Offsets Methodology for an Example Boiler Project Proposed by SC Johnson

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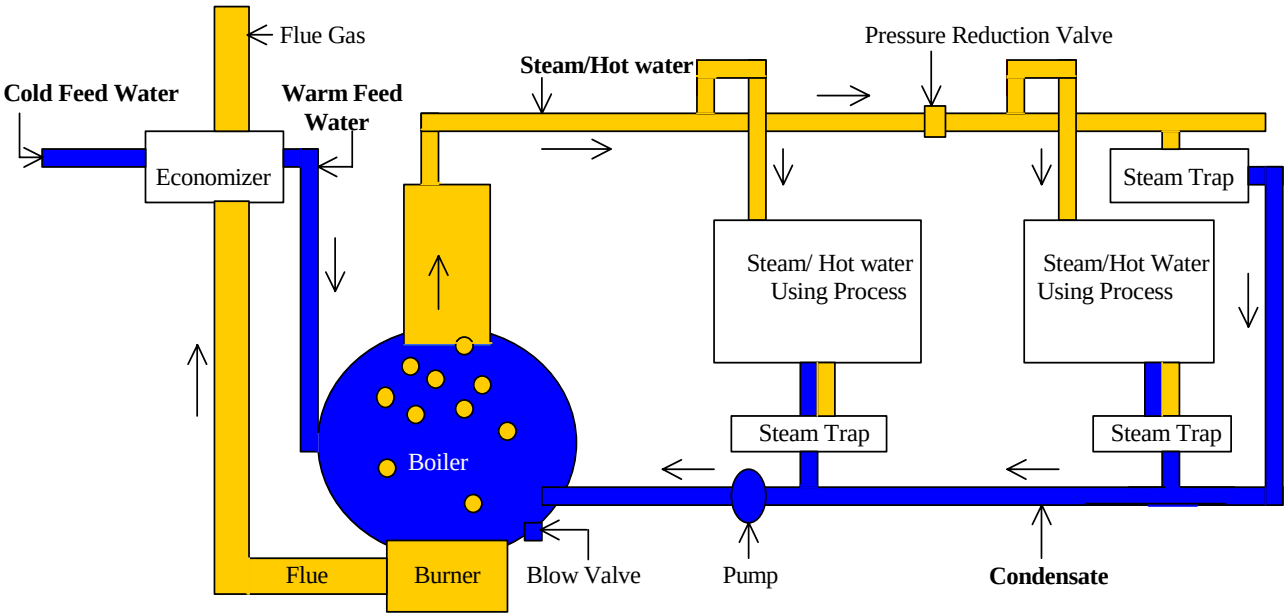
Potential Boiler Offsets

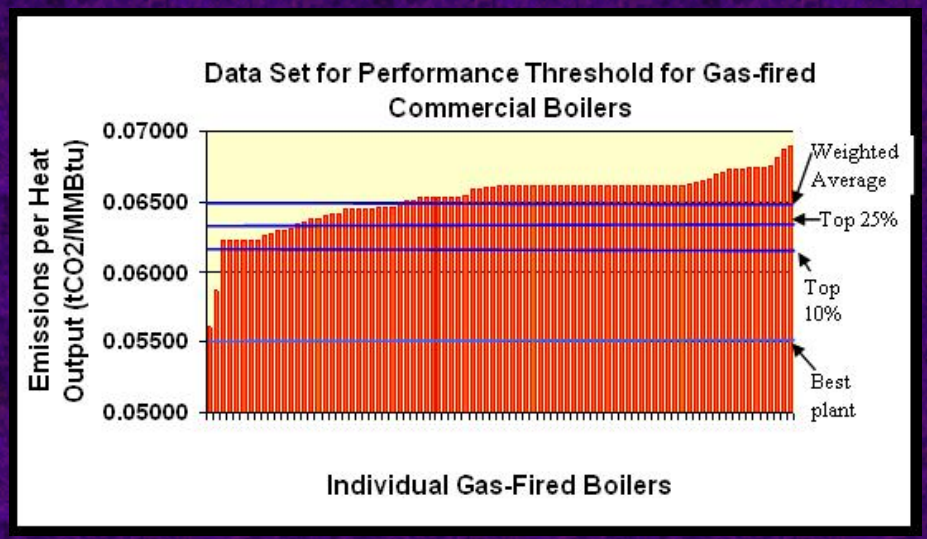
- May occur in the industrial or commercial sectors
- Four major project types:
  - Replacement of an existing boiler
  - Retrofit of an existing boiler
  - Fuel (or mix) change of an existing boiler (may need retrofit of burners)
  - Upgrade of distribution system (including condensate return)



Developing the Performance Threshold for Commercial and Industrial Boilers

Commercial Boilers

- Performance threshold is **rate-based**
  - Wider range of performance of new commercial boilers
  - Boilers are usually purchased off-the-shelf



Industrial Boilers

- Performance threshold is **technology-based**
  - Relatively narrow range of design efficiencies
  - Site-specific permitting requirements
- Performance threshold equal to performance of boiler meeting engineers specifications of the site *with* a non-condensing economizer.
  - To be additional, proposed project must include additional "options" to reduce GHG emissions.

SC Johnson Project Background

Project Description: Replace ten-year old gas-fired industrial boiler (60MMBtu/hr steam) at a local industrial facility in Racine, WI with a new, state of the art, gas-fired boiler with the same capacity.

- Current boiler, and its replacement, operate 5000 hrs/yr.
- The current boiler does not have specific GHG emission reduction features installed.
- New boiler will have condensing economizer, combustion air pre-heaters, blowdown heat recovery and advanced burner and controls.

- Key Services Provided by the Project: Used for space heating and process needs, will provide some absorptive chilling.

- Technology/Practice Introduced: Gas-fired condensing economizer, combustion air pre-heaters, blowdown heat recovery, and advanced burner and controls

- Project Size/Output: 60MMBtu/yr that makes steam at 150psi and 350F

- Location/Spatial Area: Racine, WI

Determine Regulatory Eligibility

- Any new industrial boiler is subject to the following Federal Clean Air Act Requirements
  - National Ambient Air Quality Requirements
  - New Source Performance Standards
  - National Emission Standards for Hazardous Air Pollutants
  - Construction Permits

- There are no Federal, State or Local regulations that require the new boiler to install options to reduce GHG emissions.

- The proposed industrial boiler will meet all air permitting requirements. As the project is not being undertaken to come into compliance with these requirements it is considered “eligible” as an offset. Any GHG emissions impacts of meeting CAA requirements are factored into the baseline.

Project Boundary

- Physical Boundary: The boiler itself plus the optional components (which affect the boiler exhaust, the incoming combustion air, the feedwater, and the heat recovery system)

- GHG Accounting Boundary: CO_2, N_2O and CH_4

- Temporal Boundary: Assess emission reductions over the course of a year to take into account any seasonal fluctuations in emissions from boiler operation

- Leakage: The project is not expected to result in leakage (i.e., increases in emissions outside the project boundary).

Performance Threshold

- Performance threshold is based on technologies in use across the United States (i.e., a technology threshold).
- Industrial boilers typically not "off-the-shelf"- designed based on company needs and air quality permitting requirements.
  - Common practice in the U.S. is a boiler that (1) meets company requirements and (2) installs a non-condensing economizer.
- Performance threshold = the emissions performance of the boiler, as determined by the boiler manufacture, that will meet the company's requirements and has a non-condensing economizer installed.

Industrial Boiler and Optional Components	Efficiency Range and Incremental Improvement*	Manufacturer Specified Efficiency Value*	Resulting Overall Efficiency*
Nominal New Boiler Efficiency	75% - 83%	80%	80%
Non-Condensing Economizer	1% - 7%	5%	85%
Advanced Burner and Controls	1% - 2%	1%	86%
Condensing Economizer	1% - 2%	1%	87%
Combustion Pre-heater	1% - 2%	1%	88%
Blowdown Heat Recovery	1%	1%	89%

* Thermal Efficiency

Performance Threshold for Project

Project includes options beyond non-condensing economizer, therefore is additional!

Estimate Baseline Emissions and Emission Reductions

Estimated Project and Baseline Emissions			
Baseline Boiler Attributes	**Baseline**	**Project Case**	**Net GHG Emission Reductions**
Heat Output (Million Btu / hr)	60	60	
Heat Input (Million Btu / hr)	75	67.4	
Load Factor (%)	80%	80%	
Operating Hours (hrs/yr)	5,000	5,000	
Thermal Efficiency (%)	80%	89%	
Fuel Use (Billion Btu / yr)	300.0	269.7	
CO_2 Emissions rate (t C02 /Billion Btu)	53.06	53.06	
CH_4 Emissions rate (tCO2e/Billion Btu)	0.11	0.11	
N_20 Emissions rate (tCO2e/Billion Btu)	0.03	0.03	
CO_2e Emissions (t CO_2e) / yr	15,960	14,348	1,612
Remaining life of boiler (years)	20	20	20
Cumulative CO_2 emissions over remaining life (t CO_2)	319,200	286,960	32,239

Implementation, Monitoring and Calculation

- Monitoring options include:
  - Direct fuel volume measurement
  - Steam flow measurement
  - Direct Stack CO_2 measurement
  - Dealer certified fuel volume measurement
  - Emission reductions would be calculated as the difference between the baseline emissions and the monitored project emissions