

# M2G Year over Year Energy Analysis Report Carolinas HealthCare System Mount Holly

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Analysis Period:

June 2011 – May 2013

Location:

275 Beatty Dr., Belmont, NC 28232

Report Date:

September 18, 2013



## Summary

The M2G boiler optimization control unit was installed at the Mount Holly Rehabilitation Center located at 275 Beatty Dr., Belmont, NC. The building makes use of two Parker boilers, each with a capacity of 1,700,000 BTU/hr. The M2Gs were installed on the boilers on May 14, 2012. A year-over-year analysis of the building's natural gas consumption was performed to determine the energy savings generated by the M2G using the building's actual billing data provided by the Carolinas HealthCare System. The natural gas consumption was normalized using heating degree days (HDD) to account for weather variation in the comparison. By using a year-over-year analysis, it was concluded that there was a 16.1% reduction in natural gas usage after the M2G's installation. The gas consumption, number of heating degree days, and normalized gas consumption can be seen in the table below. It was also determined that the return on investment (ROI) was 1.6 years for the two M2G units.

Mount Holly – Belmont, NC				
	Therms	HDD	Therms/HDD	Energy Savings
Pre-M2G	86,119	2,673	32.2	16.1%
M2G	89,512	3,322	27.0	

Findings from the data collected to-date include the following:

- ❖ Building comfort levels were unaffected by the M2G device.
- ❖ An average natural gas savings of 16.1% was observed during the study period.
- ❖ The Mount Holly Rehabilitation Center recognized a return on investment (ROI) of 1.6 years using the actual billing data provided by the Carolinas HealthCare System.
- ❖ The M2G has delivered significant energy and carbon savings and has also integrated into the existing building operations proving that the M2G is a commercially viable energy saving technology for the Carolinas HealthCare System.



# Introduction

## Greffen Technology

The M2G is an advanced intelligent boiler control that optimizes the gas usage of a boiler. An M2G unit monitors and records the temperature of the water flowing in and out of the boiler every 10 seconds. The M2G also monitors additional boiler operating data, including heat transfer rates during firing and interval periods when the burner is off.



When a demand on the boiler is made, the M2G microprocessor checks the latest data it has stored and decides whether to allow the control signal to fire the boiler or open a relay which blocks the boiler from firing. Energy savings are only one of the criteria used in the M2G decision making process: (1) building comfort level and (2) protection of the boiler from thermal shock are other key criteria that are constraints used by the M2G. Also, the M2G preserves the existing system's control over the boiler and system. The M2G's built-in intelligence adjusts to changing conditions and operational settings without any requirement for operator adjustment or intervention. From an operator viewpoint all existing controls and procedures remain fully functional.

The result is energy savings while ensuring maximum capacity during heavy load periods; this is accomplished with no impact on building comfort levels. Viewed from a perspective of waste heat, the M2G minimizes the waste heat going up the boiler flue while preserving the transfer of beneficial heat into the building.



# Data Collection, Analysis and Findings

## Energy Consumption

To determine the energy savings generated by the M2G, a year-over-year analysis was performed. A baseline year was established to determine the building's gas consumption without the M2G. The baseline year consumption was established using the billing data from June 2011 to May 2012. The consumption during the first year after the M2G's installation was then compared to the baseline. The first year with the M2G installed ranged from June 2012 to May 2013. The timeline can be viewed graphically in the table below.

Data Analysis Time Line			
June 2011	May 2012	June 2012	May 2013
Baseline Year		M2G's First Year Installed	

Annual consumption was normalized using heating degree days (HDD) to eliminate weather variation effects. The final calculations show that the M2G reduced the gas consumption at the Mount Holly Rehabilitation Clinic by 16.1%. The values used to calculate the savings are presented in the summary.

Using a two year heating degree day (HDD) average for the geographical region and the gas consumption savings per HDD during the M2G's first year installed, it was also determined that the M2G will save 15,462.2 Therms on average per year. The average annual savings were determined by calculating the gas (Therms) that is saved per HDD with the M2G. The savings per HDD was then applied to the average HDDs per year to determine the return on investment (ROI). The annual savings generated a ROI of 1.6 years for the Mount Holly Rehabilitation Center using a cost per Therm of \$0.62.

Annual Avg. HDD	Savings per HDD	Annual Savings	ROI
2,934	5.27 Therms	15,462.2 Therms	1.6 years



## Conclusions

The M2G was successful in delivering natural gas savings during the observed time period. This was accomplished by a reduction in the number of boiler firings, a reduction in waste heat going up the flue, and an increase in heat transfer to the building. The boiler met demand with less energy consumed and lower carbon emissions with no effect on the building comfort levels as confirmed with tenant reports (or lack thereof). Confirmed average annual energy savings are 16.1% with an ROI of 1.6 years. The M2Gs should also provide additional savings by lowering boiler maintenance costs due to the decrease in wear resulting from the reduction in boiler firings.

This analysis has demonstrated the M2G's delivery of significant energy and carbon savings for the Mount Holly Rehabilitation Center using the actual normalized year-over-year data. This savings was accomplished by the installation of a device that was easily integrated into the Mount Holly Rehabilitation Center's existing building operations. The M2G is therefore a commercially viable and proven energy saving technology for the Carolinas HealthCare System.



Carolinas HealthCare System

