SUPERHEAT OPTIMIZER SYSTEM
FIELD TEST DATA

The following report outlines the energy and operation of two test supermarkets.

Two (2) supermarkets were selected by the customer for the energy analysis. They had identical layouts, equipment and controls. Both stores implemented Tyler cases and racks as well as a few Hussmann bunkers. For testing and monitoring purposes, the low temperature rack was monitored and related cases were outfitted with the **superheat optimizer system** in supermarket #2 only.

Supermarket #1 - Standard refrigerated display case(s) were used - low temperature only

Supermarket #2 - 43 refrigerated display cases and walk-in boxes were equipped with the **superheat optimizer system** - low temperature only

- The stores operated for a minimum of four (4) months before the energy data was collected
- All data points were gathered using the MicroThermo DDC control system
- Both racks were controlled using floating suction control. The control setup was identical including PID loop tuning
- Floating suction control was based on maintaining -10 F in the critical temperature cases
- The critical temperatures cases were two ice cream display cases at the end of the run

To determine the exact benefit of the test, the following points were monitored (all data collected in this report was the daily average):

- Suction pressure - rack pressure required to maintain -10° F at the critical temperature cases
- Rack PID output - 0 to 100 % - determines the percentage of the rack required on a daily average to maintain the suction pressure as required to satisfy the critical temperature cases. The actual compressor rack is a step function, however, this provides a good approximation for comparison purposes
- Rack amps - daily average of the rack amp draw

The operation of both low temperature systems was optimized and fine tuned to achieve the best possible operational performance.

When the energy consumption of the two (2) stores was compared, the data from the testing was consistent across the board, with a resulting rack energy savings of ~ 22.0 % realized in the **superheat optimizer system** equipped store, supermarket #2.

- Total incremental cost = $ 19,500.00 CDN
- Annual Rack Energy Consumption = $ 29,730.00 CDN (@ $0.09/kwh)
- Annual Energy Saving of Supermarket #2 = $ 6,540.00 CDN
- **Simple Payback = 3 years.**

Net Present Value = $ 25,700.00 CDN
(10 year period, 7% cost of capital)

SYSTEM IMPROVEMENT AND BENEFIT SUMMARY

- Tests have consistently shown that implementing the **superheat optimizer system** allows for an increase in rack suction pressure of 5 to 7 psig, while maintaining the same case temperatures
- As the coils are running fully flooded at low steady state superheats (set at 3° F to 5° F), heat transfer is dramatically improved, TD's are reduced and uniform coil frosting is achieved. This allows for higher case humidity levels and shorter and more effective defrost cycles, resulting in less retail product shock, reduced shrinkage, improved product appearance and freshness
- ***Perishables, in terms of procurement and freshness are a major point of differentiation with supermarket retailers***
- The oversized orifices, distributors and TXVs provide improved control and much faster pull-downs
- The insulated liquid lines and components contribute to greatly enhanced suction-to-liquid heat exchanger performance as well as providing a constant temperature liquid to the valve
- By fully activating / flooding the evaporator, the amount of oil trapped in the evaporator coil is reduced; further aiding heat transfer and improving oil management
- Uniform frosting results in improved airflow and less problems with case icing
- ***Addresses the supermarket industry need to focus on operational and cost efficiencies***