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Preliminary M2G Pilot Study Report
Baylor Medical: All Saints Medical Center
Fort Worth, Texas

BAYLOR Medical Center

Pilot Period:
August 21 through September 9, 2010
Location:
Fort Worth, Texas
Report Date: September 14, 2010

Strategic Partner:

Greffen Systems, Inc. Confidential and Proprietary - Do Not Duplicate

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Summary

The M2G boiler optimization control unit was piloted at the All Saints Medical Center facility located in Fort Worth, Texas. The M2G device was installed in June 2010; testing and monitoring equipment was subsequently installed on August 20, 2010. Pilot data was collected for the period commencing on August 21 running through September 9, 2010. Greffen Systems managed the pilot, collected and analyzed data, and produced this report. Holman Boiler Works installed the device on the Bryan boilers. The following statistics summarize the performance of the M2G device during the pilot period.

M2G Pilot Summary Findings – ASMC Fort Worth, Texas				
Pilot Period:	*Start Date:*	20-Aug-10	*End Date:*	09-Sep-10
Parameter			**Change/Value**	
Firing Rate drop with M2G			24% Reduction	
Total Energy Savings			**14.4 % reduction**	

Findings from data collected include the following:

- Building comfort levels are unaffected by the M2G device.
- The M2G reduced the number of boiler fires by 24% which will produce additional savings by lowering boiler maintenance costs.
- Greffen expects that the M2G will deliver significant energy and carbon savings and integrate into Baylor's existing building operations making the M2G a commercially viable energy efficiency technology for Baylor Medical.

Introduction

Greffen Technology

The M2G is an advanced intelligent boiler control that optimizes the efficiency of a boiler. An M2G unit monitors temperatures of water flowing in and out of the boiler at least every 10 seconds and the information is recorded. 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 is only one of the criteria used in the M2G decision making process: (1) building comfort level and (2) protection of the boiler from stresses of thermal shock are the 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.

The All Saints Medical Center Facility

Baylor Medical Center at Southwest Fort Worth provides quality health care to the citizens of Southwest Tarrant County and surrounding areas for over 20 years. With 71 licensed beds, Baylor Southwest offers a broad range of general acute care, gynecological and emergency services. The Baylor Southwest campus encompasses medical office buildings that house family practice, internal medicine, orthopedic, podiatry and general surgery physicians. Specialty physicians practicing on this campus include gastroenterologists, endocrinologists and bariatric surgeons.

Fort Worth, TX climate is hot during summer when temperatures tend to be in the 80's and cold during winter when temperatures tend to be in the 40's. The warmest month of the year is July with an average maximum temperature of 94 degrees Fahrenheit, while the coldest month of the year is January with an average minimum temperature of 32 degrees Fahrenheit. Temperature variations between night and day tend to be moderate during summer with a difference that can reach 21 degrees Fahrenheit, and moderate during winter with an average difference of 22 degrees Fahrenheit.

The sprawling facility is served by a two Cleaver Brooks boilers, natural gas consumed on the site in the past year exceeded $900,000 worth of fuel. The boilers and ancillary equipment are located in a mechanical room located mechanical building located at the perimeter of the site. The boilers operate year-round, they provide space heat and reheat for the patients, caregivers, support staff, and visitors to the building.

Pilot Installation and Methodology

The M2G's was installed on the side of the main boiler control box. The primary stage control circuits were routed through the M2Gs. A boiler control unit exercises control over the boiler by means of this primary thermostat circuit. Gas consumption was determined from measurement of the gas control valve operation on the boiler. A Building Management System (BMS) supervises control of the boilers including enabling and determining the lead boiler. The M2G installation was accomplished without impacting existing controls.

In addition to the M2Gs, timers were installed which allowed the unit to operate in either of two modes. In the "save" mode of operation the M2G unit operates normally. In "bypass" mode the M2G is powered, but its ability to modify boiler firing and timing is blocked electronically. In bypass mode the boiler operates just as it would were the M2G technology not installed. The timer toggles save and bypass modes alternately on a 24 hour basis at midnight. Data was collected on boiler operations using a

Dent data logger which measured the gas valve operation for the boiler. The data was collected with time and date information for each change in boiler status. Each time the boiler turns on or off the event was recorded with the date, time, and action. The collected data was analyzed and a comparison of boiler operation was made with and without the M2G device operation.

Data Collection, Analysis and Findings

Energy Consumption

Time of use data was collected during the pilot period. Each boiler firing was recorded including start time and end time. Analysis of the time of use data was performed to determine gas consumption.

Operation of the M2G provided reduction in fuel consumption with no effect on building temperatures nor any other indications of any impacts on performance.

M2G Pilot Statistics — University of North Texas	
Parameter	Value
Firing Rate drop with M2G active	24% reduction
Total Energy Savings	**14.4 % reduction**

The pilot results validate the technology's performance with this boiler installation. The M2G operated well under a wide range of daily loading conditions. Data was collected for the entire pilot period. These boilers experience normal cycling behavior.

Conclusions

The M2Gs delivered significant savings on natural gas for the pilot period. This was accomplished by reducing the number of boiler firings by 24%, reduction in waste heat going up the flue, and in more efficient transfer of heat for use in the building. The boiler met demand with less energy consumed, lower carbon emissions, and with no effect on building comfort levels. Expected annual energy savings are 14.4%.

The M2G should provide additional savings by lowering boiler maintenance costs due to the decrease in wear resulting from the reduction of boiler fires. Greffen has demonstrated potential for M2G delivery of significant energy and carbon savings. This is savings is accomplished by installation of a device that easily integrates into Baylor's existing building operations.