Form: 2019

COMBUSTION EXHAUST HEAT EXCHANGERS

cain industries
heat recovery systems

"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 20250.

GENERAL APPLICATION DATA - Request For Quote:

Date: _____

Representative: _____ Contact: _____
End User: _____ Attention: _____
Address: _____ Phone: _____
City, State, Zip: _____ FAX: _____
Country, Province: _____ Email: _____

1. Type of Heat Exchanger: ❑ Exhaust-to-Liquid ❑ Exhaust-to-Steam

2. Exhaust Heating Source:

❑ Steam Boiler (Operating steam pressure: _____PSIG)
- ❑ Continuously running boiler feedwater pumps
- ❑ On / Off boiler feedwater pumps

❑ Hot Water Boiler ❑ Thermal Oxidizer
❑ Oven ❑ Fume Incinerator
❑ Furnace ❑ Natural gas Engine
❑ Furnace ❑ Diesel Engine
❑ Other: _____

Burner Type: ❑ Atmospheric Burner ❑ Power Burner

Exhaust Steam Generator Data:

Steam Pressure (PSIG): _____

Desired Performance: _____

(PPH, BTU, Final Outlet Exhaust °F)

Model: _____
Max. Btu/hr. Input (boilers): _____
Horsepower Output (boilers): _____
Lbs./hr. Steam Output (boilers): _____
kW@ (engines): _____
$In.^3$ (engines): _____
RPM (engines): _____
❑ Turbocharged ❑ Naturally Aspirated (engines)

3. Heat Sinks:

❑ Boiler feedwater
❑ Boiler makeup water
❑ Hot water return loop ❑ Swimming pool water
❑ Process water ❑ Glycol Return Loop
❑ Potable water ❑ Hot Oil Return Loop
❑ Other: _____

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)

Temperature (°F):				
❑ GPM, or ❑ #/hr.:				
Desired Outlet (°F):				

8. Type of Liquid:

❑ Water
❑ 50% Ethylene Glycol
❑ Therminol
❑ Dowtherm ❑ Other: _____

9. Savings Analysis Information:

Fuel Cost Per 100,000 Btu: $ _____
Total Hours per Year Combustion Operation (loads 1 + 2 + 3 + 4): _____

10. Justification for purchase:

Payback (months): _____
Return on Investment (%) : _____

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

PLEASE PRINT A COPY FOR YOUR RECORDS BEFORE SUBMITTING
You may submit electronically via email or fax your request to 262-251-0118.

Submit (electronically via email)

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Instructions For Completing Form #2019 (Combustion Exhaust Heat Exchangers)

The General Application Data Form #2019 is designed to gather all pertinent information 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 (typing is not required) customer name, city, state, zip code, attention line and phone number completely. (Note: If you are sending by FAX please use a dark colored ink pen instead of a pencil.) Also include your name and the company you represent.

We also highly recommend having a combustion analyzer and tape measure for the most accurate determination of data. A good, reasonably accurate and inexpensive O2 or CO2 combustion analyzer is made by Bacharach Combustion Instruments and can be purchased from Cain Industries. This lightweight instrument comes complete with a built-in thermometer, O2 and CO2 analyzer, smoke tester, digital excess air/combustion efficiency calculation, and can fit easily into a briefcase.

1. TYPE OF HEAT EXCHANGER:

The reason the type of exchanger must be noted is because Cain Industries builds two different types: air-to-steam and many versions of air-to-liquid.

2. EXHAUST HEATING SOURCE:

Please check off the appropriate source of combustion and print the manufacturer of the combustion source if that information is available. For many of the various types of combustion sources, we need either the maximum Btu/hr input or the lbs/hr steam or the boiler horsepower to determine the maximum design of the source of combustion. If the combustion source is not a boiler, we then need to know the maximum Btu/hr input. Also note whether or not the burner itself is an atmospheric (natural draft) type burner or a power burner (forced draft). Induced draft fans located downstream of the combustion source are usually considered in the power burner category.

If the combustion source is a diesel or gas engine, note the model, kilowatt output, cubic inch displacement, R.P.M., the configuration (i.e., turbocharged or naturally aspirated), and any other information which may be pertinent to the description.

EXHAUST STEAM GENERATOR DATA:

If the type of heat exchanger you have selected is an exhaust to steam, then enter the desired operating steam pressure and the desired performance. Describe the desired performance in lbs. steam/hour, Btu/hour output, or the maximum performance available (specify an exhaust steam generator outlet temp.).

3. HEAT SINK:

This information is necessary because it helps us determine the type of system which we will recommend. Please note those which are listed and if the system is special, describe it. This information also helps us select submittal flow diagrams and components which will all be part of 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 different models from which to choose to accommodate 99% of the installations. Describe any special circumstances or recommendations which may be evident.

5. TYPE OF FUEL BURNED:

Type of fuel burned is important because it tells us how low we can take the final gas temperature exiting the exchanger. Water and gas temperatures entering also helps to determine whether the `acrylic resin coating and catch ring assembly' will be required, or if a water preheater (ex.: boiler applications operating with No. 4-6 oil) might be required. If the combustion source is firing with natural gas, we will assume that the Btu/ft3 is 1000, unless otherwise noted. If you are burning a fuel oil, we will assume the standard amounts of Btu/gal., unless otherwise noted.

6. EXHAUST GAS FLOW ENTERING:

The exhaust gas flow entering is critical information, because it tells us accurately the amount (in a given time interval) of waste heat and the temperature at which it leaves the combustion source. All four columns do not have to be filled out, however one must be filled out as completely as possible, because the Savings Analysis will be based on that amount of waste heat at it's temperature.

Example: A boiler with a maximum output design of 350 Bhp may operate continuously at an average load of only 200 Bhp. Ideally, we would prefer to know what the maximum load conditions are which is 350 Bhp, and the average load condition which is 200 Bhp. This is because the 200 Bhp 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.
d. A pitot tube analysis (the most accurate).

The temperature of the gas entering the economizer is the temperature measured just prior 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). If there is not a hole already in the stack for normal combustion testing, install one (the installation of a hole 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. Our computer system requires the operator to key in the value of SCFM. SCFM can also be determined with the `SCFM Equivalent Reference Chart', bul.21576, if the O2, CO2, or % excess air is known. This chart is extremely important because is relates SCFM to O2, CO2, excess air, and boiler efficiency (one affects the others).

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 has to be met. Also excess air and combustion efficiency are 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. Please check the column depicting the load, which the savings analysis will be based.

7. LIQUID FLOW ENTERING:

The liquid temperature can be obtained by questioning the customer, measuring it with a surface pyrometer or by some other temperature indicating means.

The more information available regarding the liquid 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 liquid temperature of water or some other fluid 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 temperatures only become important upon more particular performance requirements in addition to the other output data.

IMPORTANT: 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. 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 spec. for our review along with the 2019 Form.

8. TYPE OF LIQUID:

The type of liquid, such as water, ethylene glycol, therminol fluids, etc. is important to note because of variances in their specific heat, specific gravity, and viscosity which can have an considerable effect on the heat transfer.

9. SAVINGS ANALYSIS INFORMATION:

When a savings analysis and/or savings study is requested, note how many 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 to 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.

10. JUSTIFICATION FOR PURCHASE:

Most economizers purchases are based on payback periods or return on investment minimums as defined by someone. Most of the proposals supplied have a return on investment ranging from 12 to 24 months (after utility rebates and incentives) based on present fuel costs. As an example if the total purchase price to the customer 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. Again, to be very accurate and to provide a complete, concise proposal, any other additional information which will help, such as pipe and tank space limitations, special code requirements regarding installation, ASME, AGA, insulation requirements, etc., should be noted.