Brookhaven National Laboratory Test Results

Testing conducted by

Intellidyne, LLC

at the Brookhaven Energy Efficiency Laboratory

Test results depicting ThermoMi$er™ Efficiency
&
ThermoMi$er™ vs. MicroTherm™ Comparison

GENERAL

In late 1997, Intellidyne LLC arranged with Brookhaven National Labs, to conduct laboratory performance testing of the ThermoMi$er™-HW hydronic heating energy economizer. To prepare for the testing, Intellidyne modified and instrumented an existing 'boiler test rig' in the Energy Efficiency Laboratory of the Department of Applied Sciences of Brookhaven National Laboratory, located in Upton, New York. A computerized data acquisition system was installed by Intellidyne to record the boiler performance and system temperatures.

In preparation for the official observation of the testing by Brookhaven personnel, Intellidyne performed an extensive series of tests. The purpose of these tests were to adjust the test rig to obtain typical boiler cycling rates and loading responses. Extensive data on the performance of the ThermoMi$er™ control unit was obtained during these tests. This test data was also used to validate the accuracy of Intellidyne's Hydronic Heating System Computer Simulation Program©.

While these tests were underway, Intellidyne was asked by the owner of a MicroTherm™ energy efficiency device (the only known competition to Intellidyn's Commercial Hydronic Heating Economizer Product), to perform equivalent tests on the MicroTherm™ unit and to compare the results. This report also presents the results of those tests.

RESULTS OF TESTING:

Table 1 below summarizes the results in terms of the percentage changes compared to the "base-line" which corresponds to the boiler running with neither of the two controls installed.

The MicroTherm™ was tested at three different settings. Two of these "Economy Factors" 50% and 75% are within normal MicroTherm™ settings. The 90% test was performed after analyzing the results of the first two tests and then trying to give the MicroTherm™ device as fair a test as possible. The ThermoMi$er™ does not have any adjustments so there is only one result.

For each control test condition the following results are provided:

1. The percentage reduction in burner run-time due to the control.

2. The percentage reduction in burner cycling due to the control.

Test Condition	*Burner Run Time Reduced by*	*Burner Cycling Reduced by*
ThermoMi$er™	**15.3%**	**60.2%**
MicroTherm™ @ 50%	5.4%	24.7%
MicroTherm™ @ 75%	6.1%	33.6%
MicroTherm™ @ 90%	7.1%	38.3%

Table1 - Performance of ThermoMi$er™
&
ThermoMi$er™ vs. MicroTherm™ Comparison

TEST CONDITIONS

CONTROL DEVICES - ThermoMi$er™-HW and MicroTherm™

AQUASTAT SETTINGS - Low Limit : 180 deg F ; Deadband : 8 deg F

BOILER - UTICA Model SFH3100WLC , 87% Efficiency Hydronic Boiler

FUEL RATE - 0.77 gpm (93,600 BTU/hr Net I-B-R)

BOILER CIRCULATOR FLOW RATE - 4.6 gpm

BOILER LOAD – Water Cooled Plate Heat Exchanger

TEST PROCEDURE

1.) The boiler and the circulator are turned on and the system is allowed to attain its operational cycling pattern.

2.) The data acquisition system is started. The temperatures of the boiler inflow and outflow water and the heat exchanger coolant inflow and outflow water are recorded. The boiler's aquastat call signal and burner start and stop signals are also recorded. All data was recorded in 5 second intervals. From this data the individual and cumulative burner on and off times can be determined and analyzed.

3.) The test is terminated after sufficient boiler cycling has occurred to render a reliable and repeatable test. This usually requires between 15 to 20 burner cycles and takes between 2 to 8 hours per test, depending on the control being tested.

To compare the two control devices, a total of 6 tests were run. First, to get a base-Line, data was collected with no economizer controls installed on the boiler. Next, the MicroTherm™ was installed on the boiler. The MicroTherm™ is a device which requires a manually entered "Economy Factor" to operate. To determine this factor, the MicroTherm™ manual instructs the installer to run the unit in "Test Mode" with four Economy Factors (40, 50, 60 and 70%). The unit is then left for a number of days during which time it cycles through these factors. At the end of the test, the economy factor with the best savings is manually entered into the MicroTherm™ and used for any further operation. To eliminate this extensive test period, the MicroTherm™ was tested here with settings of 50, 75 and 90%.

After the three MicroTherm™ tests were completed, the ThermoMi$er™ was installed and tested. Since the ThermoMi$er™ dynamically optimizes itself using its active temperature sensor there is no programming required and thus only one test was needed.

Finally, to check reproducibility of the results, the "base-line" test was repeated.

The recorded data for each test was broken down into individual cycles and the burner on-time and off-time for each cycle was found and used to calculate the results.