ARTICMASTER TEST REPORT

Demonstration Installation
Retail Warehouse, Sydney, Australia

Introduction

Two Articmaster units were installed on one of the four package air conditioning/heat pump systems which served the retail warehouse. Each package unit is comprised of twin compressors with associated evaporator and condenser equipment.

Monitoring equipment was installed on the system before the Articmaster installation and again after the Articmaster was commissioned. In each case, a period of slightly greater than forty-eight hours of monitoring was completed, using the same days of the week and hours per day, each using measurement frequencies of forty seconds.

The measurements taken included:

- Warehouse temperature and humidity
- Amp draw on each leg of each compressor (total of six readings)
- Supply and Return temperatures of the condenser and evaporator
- External Ambient temperature

The measurement periods were chosen to be as representative and as easily comparable as possible.

Results

The measurement periods saw sharply differing ambient conditions, with the "after" period being colder during the second day, and sharply warmer during day 3. Day 2 of the after period was very cool, which caused the system to work as a heat pump (see chart 2).

The ambient temperature measurements were subsequently found to have been placed in an unsuitable location, being subjected to the cooling and heating draughts from the equipment. Ambient temperatures were thus ignored except to the extent that discrete measurements were also taken at certain points during the monitoring for other reasons. These allowed a broad comparison.

During the after period of the installation a partial blockage was also found in the distributor to one of the evaporators, thus making monitoring of the second compressor worthless. However other manual measurements taken at the time confirmed the good results.

The following conclusions can be drawn from the measurements:-

- The temperature measurements inside the warehouse indicate that the specified conditions were maintained at all times.

Comparison of before and after charts provide the following detailed measurements:-

Finding	Source of Comparison
Compressor A: High Leg Amps were reduced from 19.3A to 18.5A	Day 3 of each period where after period ambient was 11°C higher
Compressor A: Low Leg Amps were reduced from 17.6A to 17.1A	ditto
Evaporator Supply and Return Air increased from 10°F to approximately 25°F	Day 1 and 3 of before and day 2 and 3 of after period

Calculated Savings

At this demonstration the savings are calculated in three ways. Firstly from reductions in Amps used to drive the twin compressors, secondly the increased cooling capacity (i.e. cooler supply air to the retail warehouse) and thirdly from the external ambient change experienced, i.e. the additional climatic load experienced between the two measurement periods.

Amp Draw

Compressor A High Leg 0.8/19.3 = 4.1%

Compressor A Low Leg 0.5/17.1 = 2.9%

Average reduction using two High Legs and One Low Leg readings = 3.7% (Note: These were measurements taken at sharply different temperature readings)

Cooling Capacity

Increase in delta temperature equals:-

15.0 degree F x 5% per degree = 75% (*)

(*) Note: The TXU multiplier of 5% per degree F is robust for small movements in delta T up to five degrees. At 15 degree F the multiplier must be discounted. Energy Enhancement has therefore ignored any calculated figure above 25%.

Ambient Temperature

Increased ambient assumed to be approximately 6 degrees F thus increasing savings by 3 per cent.

Total Savings

Amp draw of 3.7%, Cooling Capacity of 25% & Ambient 3%

= approximate efficiency improvement of 31%

Appendix A - Before and After Installation Charts

Note: Red equals measurements taken in the before installation period, and Blue the after installation period.

Chart 1: Comparison of Compressor Amps and Ambient Temperature

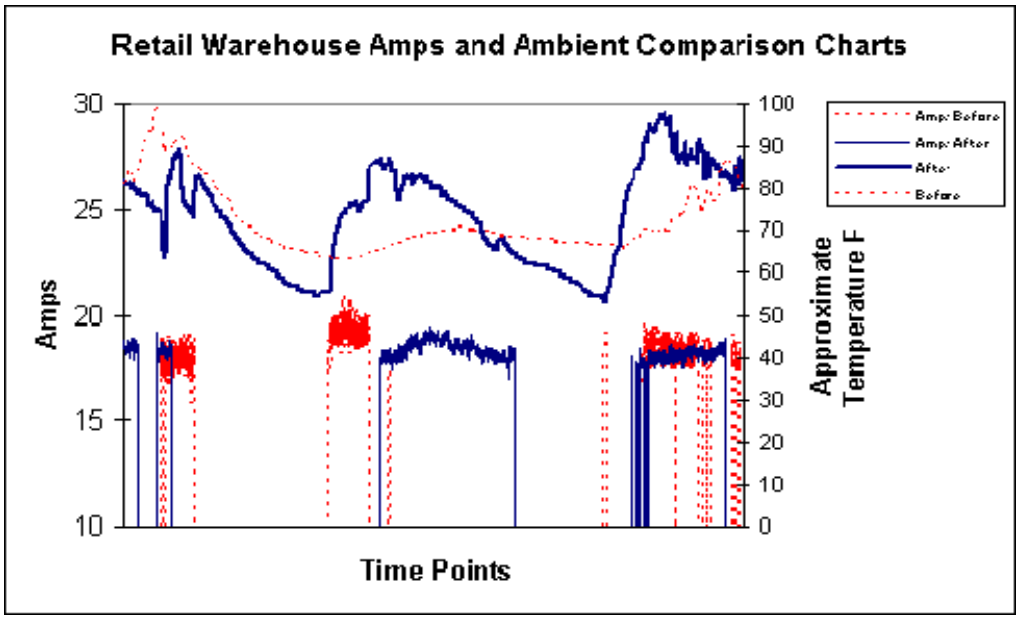
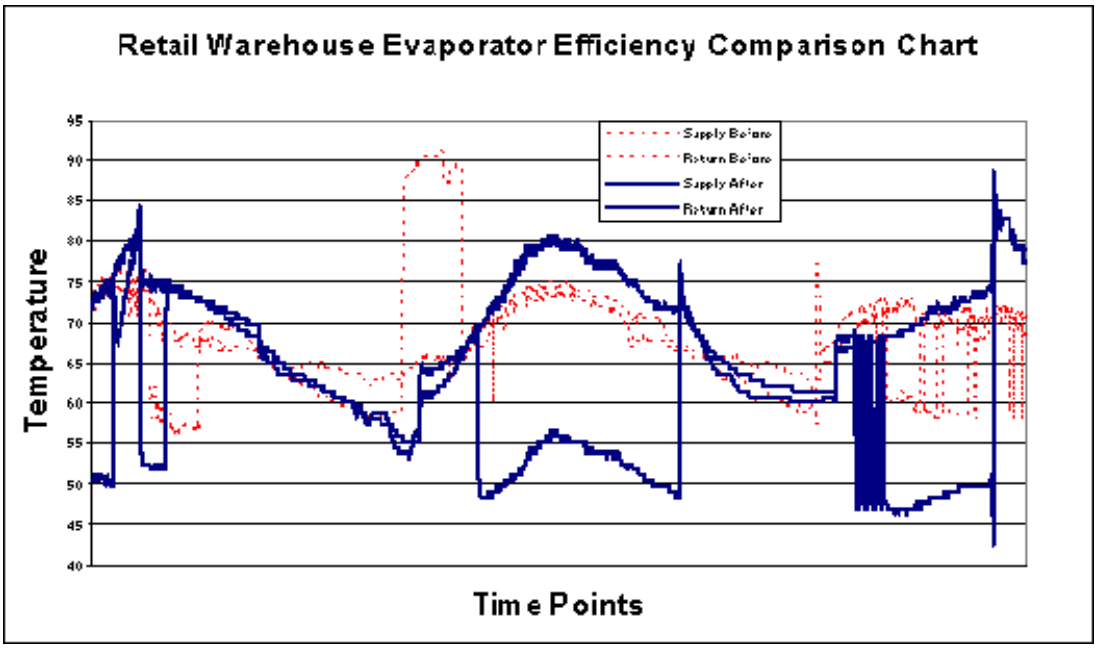


Chart 2: Supply and Return Evaporator Air Temperatures


Retail Warehouse Evaporator Efficiency Comparison Chart
Temperature
Time Points
Supply Before
Return Before
Supply After
Return After
95
90
85
80
75
70
65
60
55
50
45
40