

# RETROFIT EXISTING BOILERS TO MEET LOW NOX EMISSIONS REQUIREMENTS

## BOILER DIVISION CASE STUDY

### UC Davis Medical Center

Sacramento, California

Boiler Retrofit

### CUSTOMER APPLICATION AND KEY CHALLENGES

The UC Davis Medical Center serves 6 million residents in 33 counties encompassing 65,000 square miles in Northern and Central California. The acute-care, teaching hospital is licensed for 613 beds and maintains an annual budget of roughly \$1 billion. The hospital used their boilers for sterilization, domestic hot water and heating applications within the facility. They were operating four boilers: two Johnston 750 HP High Pressure, Dual Fuel (natural gas and #2 oil) Boilers that operated at 150 PSI and two Johnston 750 HP Low Pressure, Dual Fuel (natural gas and #2 oil) Boilers that operated at less than 15 PSI.

Under the new Sacramento Metropolitan Air Quality Management District (SMAQMD) Rule 411, they were required to reduce their emissions from 30 PPM NO<sub>x</sub> to 9 PPM NO<sub>x</sub> and in addition were required to reduce their CO from a permitted 400 PPM to 100 PPM.



UC Davis Medical Center in downtown Sacramento

### THE R.F. MACDONALD CO ANALYSIS & SOLUTION

Upon review, R.F. MacDonald Co. determined that the existing equipment could not be adjusted to the lower thresholds and would require a new retrofit burner package to be installed. The solution was to supply four industrial combustion ICNT Burners with Cleaver-Brooks Hawk ICS Integrated Parallel Positioning Controls in order to meet the 9 PPM NO<sub>x</sub> requirement for natural gas and 40 PPM NO<sub>x</sub> for number 2 oil.

The CB Hawk ICS provides precise computerized boiler/burner management control and monitoring for all the important boiler system operating and safety functions. The control system provided with the UC Davis Medical Center burners included O<sub>2</sub> trim and variable frequency drives that helped to ensure higher combustion efficiency. This also resulted in the added benefit of lower electrical costs.

The project also included the addition of 4 Thermal Gas flow meters used to monitor the natural gas flow and provide data to the ICS system. This data was used to determine boiler efficiency and fuel usage in order to track and trend the overall boiler operation. The final elements included in the package were fuel oil meters. These meters were used to ensure that operational limitations for burning the backup fuel were not exceeded.

BOILERS

PUMPS

SYSTEMS

SERVICE

PARTS

#### CORPORATE

25920 Eden Landing Road  
Hayward, CA 94545  
510.784.0110

#### FRESNO

88 N. Hughes Avenue  
Fresno, CA 93706  
559.498.6949

#### LAS VEGAS

3111 S. Valley View Blvd., Ste. E120  
Las Vegas, NV 89102  
702.220.6680

#### LOS ANGELES

578 Explorer Street  
Brea, CA 92821  
714.257.0900

#### MODESTO

1549 Cummins Drive  
Modesto, CA 95358  
209.576.0726

#### RENO

1430 Greg Street, Suite 503  
Sparks, NV 89431  
775.356.0300

#### SAN DIEGO

14781 Pomerado Road  
PMB 184  
Poway, CA 92064  
858.538.5877

[www.rfmacdonald.com](http://www.rfmacdonald.com)



Final retrofit in the UC Davis Medical Center

#### PROJECT RESULTS

The installation of the new burners was performed in two phases, each phase consisting of installing one High Pressure burner and one Low Pressure burner. In this manner the hospital never experienced downtime as a result of the installation.

**R.F. MacDonald Co. understood the importance of zero downtime for this customer and the two-stage installation of the new burners minimized the impact on the hospital operation to achieve that goal.**

The new burners achieved less than 8 PPM NO<sub>x</sub> and Zero CO throughout the range for natural gas and less than 40 PPM NO<sub>x</sub> and less than 50 PPM CO throughout the range for #2 Oil. These results were validated by a third party source testing company.

The new Hawk ICS controls provided new lead-lag features that enhanced the total plant operation that resulted in reduced cycling. The Parallel Positioning control system also optimized the positioning throughout the range.



**R.F. MacDonald Co.**

*your boiler & pump solutions team*

*~ since 1956*