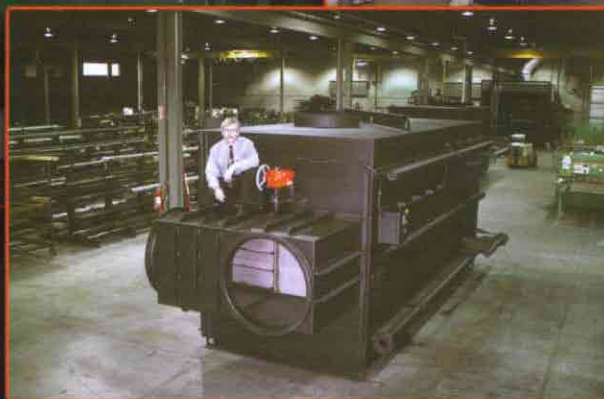


cain
industries
heat recovery systems

EXHAUST HEAT RECOVERY

Heat Recovery Systems



"Manufacturing Waste Heat Transfer Products To Save Energy"

EM SERIES ENERGY MANAGER

DESIGN

Stainless cylindrical heat transfer coil design



Slip fit gas connections

Quick release tension latches

Hinged stainless steel access door panels

Stainless steel internal bypass

Circulating pump package including: in line circulating pump, (2) inlet and outlet temp. gauges, check valve, 125 psig T&P relief valve, flow control valve, differential pump control

- Condominium Complex
- AO Smith: 650,000 Btu/hr. Hot Water Heater
- Cain Model: EM8-12
- Preheating hot water return



APPLICATION

Combustion Sources: Steam boilers, hot water boilers, dryers, ovens

Combustion Capacity: 200,000 to 6,400,000 Btu/hr input

Entering Gas Temps.: 300°F to 700°F

Heat Sink Types: Boiler feedwater, makeup water, hot water return, hot water storage tank, condensate tank, process water, potable water.

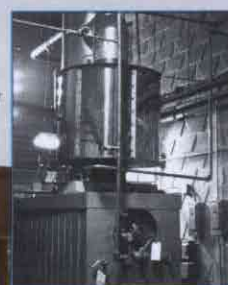
Miscellaneous: The EM is a circulating recovery system designed to recover waste heat safely and efficiently. By utilizing the flow control valve to adjust the flow of water to the unit, the EM effectively reduces the stack temp. to 250°F or lower (adjustable with the differential pump control as the burner cycles). They are designed to operate with very low static gas pressure drop for safe, automatic, operation on atmospheric as well as power burners. These 10 lightweight, standard models come complete with a circulating pump package. Standard stack sizes of 6, 8, 10, 12, 14, 16, 20, 24, 28, & 32" diameters are designed to fit most small size combustion sources (optional stack transitions available as required). Like the larger cylindrical units, they come equipped with all the standard design features for specific engineering design needs.

CRS SERIES CIRCULATING RECOVERY SYSTEM

DESIGN

Cylindrical heat transfer coil design

- Brake Lining Manufacturer
- Cleaver Brooks: M4, 5,000,000 Btu/hr. Steam Boiler
- Cain Model: C500
- Preheating boiler feedwater



Slip fit or flange gas connections (custom designed to fit the stack)

Hinged stainless steel access door panels

Quick release tension latches

Stainless steel internal bypass

Condensate drain catch ring assembly

Circulating pump package including: in line circulating pump, (2) inlet and outlet temp. gauges, check valve, 125 psig T&P relief valve, flow control valve, differential pump control

APPLICATION

Combustion Sources: Steam boilers, hot water boilers, dryers, ovens

Combustion Capacity: 1,000,000 to 15,000,000 Btu/hr input

Entering Gas Temps.: 300°F to 700°F

Heat Sink Types: Boiler feedwater, makeup water, hot water return, hot water storage tank, condensate tank, process water, potable water

Miscellaneous: The CRS, complete with a pump package assembly, is a unique system of selection and design. Its objective is to simply reduce the stack temperature to 250°F and send the recovered heat to the heat sink. By utilizing the flow control valve to adjust the flow of water to the unit, the CRS effectively reduces the stack temp. to 250°F or in many cases lower (adjustable with the differential pump control as the burner cycles). The unit is selected based on flue gas temperatures entering and the Btu/hr input to the burner. The basic and unique design features are that the unit is guaranteed to reduce the flue gas temperature to 250°F and custom fit to the existing round stack.

FTR SERIES FIN TUBE RECOVERY

DESIGN

Internal thermal expansion design

Header manifold for high liquid flow

Mounting flanges for bolting to mating flanges or adapters

Hinged stainless steel access door panels

Quick release tension latches

Stainless steel internal bypass

Optional sootblower assembly

- Hospital
- Keeler: 435 Bhp Steam Boiler
- Cain Model: FTR-1F1F28CSS
- Preheating boiler makeup water



APPLICATION

Combustion Sources: Steam boilers, hot water boilers, hot oil heaters, combustion sources with round stack diameters from 14" to 72", liquid flow rates 50 to 500 g.p.m.

Combustion Capacity: 100 to 30,000 scfm

Entering Gas Temps.: 325°F to 1400°F

Heat Sink Types: Boiler feedwater, makeup water, process water, hot water return, potable water, thermal fluids, run-around systems

Miscellaneous: The FTR can be applied in cold water condensing heat exchangers, confined area restrictions, and is offered in stainless, carbon, or AL-FUSE fin tubing. The many standard models make it possible to size with overall diameter and height constraint considerations. Stack to FTR adapters are required when the same gas connection diameters cannot be met. The unit is selected over the FCR when low liquid side pressure drops are required or when there are large volumes of flue gas available. Flexibility allows specific engineering requirements to be met such as fin spacing for fouling conditions and low gas pressure drops.

RTR SERIES RECTANGULAR TUBE RECOVERY

DESIGN

No pressure welds in the gas stream

Internal thermal expansion design

10 ga. structural exterior

Stainless steel interior

2" factory insulation

Mounting flanges for bolting to mating flanges or adapters

Removable access door

Stainless steel internal bypass

Header manifold for high liquid flow

Compression fittings for tube replacement

Condensate drain catch ring assembly

- Medical Center
- (4) 600 Bhp Steam Boilers manifolded in a common breeching
- Cain Model: RTR-112128SSS
- Preheating boiler makeup water



APPLICATION

Combustion Sources: Steam boilers, hot water boilers, generally having rectangular or square stacks

Combustion Capacity: To 40,000 pph (50,000,000 Btu/hr input approx.)

Entering Gas Temps.: 300°F to 1250°F

Heat Sink Types: Boiler feedwater, makeup water, hot water return, hot water storage tank, condensate tank, process water, potable water

Miscellaneous: The RTR fin tube materials are available in stainless steel, carbon steel, 316 stainless tube and carbon steel fin, or AL-FUSE with special fin spacings when specified. Combustion sources with round exhausts require optional stack transitions. The internal gas bypass can be used to temper the exiting gas for stack corrosion control or maintain water temps. when too much heat is available. The economizer can be used in conjunction with cold water or condensing applications.

UTR-1

SERIES

U-TUBE RECOVERY 1

DESIGN

Internal thermal expansion design

2" thickness factory installation

Hardshell 10 ga. structural exterior

Optional compression fitted tube to header attachment

Removable core assembly

Removable inspection door

Header manifold for high liquid flow and low static head



APPLICATION

Combustion Sources: Incinerators, thermal oxidizers, catalytic converters, boilers, hot oil heaters.

Combustion Capacity: 200 to 50,000 scfm

Entering Gas Temps.: To 1600°F

Heat Sink Types: process water, boiler feedwater, ethylene glycol, thermal transfer fluids

Miscellaneous: The UTR1 is applied where a specific heat transfer requirement is specified, and square or rectangular stacks along with confined area restrictions have to be addressed. The UTR1 is offered in stainless, carbon, or AL-Fuse fin tubing with bare tube thru 8 fins per inch spacing selection flexibility. With over 100 different face areas available ranging from (8" x 19") thru (72" x 131") and unlimited rows deep, many possible selections are available to choose from to adapt easily to the design needs. The capability of quickly removing fin tube rows or core assemblies from the shell without disturbing the exhaust gas connections, reduces down time and allows cleaning and periodic inspections easy.

HRS-A

SERIES

HEAT RECOVERY SILENCER-AXIAL

DESIGN

Stainless steel exterior

Internal thermal expansion design

Cylindrical heat transfer coil design

Optional stainless steel internal bypass

Sound attenuation

Optional 1" factory insulation

Optional circulating pump

- Cogeneration Prime Power
- 450 cu. in. V8 Gas Engine
- Cain Models: HRS-7001SAC
- Preheating engine jacket water & engine silencing



APPLICATION

Combustion Sources: Gas engines (reciprocating, turbo charged, naturally aspirated, rotary), diesel engines, boilers

Combustion Capacity: 15 to 150 kw (20 to 200 scfm)

Entering Gas Temps.: To 1250°F

Heat Sink Types: Engine jacket water, process water, boiler water, ethylene glycol

Miscellaneous: The HRS Axial waste heat recovery silencers are compact cylindrical heat exchangers designed for either dual or single exhaust small engines. In addition to lowered exhaust noise, eliminating the need for a muffler, the unique coil type configuration and circulating pump allows for a liquid flow system, like the CRS or circulating recovery system. The 1" NPT interconnecting piping, to and from a main liquid flow loop, is simple and less costly than special main piping changes. The required heat transfer surface coupled with a small diversion of the main flow, adequately recover desired Btu/hr and lower the outlet gas temperature below 250°F as required. The optional internal stainless steel gas bypass also allows tempering of the exit temperatures when required.

ESG

SERIES

EXHAUST STEAM GENERATOR

DESIGN

Skid mounted packaged forced circulation watertube design

Size ranges from 20 to 350 Boiler horsepower

Operating steam pressures ranging from 3 psig to 250 psig

98% dry steam at saturated steam temperatures

5 minute startup to operating steam pressure

Large steam flash drum assembly allowing for wide load fluctuations to prevent low water shut down

1/3 the weight of conventional waste heat boilers

1/2 the size of conventional waste heat boilers

Component designed requiring no welding for ease of maintenance

Stamped in accordance with the latest edition of the ASME code and National Board

Fully automatic for supplemental or primary steam output source

'Explosion proof' heat transfer exchanger within the exhaust gas

Full modulating internal exhaust bypass designed to easily accept dual engine exhausts

Lowest 'pinch point' (operating steam temperature to final leaving exhaust temperature) offering greater efficiency



APPLICATION

Combustion Sources: Gas engines (reciprocating, turbo charged, naturally aspirated, and rotary), diesel engines, incinerators, thermal oxidizers, catalytic converters, boilers, hot oil heaters.

Combustion Capacity: 1000 to 50,000 scfm

Entering Gas Temps.: 600-1600°F

Heat Sink Types: supplemental steam demand and/or primary steam source for steam heating or process steam.

Miscellaneous: The ESG is a unfired fully automatic, skid mounted packaged steam generator combining a fin tube heat transfer section, steam flash circulating drum assembly, and full exhaust bypass. Where low or high pressure steam output demand is a necessity, the ESG in terms of recovered Btu/hr and its use, is a more valuable alternate selection to liquid or air preheat exchangers. The design allows for important flexibility in heat transfer (explosion proof) output, light weight design compactness for lower installation costs, and will offer the greatest thermal efficiency.

HRS-R

SERIES

HEAT RECOVERY SILENCER-RADIAL

DESIGN

Sound attenuation

Optional temperature indicating control panel

Factory insulation

Internal thermal expansion design

Horizontal/vertical exhaust flow connection

Full exhaust bypass assembly

Optional modulating damper actuator

Optional exhaust transitions/expansion joints



APPLICATION

Combustion Sources: Gas engines (reciprocating, turbo charged, naturally aspirated, rotary), diesel engines, boilers

Combustion Capacity: 200 to 4000 kw

Entering Gas Temps.: To 1250°F

Heat Sink Types: Engine jacket water, process water, boiler water, ethylene glycol

Miscellaneous: The HRS Radial waste heat recovery silencer is a module configuration designed to receive total liquid flow, reduce the gas temperatures to desired levels, and lower exhaust noise eliminating the need for a muffler. As a standard component within each module, the stainless steel internal gas bypass also will allow tempering of exit temperatures when required. The radial design allows immediate access to the core for cleaning and/or routine inspection of a single row core assembly (when dirty combustion is a possibility optional sootblowers are available upon request).

B SERIES BOILER ECONOMIZER

DESIGN

Internal thermal expansion design

Stainless steel internal bypass

- College
- Columbia Steam, (2) 4,200,000 Btu/hr Hot Water Boilers
- Cain Model: B25
- Preheating hot water return



Mounting flanges for bolting to mating flanges or adapters

Hinged stainless steel access door panels

Quick release tension latches

Cylindrical heat transfer coil design

Optional sootblower assembly

APPLICATION

Combustion Sources: Steam boilers, hot water boilers

Combustion Capacity: 40 to 800 Bhp

Entering Gas Temps.: 300°F to 700°F

Heat Sink Types: Boiler feedwater, makeup water, hot water return, hot water storage tank, condensate tank, process water, potable water

Miscellaneous: The B-Series type boiler economizer is comprised of 14 standard models. An "off the shelf" unit, it is designed primarily for boilers with round stacks. The standard stack connections can easily be altered to fit specific boiler stacks with 10" to 34" maximum diameters alleviating the cost of stack adapters. The units come standard either with 4 or 6 fpi spacings for operating with No. 2 fuel oil and/or natural gas depending on the efficiency of the combustion. With its light-weight design and exclusive AL-FUSE heat transfer surface, installation is fast and costs are kept to a minimum.

FCR SERIES FIN COIL RECOVERY

DESIGN

Internal thermal expansion design

Cylindrical heat transfer coil(s) design

- Waste Water Treatment Facility
- Vapor Corp., 150 Bhp Modulating Steam Boiler
- Cain Model: FCR-120B26ALS
- Preheating boiler makeup water to the deaerator



Mounting flanges for bolting to mating flanges or adapters

Hinged stainless steel access door panels

Quick release tension latches

Stainless steel internal bypass

Condensate drain catch ring assembly

APPLICATION

Combustion Sources: Steam boilers, hot water boilers, hot oil heaters, combustion sources having round stacks from 4" to 36" diameter and a maximum liquid flow of 50 g.p.m.

Combustion Capacity: 50 to 10,000 scfm

Entering Gas Temps.: To 1400°F

Heat Sink Types: Boiler feedwater, makeup water, process water, potable water, thermal fluids, run-around systems

Miscellaneous: The FCR is a more custom designed heat exchanger which can be applied in cold water condensing heat exchangers, confined area restrictions, and is offered in stainless, carbon, or AL-FUSE fin tubing. Flexibility allows specific engineering requirements to be met such as fin spacing for fouling conditions and low gas pressure drops.

ITR SERIES INCINERATOR TUBE RECOVERY

DESIGN

10 ga. structural exterior

High temperature alloy interior

4" factory insulation

High temperature alloy internal bypass

No pressure welds in the gas stream

Internal thermal expansion design

- Medical College
- Atlas Incinerator
- Cain Model: ITR-1FEE28SSS
- Preheating shell and tube hot water return



Mounting flanges for welding to existing stack or adapters

Removable access door

Header manifold for high liquid flow

Compression fittings for tube replacement

APPLICATION

Combustion Sources: Incinerators, thermal oxidizers, catalytic converters

Combustion Capacity: All load conditions

Entering Gas Temps.: 1250°F to 2000°F

Heat Sink Types: Process water, boiler feedwater, hot water return, potable water, hot oil

Miscellaneous: The ITR is specifically designed for high temperature exhausts. All gas side surfaces in contact with the exhaust are stainless and/or high temp. alloy. Combustion sources with round exhausts require optional stack transitions. Special fin spacing specifications can be offered dependent on fouling conditions. The internal gas bypass can be used to bypass heat (up to 70% dependent on the application) and temper water and/or the exiting gas temperatures.

UTR SERIES U-TUBE RECOVERY

DESIGN

Hardshell 10 ga. structural exterior

Stainless steel interior

1" thickness factory insulation



- Cogeneration-Prime Power
- White: G3400 33Kw Gas Engine
- Cain Model: UTR-630218CSS
- Preheating engine jacket water & engine silencing

Condensate drain catch ring assembly

Individual gas connection sizes and design

Sound attenuation

Removable core assembly

Header manifold for high liquid flow and low static head

APPLICATION

Combustion Sources: Gas engines (reciprocating, turbo charged, naturally aspirated and rotary), diesel engines

Combustion Capacity: 15 to 300kw

Entering Gas Temps.: To 1600°F

Heat Sink Types: Engine jacket water, process water, boiler water, ethylene glycol, thermal transfer fluids

Miscellaneous: The UTR is applied where both rectangular configuration and heat transfer surface vs. performance is critical. The UTR can be located within the engine to meet space limitations. Flexible exhaust gas connection locations and sizes allows the UTR to adapt easily to an OEM packager's design needs. The capability of removing the core assembly without disturbing the exhaust gas connections, makes cleaning and inspecting the fin tubing easy, especially when operating with various fuel oils. Optional insulation thicknesses available as requested.

"Cain Industries is dedicated to design and production of the highest quality, fuel-saving, Exhaust Heat Recovery Systems."

It is a fact that a minimum of one quarter of every fuel dollar is wasted, when instead, much of it can be recovered.

Cain Industries recovers the heat and transfers the usable Btu's to water, glycol, special fluids, or steam. Listed below are some of the combustion sources that would benefit from a Cain heat recovery system.

Combustion Sources:	Wasted \$\$ for every fuel dollar spent:
Industrial hot water or steam boilers	\$.25
Commercial hot water or steam boilers	\$.30
Dryers	\$.30
Reciprocating gas engines	\$.35
Diesel engines	\$.35
Ovens	\$.40
Furnaces	\$.80
Incinerators	\$1.00
Catalytic converters	\$1.00

VERSATILITY

Since 1978, Cain Industries has produced high quality waste heat transfer products. We are dedicated to the reduction of fuel usage and pollution - worldwide. Our expertise makes us the natural choice for both the retrofit and OEM client. We set ourselves apart from others by producing products to serve a broad spectrum of markets: The *Diesel and Gas Cogeneration* market, the *Boiler Exhaust* market, and the *Fume Incineration* market. As the only manufacturer in all of these markets, Cain Industries has the greatest selection of products and system applications available.

We have become leaders in this industry by replacing old technology with the most recent technological advancements. Using elaborate computer programs, Cain Industries has developed and manufactured twelve product lines with over 1,350 dependable heat transfer products. Our unique designs increase efficiency and performance, while making installation, service, and maintenance more cost effective.

We are also dedicated to a primary investment in our associates, their manufacturing technology, quality improvements, and innovative cost reductions to meet the customer's budget. It is by these means, that we will achieve absolute customer satisfaction. The success of Cain Industries is a direct result of our simple philosophy: to produce the highest quality products, and provide unmatched customer service.

FAST PAYBACK

The words "safely and economically recover waste heat" also mean "no-risk return on investment" which is exactly what Cain Industries heat recovery systems represent. By installing a fuel saving economizer on a combustion source, the Btu recovered pays for all the equipment installed, usually in 12 to 18 months (or an equivalent return on investment of 75 to 100% annually). This means recapturing approximately 50% of the wasted \$\$ for every fuel dollar spent. The exact payback period for your installation will depend on local fuel costs and the number of hours of usage.

ADVANTAGES

Depending on fuel type, temperatures, flow size requirements, performance and specification, Cain Industries can propose a specific cost effective exchanger to economize your fuel bills. Listed below are just a few design features which clearly speak for themselves and far exceed the capabilities of other economizer manufacturers:

- **Internal, stainless steel, exhaust bypass** for stack corrosion control, tempering exit temperatures, and/or protection against exhaust backpressure buildup due to fouling.
- **Stainless steel hinged access doors** for ease of routine inspection and/or cleaning.
- **Quick release, adjustable tension latches** requiring no tools, which lock the access doors in place.
- **Three types of available fin tube materials:**
 1. TP316 stainless steel tube and ALFUSE™ fin metallurgically bonded.
 2. SA178 carbon steel tube and fin, Nickel Braze/welded or standard frequency welded.
 3. TP316 stainless steel tube and TP304 stainless steel fin, Nickel Braze/welded or standard frequency welded.
- **No weld/removable tubes** with no pressure welds in the gas stream, for easy tube replacement.
- **Round or rectangular design configurations** as standard model selections.
- **Custom computer design** for special multiple order OEM requirements.
- **ASME & National Board** designed and certified by Cain Industries.

OPTIONAL COMPONENTS

Depending on the application, Cain Industries offers a variety of ancillary equipment, such as timed automatic sootblowers, factory insulation, circulating pumps, thermometers, remote indicating controllers, modulating damper actuators, and stack-to-economizer transitions, to meet the needs of each specific installation.

FREE SAVINGS ANALYSIS

Upon review of your application, you can expect our proposal within 24 hours. It will include professionally engineered details showing equipment costs, savings analysis, computer-generated economizer performance, cad dimensional drawings, flow schematics, warranty and performance guarantee.

EASE OF INSTALLATION

The selection of a Cain Industries economizer results in the most economical design to install and maintain. Design advantages such as compactness and lightweight construction allow for installation at the very lowest cost.

GUARANTEED PERFORMANCE

All economizers are guaranteed to meet or exceed the anticipated performance specification.



SAVINGS COMPARISON ANALYSIS

Four examples of typical combustion source types, and the results with a Cain Industries heat recovery system applied.

DATA without a Cain System

Combustion Source: **Hot Water Boiler**
 Heat Sink Return Water
 Waste Exhaust Temp 510°F
 Water Temp. Inlet 130°F
 Btu/hr Burner Input 6,437,000
 Fuel Type Natural Gas
 O₂ Content 10%
 Excess Air 82%
 Combustion Efficiency 75%
 Fuel Cost Per Therm \$.40
 Annual Operating Hours 6,000

PERFORMANCE with a Cain System

Model Selection C700
 Circulating Water Flow 20 gpm
 Final Exhaust Temp. 250°F
 Water Temp. Outlet 186°F
 Pressure Drop, Water 5.0 psig
 Pressure Drop, Exhaust 0.10" WC
 Btu/hr recovered 560,900
 Btu/hr saved 747,900
 Total Cost Installed \$12,400
Payback 13.3 mo.
Annual Return on Investment 90%
Annual Savings \$17,930

DATA without a Cain System

Combustion Source: **800 BHP Steam Boiler**
 Heat Sink Boiler Feed Water
 Waste Exhaust Temp. 470°F
 Water Temp. Inlet 210°F
 Btu/hr Burner Input 33,580,000
 Fuel Type Natural Gas
 O₂ Content 6%
 Excess Air 36%
 Combustion Efficiency 78.9%
 Fuel Cost Per Therm \$.40
 Annual Operating Hours 6,000

PERFORMANCE with a Cain System

Model Selection RTR-142H26ALS
 Boiler Feed Water Flow 55.2 gpm
 Final Exhaust Temp. 319°F
 Water Temp. Outlet 263.3°F
 Pressure Drop, Water 2.0 psig
 Pressure Drop, Exhaust 0.47" WC
 Btu/hr recovered 1,417,000
 Btu/hr saved 1,776,000
 Total Cost Installed \$37,700
Payback 8.9 mo.
Annual Return on Investment 134%
Annual Savings \$ 42,624

DATA without a Cain System

Combustion Source: **1,250 kW Engine**
 Heat Sink 50% Ethylene Glycol
 Waste Exhaust Temp. 968°F
 Water Temp. Inlet 195°F
 SCFM 3,667
 Fuel Type Natural Gas
 O₂ Content N/A
 Excess Air N/A
 Combustion Efficiency (relative) 78%
 Fuel Cost Per Therm \$.40
 Annual Operating Hours 6,000

PERFORMANCE with a Cain System

Model Selection HRSR-336B28CSS
 Circulating Liquid Flow 175 gpm
 Final Exhaust Temp. 330°F
 Water Temp. Outlet 232°F
 Pressure Drop, Water 8.3 psig
 Pressure Drop, Exhaust 1.75" WC
 Btu/hr recovered 2,863,000
 Btu/hr saved 3,670,000
 Total Cost Installed \$ 57,960
Payback 7.9 mo.
Annual Return on Investment 118%
Annual Savings \$ 88,080

DATA without a Cain System

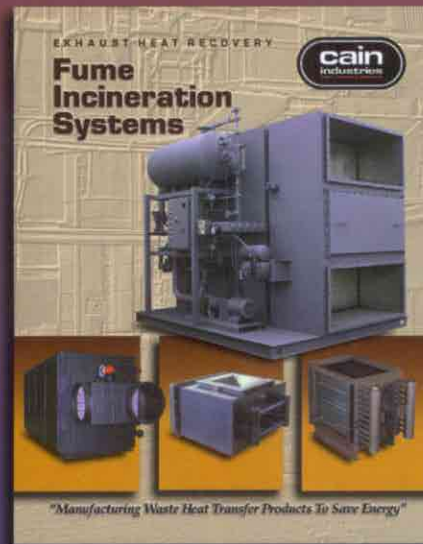
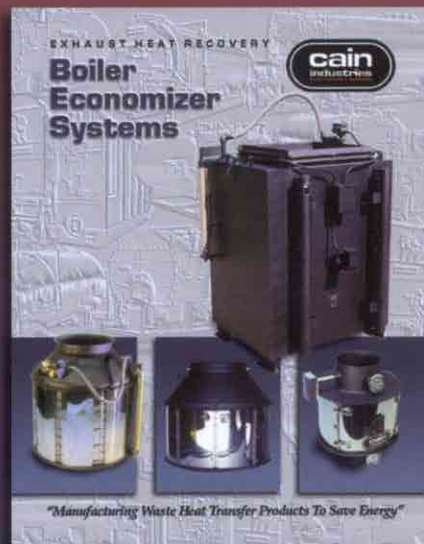
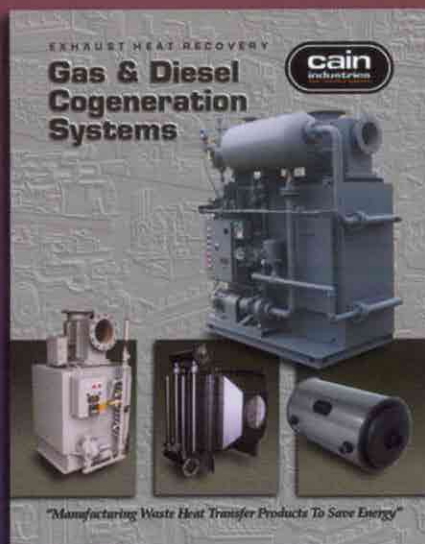
Combustion Source: **1,700 kW Engine**
 Heat Sink Process Steam
 Water Exhaust Temp. 783°F
 Water Temp. Inlet N/A
 SCFM 5,222
 Fuel Type Natural Gas
 O₂ Content N/A
 Excess Air N/A
 Combustion Efficiency (relative) 78%
 Fuel Cost Per Therm \$.40
 Annual Operating Hours 6,000

PERFORMANCE with a Cain System

Model Selection ESG-1-620D18CSS
 Operating Steam Pressure 150 PSIG
 Final Exhaust Temp. 428°F
 Boiler Horsepower 68 BHP
 Equivalent Evaporation 2,339 pph
 Pressure Drop, Exhaust 1.55" WC
 Btu/hr recovered 2,269,000
 Btu/hr saved 2,908,000
 Total Cost Installed \$113,600
Payback 19.5 mo.
Annual Return on Investment 61%
Annual Savings \$ 69,790

Savings comparison data is based on an average fuel cost per therm (100,000 BTU), and approximate annual operating hours. Your results may vary. Total Cost Installed includes: Equipment, shipping, and complete installation. Contact Cain Industries for your FREE savings analysis proposal.

MARKET SPECIFIC PRODUCT LINES



Your Authorized Cain Representative



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