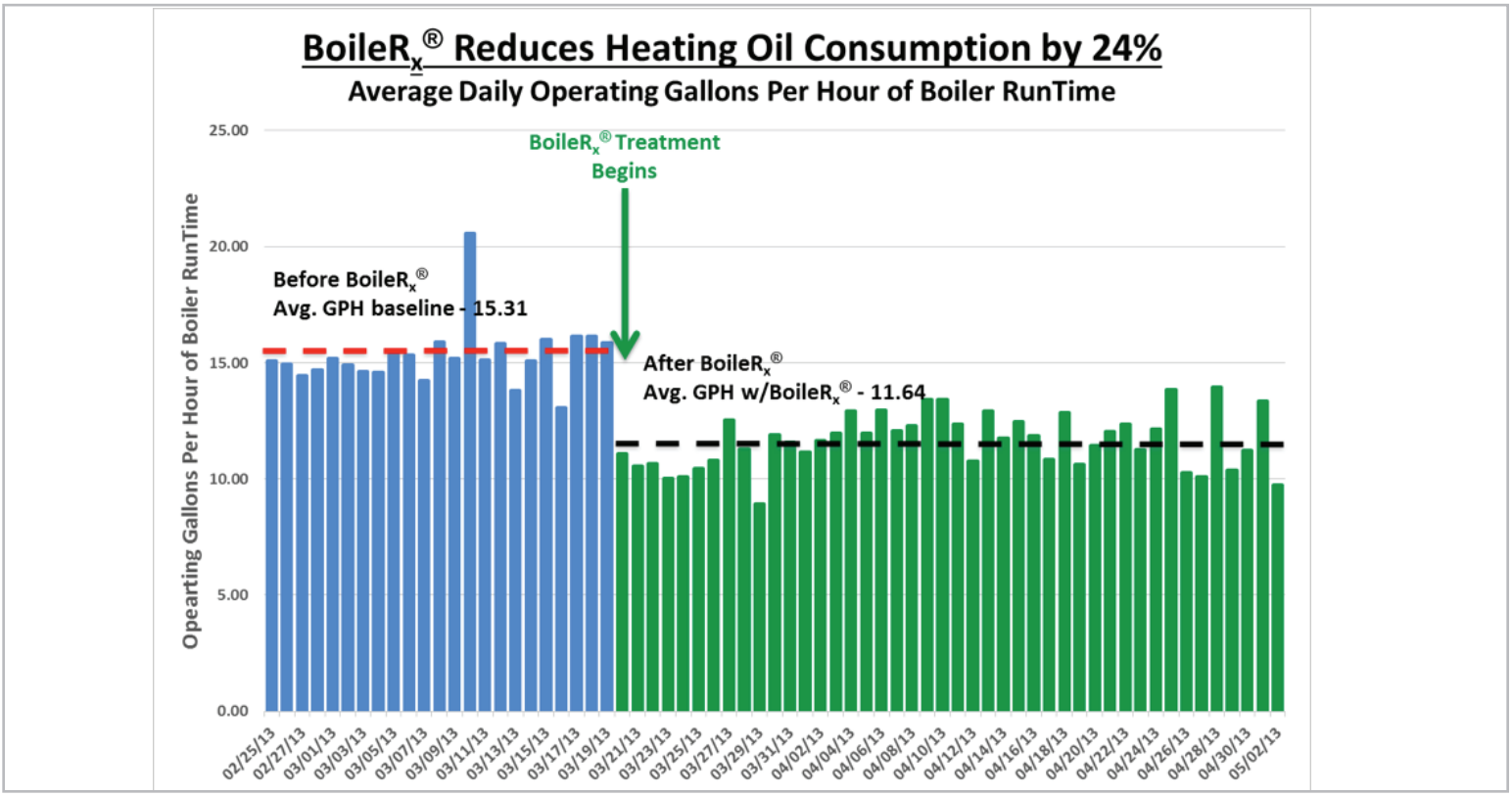
Executive Summary

Energy Innovation Works (EIW) conducted a test of BoileRx® in a boiler servicing a 70 unit residential building located at 355 W. 14th Street, New York, NY. As a result of using BoileRx® an increase in heating oil efficiency of 24% was achieved over the course of the test (see chart below).

This building uses approximately 30,000 gallons of heating oil per year. The following are the resulting annual savings:

- 24% increase in efficiency
- 7,200 gal/yr reduced heating oil usage
- $30,600/yr total savings (@ $4.25/gal)



Data Collection & Analysis Methods

Baseline data: The baseline-monitoring period represents data collected during a period of time, which accurately reflect this buildings typical heat demand driven boiler operations before BoileRx® treatment.

Benchmark data: The benchmark-monitoring period represents data collected during a period of time, which accurately reflect this buildings typical heat demand driven boiler operations after BoileRx® treatment.

To properly assess boiler heating oil consumption, several operational and weather related data points were collected:

- Total Run Time – monitors operating time (HR:MM) the boiler was running during the date specified
- Oil Consumption – measures heating oil consumed in gallons during the date specified
- Gallons Per Hour of Boiler RunTime – represents boiler heating oil consumption on an hourly basis during the date specified (Daily Oil Consumption/ Daily Total Boiler Run Time)
- Heating Degree Day (HDD) – are a measurement to reflect the demand for energy needed to heat a building. HDD used in our analysis was attained

from measurements taken by Station KNYC in Central Park, NYC

Regression Analysis: To assess the boilers operational dependence on weather, regression analysis on the baseline and benchmark data collected was conducted. A typical boiler operation is highly dependent on weather; the colder the outside temperature, the higher the demand for heat, translating to longer daily boiler operating hours and larger quantities of heating oil consumption. Regression analysis is a commonly used practice and accepted in accordance with energy efficiency guidelines such as IPMVP: International Performance Measurement and Verification Protocol and ASHRAE Guideline 14-2002.

Results

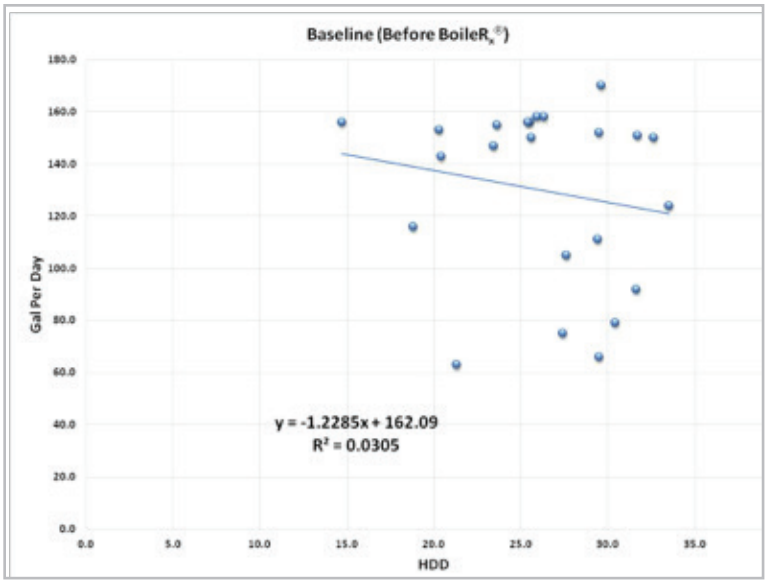
Our testing was based on a total of 67 days; 23 observed days of baseline data and 44 observed days of benchmark data.

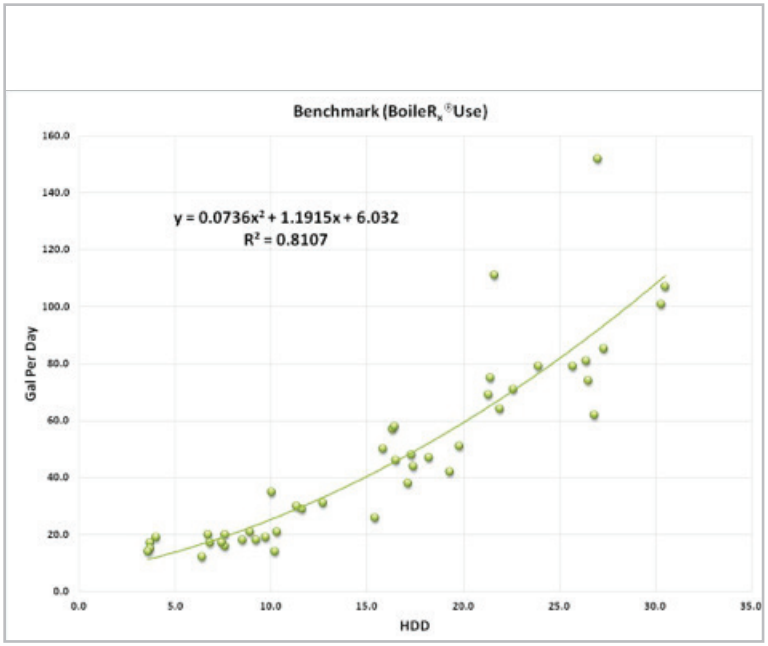
The first analysis technique divided daily heating oil consumption by daily boiler operating hours; resulting in daily operating gallons per hour of Boiler RunTime. In order to compare baseline and benchmark periods we took an average of GPH for both periods. The result was an Average GPH Baseline of 15.31 and an Average GPH w/ BoileRx® of 11.64 yielding a heating oil consumption reduction of 24% as noted in the chart above.

Our baseline data regression analysis yielded a coefficient of determination (R2) of 0.03, which indicates that before the use of BoileRx®, there was absolutely no correlation between weather and heating oil consumption. This can be observed in the accompanying chart with the scatter of observed values displaying a very low fit or correlation between gallons per day of heating oil consumed and heating degree-days (HDD).

Considering we know with certainty that gallons per day are typically highly dependent on weather (HDD) it seems clear that the boiler was operating in a very inefficient manner.

Conversely, our benchmark data regression analysis while using BoileRx® yielded a correlation coefficient (R2) of 0.81, representing a very high correlation between heating oil consumption and weather, as expected. It can be observed in the chart at left that the scatter of observed values displaying a very high fit, or correlation, between gallons per day of heating oil consumed and heating degree-days (HDD).





This type of fit is what would typically be observed when a dependent variable such as heating oil is modeled against HDD. Given that we were unable to ascertain a R2 value in excess of .50 in our baseline data, it would not be a useful exercise to estimate heating oil usage using the typical regression methods. Nevertheless, we can safely conclude that the benchmark boiler is now operating in a very efficient manner with respect to weather.