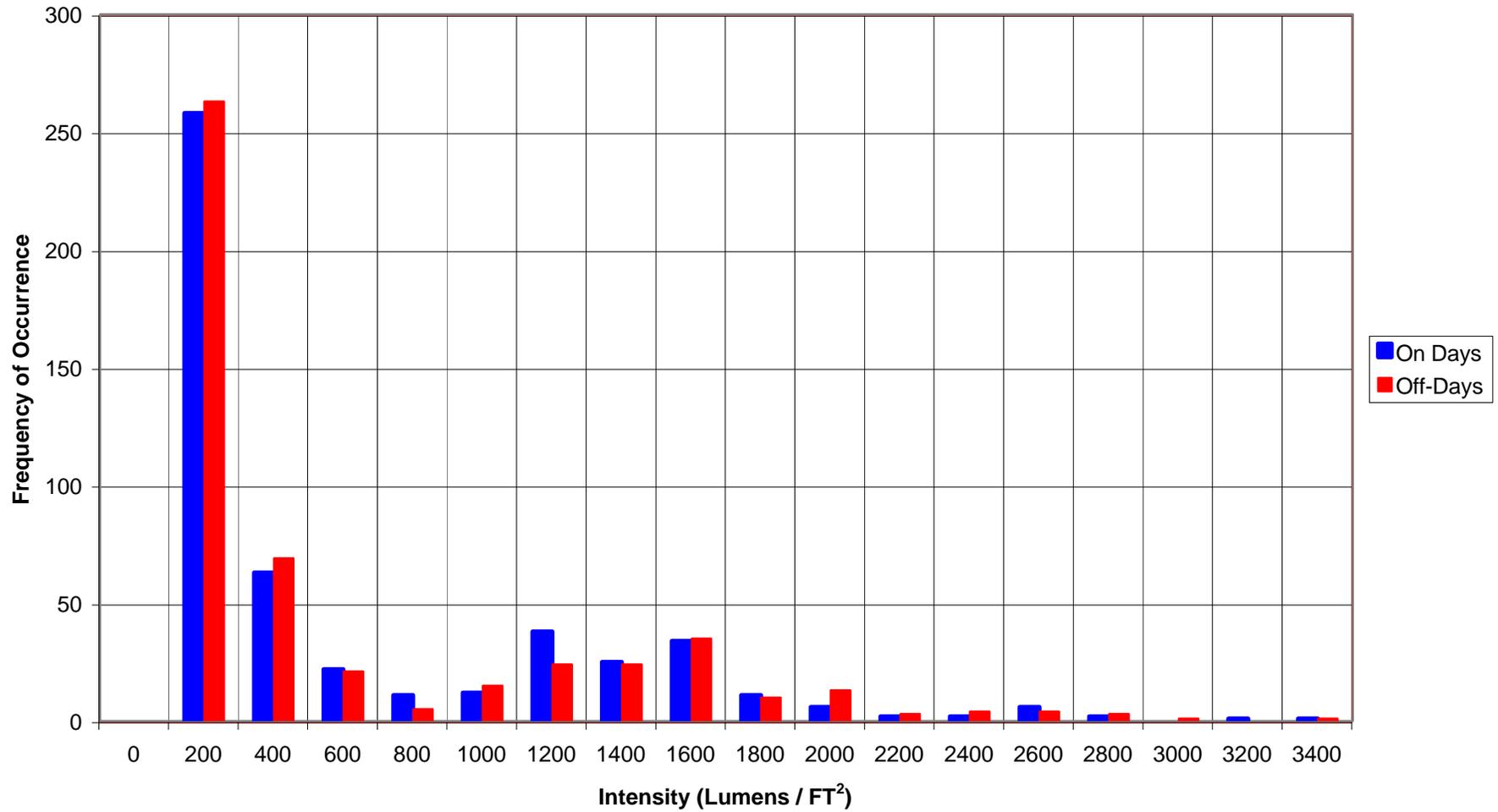**Friendship Village**
Outside Air Temperature Histogram

Legend:
- On Days (blue)
- Off-Days (red)

Y-axis: Frequency of Occurrence
X-axis: Temperature (*F)
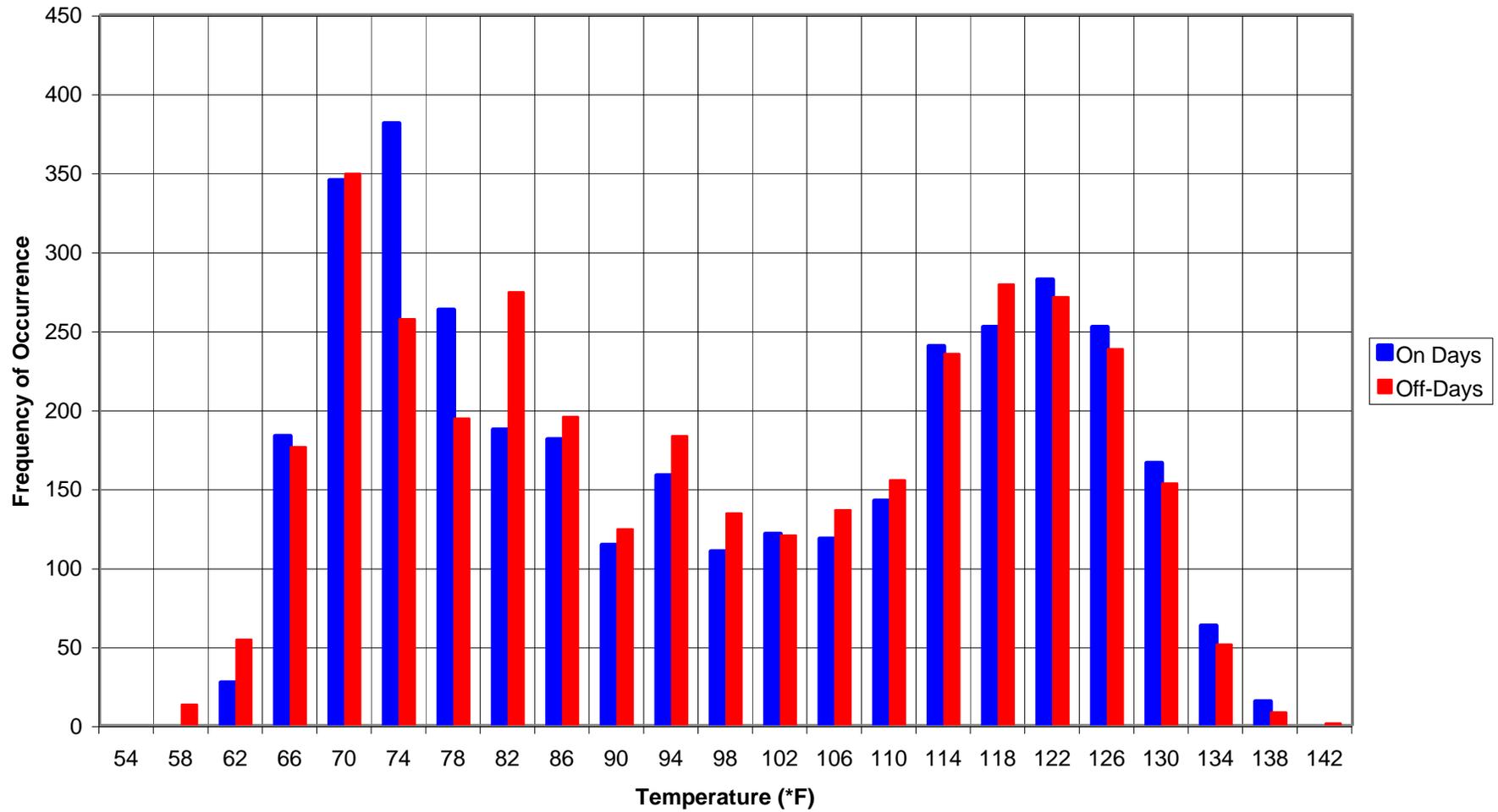
Friendship Village
Outside Air Temperature Probabilities

Friendship Village
Solar Load Histogram

Frequency of Occurrence (y-axis, 0 to 300)

Intensity (Lumens / FT^2) (x-axis, 0 to 3400)

Legend:
- On Days
- Off-Days

Friendship Village
Solar Load Probabilities

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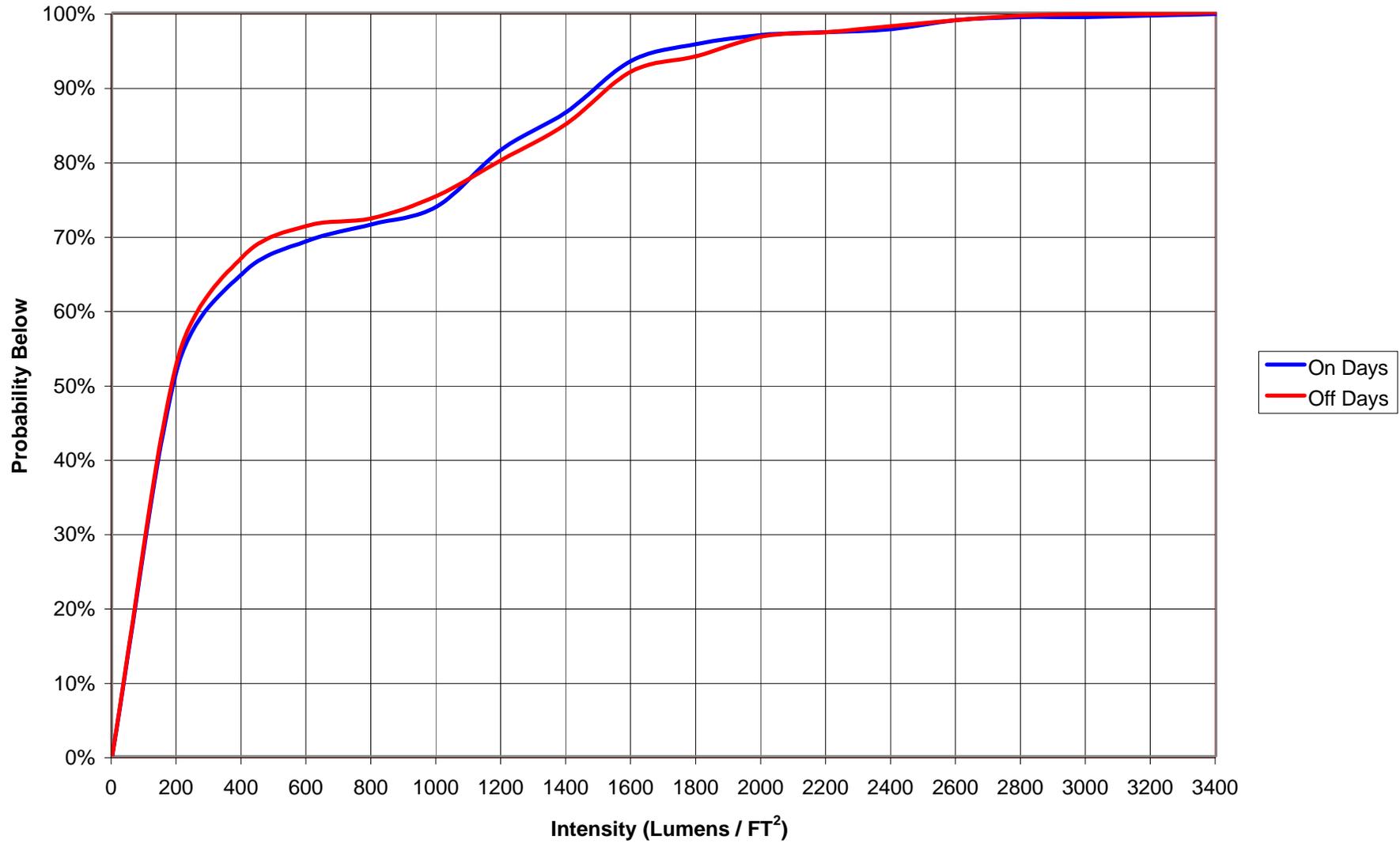
90 Pratt Oval
Glen Cove, NY 11542
Phone:516-676-0777
Fax: 516-676-2640

Test Report

Report No. 12132

Date: 08/13/04

Customer:

Energy Equities Inc.

Contact Jim Wallace

Test Site Location:

Friendship Village, Cottage #37
Tempe, Arizona

Test Type: ☐ HEATING ☑ AIR CONDITIONING ☐ REFRIGERATION ☐ OTHER: _____

Product Tested: ☐ HW ☐ LCH ☐ LCS ☐ CHW ☐ CHS ☑ AC ☐ CAC ☐ RU ☐ OTHER: _____

Type of Equipment:

Manuf: Trane Packaged Rooftop Heat Pump
Model: M/N: WCC036F100B   S/N: P3637WE1H
SetPt: 78 degs.
Tons, Btu, Hp: 3 Ton
Area Served: Cottage # 37
Act. V,Amps, Ph: 220vac, 10.2 amps, 1 Phase

Test Start Date: 06/12/04

Test End Date: 07/11/04
========
No. of Days in Test: 30

COMPRESSOR RUN-TIME:

☑ in HRS.   ☐ in MIN.

IntelliCon ON-DAYS: 106:54:15

IntelliCon OFF-DAYS: 119:50:36

The Compressor operated: **12.10%**
MORE on the OFF Days.

COMPRESSOR USAGE FACTOR:

IntelliCon On-Days: **30%**

IntelliCon Off-Days: **33%**

COOLING DEGREE-DAYS (FOR TEST PERIOD)

IntelliCon ON-DAYS: 452

It was **0.3%** Warmer on the On-Days.

IntelliCon OFF-DAYS: 451
========
Total Degree-Days: 903

AVERAGE SOLAR LOAD: (Lumens/Sq. Ft.)

IntelliCon ON-DAYS: 6440

IntelliCon OFF-DAYS: 6324

It was **1.83%** Sunnier on the On-Days.

COMPRESSOR CYCLING REDUCTION:

IntelliCon ON-DAYS: 435

IntelliCon OFF-DAYS: 456

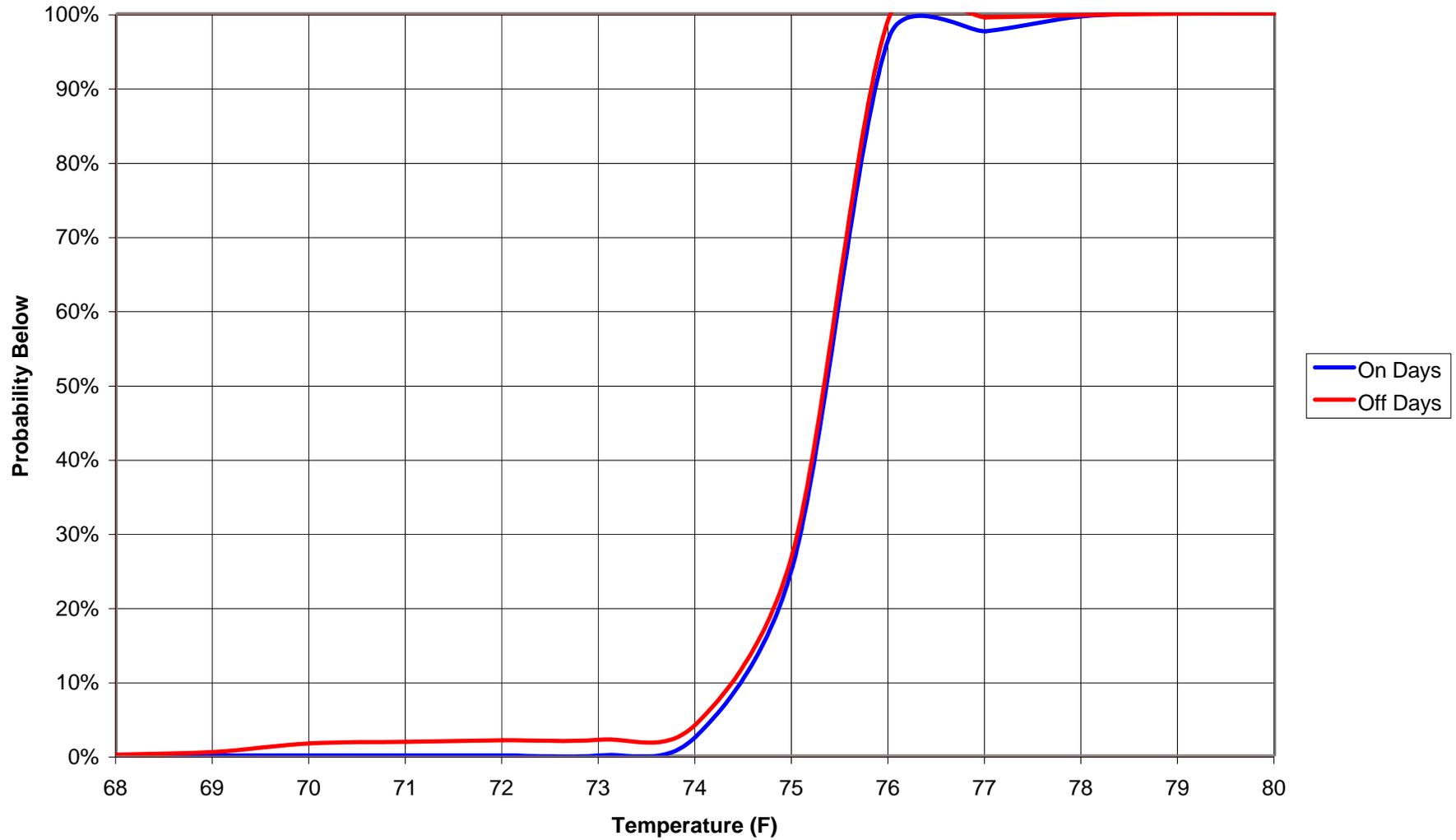Cycling was reduced by: **4.6%**

Savings = 12.10%

COMMENTS: Differences of ambient conditions, both temperature and solar, were negligible for the testing period. As such, compensation was not necessary to normalize the data. Savings would be greater if a more average setpoint was maintained in the space. As shown above, the useage factor was below normal averages of between 40% - 80%. There was also an almost 5% reduction of compressor cycling.

Friendship Village
Cottage #37 Space Temperature Histogram
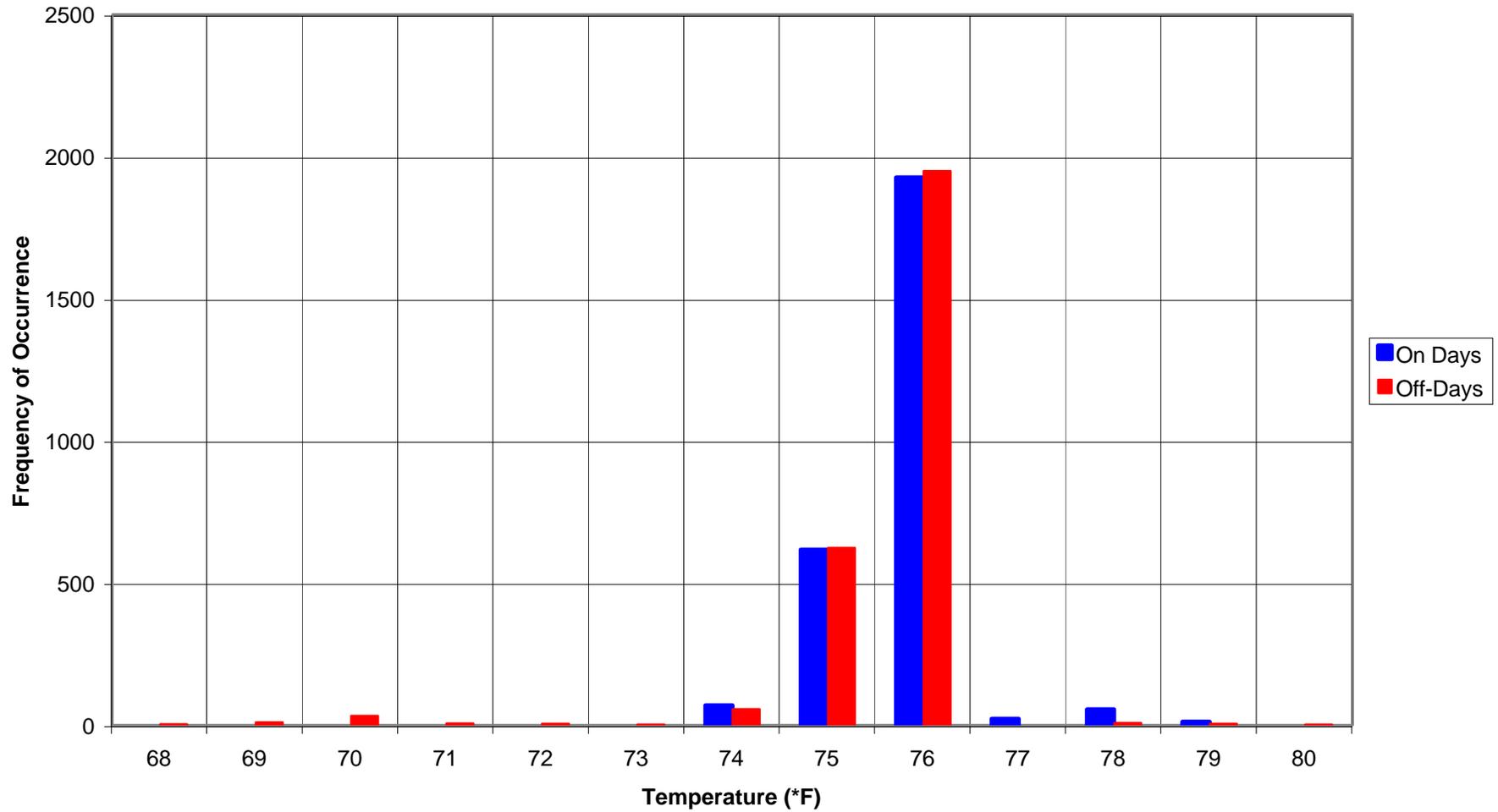
Friendship Village
Cottage #37 Space Temperature Probabilities

90 Pratt Oval
Glen Cove, NY 11542
Phone:516-676-0777
Fax: 516-676-2640

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Testing
Methodology

EQUIPMENT USED FOR TESTING PURPOSES

   Specific timing and data logging devices are used to gather detailed information about the unit(s) being evaluated. Each device has been carefully selected for its reliability, capability and function. The individual devices INTELLIDYNE uses are explained below.

1. TIME CLOCK:

Manufacturer: Tork   Model: 8007V-0

Is used to switch the IntelliCon® product in and out of the circuit. This is done on a 24 hour basis. The result is that the IntelliCon® product is in control ("in" the circuit) one day and not in control ("out" of circuit) the next day. A 14 day time clock was selected so that a complete alternation of days that IntelliCon® is in control would result.

2. CURRENT SWITCH:

Manufacturer: Veris Industries   Model: Hawkeye 608/908

The current switch is used to monitor when current is being drawn by the cooling/refrigeration compressor or heating burner. When current is sensed it is "On" when no-current is sensed it is off "OFF". The current switch is used in conjunction with the "Change-of-State" data logger.

3. "CHANGE–OF–STATE" DATA LOGGER:

Manufacturer: Onset Computer Corp.   Model: H06-001-02

This device monitors and logs the "change-of-states" (the on / off status) of the unit being tested. It is used in conjunction with the CURRENT SWITCH, above, and time and date-stamps (logs) each change of status. By processing the logged data, the durations for each cycle can be determined.

4. "LIGHT INTENSITY" DATA LOGGER

Manufacturer: Onset Computer Corp.   Model: HLI

This data logger is used to monitor and log Light Intensity and is used to determine the solar-load influence on the facility.

5. "T/Rh " DATA LOGGER

Manufacturer: Onset Computer Corp.   Model: H08-004-02

This data logger is used to monitor and log the temperature and relative humidity in the conditioned space.

6. "TEMPERATURE" DATA LOGGER

Manufacturer: Onset Computer Corp.   Model: H08-001-02

This data logger is used to monitor and log the outdoor air temperature, and is used to determine the degree-day influence on the facility

WHAT DATA IS COLLECTED

Linking all of the above together with the IntelliCon® product being "in" and "out" of the circuit, on alternating days, yields the following data:

a) How many on/off cycles per day (if applicable).
b) Total "on time" per cycle, per day.
c) Total "off time" per cycle, per day.
d) What the solar load of the facility was during the test period (if applicable).
e) What the relative humidity in the conditioned space was during the test period (if applicable).
f) What the temperature of the conditioned space was during the test period (if applicable).
g) What the outdoor air temperature was during the test period (if applicable).

How The Data Is Analyzed

Upon completion of the test, all the data is evaluated to calculate the reduction of consumption (savings).

Short-term testing analysis can only be performed properly by the elimination and reduction of as many variables as possible and through the analysis of the data on a statistical basis. The alternating "in" circuit / "out" of circuit testing has the advantage of minimizing the variations due to time-sensitivity, day-of-week sensitivity, degree-day effects, etc.

In order to properly evaluate the data, the following must be determined:

1. A baseline must be established. Baseline consumption data is the "use" or consumption information that is unaffected by the IntelliCon economizer ("out" of circuit). This may be derived during the test (which is what is done here) or from historical records. The advantage of deriving the base-line during the test is that site specific degree-day and solar data may be determined as opposed to weather-service data that may or may not be indicative of the test site.

2. It is necessary to determine what effects or influences are caused by solar- load and degree-day variations. This is done by performing a statistical analysis on the solar and degree-day data collected during the base-line phase.

3. In order to properly compare the two consumption cases (IntelliCon "in" and "out" of circuit), and determine the savings, it is necessary to adjust (or "normalize") the data collected during the "in-circuit" phase. The consumption data collected when the IntelliCon economizer was "in-circuit", is "normalized" by compensating for the effects of the solar and degree-day influences that occurred during the same phase of the test. This is accomplished by applying the statistical analysis results of the solar and degree-day influences (collected during the base-line phase) as a means to compensate for the solar and degree-day variations that occurred during the "in" circuit phase of the test.

4. The normalized consumption data acquired during the "in" circuit phase is compared to the base-line data and the savings determined.