Form: 2019

BOILER EXHAUST ECONOMIZERS

"Manufacturing Waste Heat Transfer Products To Save Energy"

Boiler Economizer Systems · Gas & Diesel Cogeneration Systems · Fume Incineration Systems · Exhaust Steam Generators · Finned Tubing

An analysis of the exhaust volume is recommended in order to determine recoverable BTU, by measuring the CO_2, O_2, or velocity. Conservative assumptions shall be used when test data is unavailable. For any questions regarding the completion of this form, please refer to the explanation sheet 20500.

GENERAL APPLICATION DATA - Request For Quote:

Date: _____

Representative: _____ Contact: _____

End User: _____ Attention: _____

Address: _____ Phone: _____

City, State, Zip: _____ FAX: _____

Country, Province: _____ Email: _____

1. Boiler Description: Boiler Make and Model: _____

BTU/Hr. input: _____ or BHP: _____ or PPH Steam: _____

2. Boiler/Burner/Water Flow System:

❑ Steam Boiler (Operating: _____ PSIG) , or ❑ Hot Water Boiler

Burner Type:

❑ Atmospheric Burner, or ❑ Power Burner

Existing Boiler Feed System (if steam boiler):

❑ Continuously running boiler feedwater pumps

❑ On / Off boiler feedwater pumps

Common Recommended Economizer-Water Flow Systems:

❑ Circulating boiler feedwater and pressurized storage tank

❑ Circulating makeup water and pressurized storage tank

❑ Boiler feedwater direct (modulating boiler feed only)

❑ Hot water boiler return loop (with circulating pump)

3. Heat Sinks:

❑ Boiler feedwater

❑ Boiler makeup water

❑ Hot water return loop

❑ Process water

❑ Potable water

❑ Swimming pool water

4. Exhaust Stack Description:

❑ Vertical gas flow direction

❑ Horizontal gas flow direction

Economizer Space Limitations:

❑ None or: _____

Rectangular Stack Size: _____ X _____

Round Stack Diameter: _____

5. Type Of Fuel Burned:

Primary	**Standby** (for dual fuel burners)
❑ Natural Gas	❑ Natural Gas
❑ Propane	❑ Propane
❑ #2 Fuel Oil	❑ #2 Fuel Oil
❑ #4, 5, 6 Fuel Oil	❑ #4, 5, 6 Fuel Oil
Btu / Ft^3 _____	Btu / Gallon _____

6. Exhaust Gas Flow Entering: (Maximum pressure drop @ 100% load: _____ inches W.C.)

	Load 1	Load 2	Load 3	Load 4
Temperature (°F):				
❑ SCFM, or ❑ ACFM, or ❑ #/hr.				
Desired Outlet (°F):				
Content O_2 %:				
or Content CO_2 %:				
Content Excess Air %:				
Thermal Efficiency %:				
Load % of Input	100%			
Hours of Operation per Load:				

7. Liquid Flow Entering: (Maximum pressure drop @ 100% load: _____ PSIG)

	Load 1	Load 2	Load 3	Load 4
Temperature (°F):				
❑ GPM, or ❑ #/hr.:				
Desired Outlet (°F):				

8. Desired BTU / Hr. Recovery: _____

9. Savings Analysis Information:

Fuel Cost Per 100,000 Btu: $ _____

Total hours per year boiler operation (loads 1 + 2 + 3 + 4): _____

10. Justification for purchase:

Payback (months): _____

Return on Investment (%) : _____

Notes:

Attention End User:

Your combustion source description as listed above including operating conditions, fuel costs, etc. has either been instrument measured and/or noted by you. Because our quotation is a detailed analysis of expected savings for your specific application, please verify that the information is complete and accurate. This will allow us to proceed with compiling a comprehensive proposal for a Cain fuel-saving economizer system for your review.

Verified By: _____ **Date:** _____

Cain Industries, Inc. PO Box 189 Germantown, WI 53022 • 262-251-0051 • 800-558-8690 • 262-251-0118 Fax • sales@cainind.com

Submit Form To Cain Industries

This automatic form submittal feature requires that you have Adobe Acrobat version 4.0 or later.

- OR -

If you do not have Adobe Acrobat, and only have Acrobat Reader (free download), you may fill out this form on-line (or print it blank), then print it and fax to Cain Industries at 262-251-0118

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Instructions For Completing Form #2019 (Boiler Exhaust Economizers)

The General Application Data Form #2019 is designed to gather only Boiler Exhaust Economizer Information specifically for a complete and formal proposal. The following is a point by point general explanation as to the reasoning and importance behind each of the question/data entries. Please print or type the end user name, city, state, zip code, attention, phone & fax number completely.

We also highly recommend having a combustion analyzer and tape measure for the most accurate determination of data. A reasonably accurate and inexpensive O2 or CO2 combustion analyzer can be purchased locally or from Cain Industries. We recommend a lightweight instrument that would include a built-in thermometer, O2 and CO2 analyzer, smoke tester, digital excess air/combustion efficiency calculation, and that could fit easily into a briefcase.

1. BOILER DESCRIPTION:

It is important to note the Boiler Make and Model to specifically relate the economizer to the particular boiler and for reasons of future archiving. Note either the BTU input or BHP or PPH steam rate determines the size of the boiler for attaining the flow rate of the exhaust.

2. BOILER/BURNER/WATER FLOW SYSTEM:

Check off whether the boiler is steam or hot water. If it is steam, note the operating steam pressure. Also note whether the burner is an atmospheric (natural draft) type burner or a power burner (forced draft). Note the type of existing boiler feedwater system and a recommended water flow system which will incorporate the economizer.

3. HEAT SINK:

This information is necessary because it helps determine the type of system which will finally be recommended. This information also helps to select submittal flow diagram and related components which will make up system and be included in the proposal.

4. EXHAUST STACK DESCRIPTION:

Describe, as accurately as possible, the following: which direction the exhaust gas is flowing (whether it is a horizontal or vertical exhaust stack; rectangular, square or round exhaust stack shape; and the measured dimensions.

Note: Sometimes there are space limitations due to a confined area that an economizer has to fit. Cain Industries has several hundred models from which to choose. Custom built or augmented models are also possible to help accommodate practically all potential installations. Also describe any special circumstances or recommendations which may be evident.

5. TYPE OF FUEL BURNED:

Type of fuel burned is important because it explains how low the final exhaust temperature can exit the exchanger. Water and gas temperatures entering also help to determine optional equipment requirements such as stack corrosion control assembly, stainless lined interior, fin tube type, condensate drain catch ring assembly, feedwater preheaters, etc. If you are burning a fuel oil, we will assume the standard amounts of Btu/gallon and sulfur content unless otherwise indicated.

6. EXHAUST GAS FLOW ENTERING:

The exhaust gas flow entering is critical information, because it tells us exactly the amount of waste heat and the temperature at which it leaves the combustion source (in a given time interval). All four columns can be used to show various load conditions if applicable. (These columns also match the four columns used in the Cain Industries software program titled: LOADS). The first column shows the maximum load condition in order to calculate the maximum exhaust side pressure drop not to exceed. The Savings Analysis also will be based on that amount of waste heat recovered from the stated flows and temperature.

Example: A boiler with a maximum output design of 350 Bhp may operate at minimum amount of annual hours at 350 Bhp and a low load of 50 Bhp each, but continuously at an average load of 200 Bhp. Each load condition must have an estimated or `approximate' total of annual hours of operation. The Cain engineering software programs will add up the total heat for all the sub total loads entered.

A good approximate for a conservation total annual savings results when all four load conditions have been addressed with temperatures, flows, and annual hours at their respective load conditions. This combined information will be used generate an accurate savings analysis which the customer will base his decision on.

The gas temperatures, and SCFM or ACFM or lbs/hr flue gas, are the most important pieces of information for determining the amount of waste heat being exhausted. Exact temperature and SCFM flow rate information can be arrived at by the following methods:

a. The current boiler service testing data.
b. The boiler manufacturer's test data sheet.
c. The CO2 or O2 combustion analyzer tester (typical).
d. A pitot tube analysis (the most accurate).

The temperature of the exhaust gas entering the economizer is the `gross' temperature measured just upstream to where the economizer will eventually be placed. Usually there is a small 5/16" dia. hole already in the stack for applying a combustion analyzer or thermometer. Drill a test port in the stack if one is not available for normal combustion testing. The installation of a test port for testing will not have any effect on the combustion source or safety concerns. A general method for determining gross temperatures, when measured temperatures are unavailable for steam boilers is: 125'F plus the operating steam temperature 'F.

Either O2, CO2 or excess air must be given to determine or qualify the SCFM. The Cain engineering software package requires the operator to key in the value of SCFM or it is calculated from other information available. SCFM can also be determined with the `SCFM Equivalent Reference Chart', #21576, if the O2, CO2, or % excess air is known. This chart is extremely important because it relates SCFM to O2, CO2, excess air, and boiler efficiency (they all are relative and each affects the other).

If SCFM cannot be calculated, usually a flow rate at the actual temperature measured as ACFM, or generally referred to as CFM, can be determined. Lbs/hr of flue gas is nomenclature referring to the amount of heat per hour based on density, weight per ft3 and specific heat. ACFM or lbs/hr of flue gas can then easily be converted to SCFM. Desired outlet temperatures are occasionally mentioned due to a requirement in the specification and are not normally required unless a specification must be met. Excess air and combustion efficiency are also important and relate to equivalent data, as determined from the SCFM equivalent reference chart. Again, we highly recommend having a `combustion analyzer' or `pitot tube' for accurately determining temperature, SCFM combustion efficiencies etc.

7. LIQUID FLOW ENTERING:

The water temperature can be obtained from the customer or measuring it with a surface pyrometer or by some other temperature indicating device. The more information available regarding the existing water flow rate and/or system, the better we can determine what the exact flow should be in the proposed system. Depending on the specification, the desired outlet boiler feedwater temperature or hot water return might be important if it is required by the customer. Please note that if we are to provide an economizer to safely reduce the outlet gas temperature leaving the combustion source, the heat recovered is the basis on which a return on investment can be calculated. Outlet water temperatures become important only upon more particular performance requirements such as preheating water other than an existing boiler feed flow rate.

8. DESIRED BTU/HR RECOVERY:

Usually this relates to a specification or a performance guide outline. Occasionally, performance might have to meet a competitor's performance specifications. Performance data to be met might include maximum gas and liquid pressure drop data not to be exceeded, outlet water and exhaust temperatures and Btu/hr. recovery. This will be important information relating directly to the size and price of the exchanger. Note the data in the spaces provided. When bidding against the competition's specification, include a copy of the specification for our review along with the 2019 Form.

9. SAVINGS ANALYSIS INFORMATION:

When a savings analysis and/or savings study is requested, note the total hours the source of combustion actually fires per year and the price of fuel. (Annual fuel usage and total hours of operation can sometimes help verify the Btu/hr input at the burner.) If the total amount of hours is questionable, you will have to examine it yourself and draw your own conservative conclusions. It should be noted that the more conservative your data is, the longer the payback will tend to be, so it is best to have a combustion analyzer or pitot tube assembly for confirmed data. Contrary, the more specific the data is, the less conservative the engineering will be which will result in more attractive payback periods and controlled pricing.

10. JUSTIFICATION FOR PURCHASE:

Most economizers purchases are based on payback periods or return on investment minimums as defined by someone. Most of the successful proposals supplied have a return on investment under three years. As an example if the total purchase price to the customer (including installation) can be recouped within a period of 18 months there is an equivalent return on investment of 75% return on his money. Each year following will result in approximately the same return on investment. The payback justification is very important in this sense, because it determines what the minimum requirements must be in order to justify the expenditure.

NOTES:

1. FAX, mail, or overnight express the completed 2019 form for processing and the return of a complete proposal for consideration. When the 2019 form is received and processed, it is filed by reference number and the end users name for job protection.
2. In order to be as accurate as possible and to provide a complete, concise proposal, additional information such as pipe and tank space limitations, special code requirements regarding installation, ASME, AGA, insulation requirements, etc., should be noted.

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