Exhaust Heat Recovery

Boiler Economizer Systems

Fin Coil Recovery Series – B/FCR

Boiler Economizer Series – FTR

Rectangular Tube Recovery Series – RTR

Energy Manager Series – EM

“Manufacturing Waste Heat Transfer Products To Save Energy”
Since 1978, Cain Industries has dedicated itself to producing exclusively, combustion exhaust heat transfer products. Our successful experience with lowering fuel costs and reducing pollution makes us the first choice for both the retrofit and OEM client.

We set ourselves apart from the competition by producing products to serve the broad spectrum of the combustion retrofit markets: Diesel and Gas Cogeneration, Boiler Exhaust, and Fume Incineration. The knowledge gained from each market has helped the continuing improvement of the others. As the only manufacturer capturing all of these markets, we have developed the greatest selection of products to more precisely fit within their particular system applications. Coupled with our elaborate heat transfer programs and extensive CAD and graphics designs, we have developed twelve product lines with over 1,350 industrial heat transfer products.

We are also especially dedicated to a primary investment in our associates, their manufacturing technology, quality improvements, and innovative cost reductions. As a result our customers can expect the greatest return on their investment along with the longest lasting equipment.

The foundation which Cain Industries has built its success and reputation upon is our basic philosophy: to produce the highest quality products, and provide unmatched customer satisfaction.
INTRODUCTION
Cain Industries offers an extensive selection of boiler economizers specifically designed to recover the lost heat exiting from exhaust stacks and preheat water. Our broad line of economizers covers the spectrum of boiler sizes, ranging from very small hot water boilers with burner inputs of 200,000 Btu/hr to large boilers delivering steam at 250,000 lb/hr. In addition, Cain produces boiler feedwater systems, condensate tank and pump systems, exclusive sootblower assemblies, and unique modulating internal exhaust gas bypass systems.

EXHAUST APPLICATIONS
• Steam Boilers
• Hot Water Boilers
• Hot Oil Heaters
• Ovens and Dryers
• Specific Combustion Sources

EQUIPMENT VARIETY
• Boiler Economizers
• Sootblowers
• Circulating System Components
• Storage Tanks
• Modulating Internal Exhaust Gas Bypass Assembly

SYSTEM FUNCTION
Exhaust heat from combustion typically leaving the stack and into the atmosphere, is instead transferred from the exhaust stream by means of a Cain economizer. This lost Btu is now captured and saved to various heat sinks such as boiler feedwater, cold makeup water, process water, swimming pool water, glycol, and thermal fluids. Combustion source fuel types including natural gas, propane, digester gas, diesel fuel, No.2-6 fuel oil, and coal are all heat sources which can be retrofitted with Cain heat exchangers.

PROPOSAL CONSIDERATIONS
Consider Cain for cylindrical or rectangular stack connections, large or small boilers, a particular pinch point requirement, stack or liquid temperature control, special heat sink requirements, special heat transfer metallurgy requirements, specific maintenance concerns, optional equipment requirements, installation space and weight concerns, and package system requirements.

ANTICIPATED RESULTS
• Tremendous fuel savings typically pay for equipment and installation within 1 to 2 years of average use
• Pollution reduction equivalent to lowered annual fuel usage
• Longest heat exchanger life expectancy
RECTANGULAR TUBE RECOVERY SERIES

The RTR is ideal for large steam boilers and hot water boilers. The RTR is typically used to preheat boiler feedwater, process water, hot oil, or cold water condensing applications. A variety of heat transfer surfaces are available, including: 316L stainless steel, carbon steel, duplex stainless steel, and the stainless steel tube with aluminum bonded AL-FUSE™ product (see the example RTR product specification for materials). The exclusive, standard feature, internal stainless steel exhaust gas bypass can be used to temper the exiting gas for stack corrosion control, or to maintain water temperatures when too much heat is available.

COMBUSTION SOURCES

Steam boilers, hot water boilers and hot oil heaters with inputs up to 250,000,000 Btu/hr.

FEATURES

- Internal expansion design
- No pressure welds in the gas stream
- Mounting flanges for bolting to mating flanges/adapters
- Condensate drain catch ring assembly
- 10ga. structural exterior
- Stainless steel interior
- 2” factory insulation
- Removable access doors
- Stainless steel bypass
- Header manifold for high liquid flow
- Exclusive Cain compression fittings between finned tubes and the liquid manifolds for easy tube removal that requires no welding
- Internal stainless steel bypass damper controls either exiting exhaust gas or liquid temperatures
- Flexible stainless steel hose allows travel of the sootblower carriage
- Sootblower controller maintains air/steam pressure during blowdown operation

OPTIONAL EQUIPMENT

- Modulating damper actuator assembly for automatic operation
- Hinged inspection doors for immediate access
- Timed automatic sootblower assembly provides blowdown without scheduling personnel
- Stack corrosion control assembly
- Structural support stand

Boiler Exhaust Application

- Capacity: to 250,000-lb/hr steam
- 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

Ethanol Plant, Oshkosh, Wisconsin
RTR-166K25.7ALS recovering Btu from a 2,200 BHP, steam boiler; Reducing 367°F @ 18,473 SCFM to 299°F; Raising the temperature of 152 gpm of boiler feedwater from 227°F to 245°F.

Ice Cream Plant, Bakersfield, California
RTR-148F26ALS recovering Btu from a 500 BHP, steam boiler; Reducing 430°F @ 4,198 SCFM to 305°F; Raising the temperature of 35 gpm of boiler feedwater from 210°F to 247°F.
INSTALLATION FOR EXACT FIT

In many cases, the RTR is designed to replace a competitor’s unit. The RTR will meet or exceed the old performance and at the same time fit within the original stack connections.

BRENNER, Ontario, Canada
(1) RTR-1V2Q2B2SS recovering Btu from (1) 95,000 pph steam boiler; Reducing 505°F @ 24278 SCFM to 333°F; Raising 196 gpm boiler feedwater entering at 225°F to 278°F.
1.0 General Design:
1.1 Furnish and install a rectangular tube recovery (RTR) in the exhaust duct of the boiler in accordance with the following specifications as designed and manufactured by Cain Industries, Inc.
1.2 The RTR shall be a light weight design for easier installation, rectangular with counterflow heat transfer design manufactured and tested in accordance with the requirements of Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code, and stamped to a minimum 250 PSIG design pressure to the appropriate section.
1.3 Each RTR shall be designed to include as standard, a stainless steel, internal, Flue Gas Bypass Diverter to provide for full emergency by-pass, requiring no additional ductwork for controlling:
1.4 The RTR shall have removable, gas-tight inspection panels, providing complete access to the entire heating surface for inspection, tube removal, and/or cleaning (optional hinged doors available).
1.6 The RTR must be capable of being drained completely when mounted in the vertical or horizontal position.
1.7 Header manifolds for low liquid flow pressure drop shall be provided and shall have connections, screwed or flanged as specified. Liquid inlet and outlet pipe connections greater than 2" NPT shall be flanged. The liquid header manifolds shall also contain ½" NPT connections for venting, draining, and/or safety relief valves as required.
1.8 The design of the vessel itself shall be such that no tube to tube, or tube to header joint welds shall be in contact with the exhaust stream so as to minimize potential vessel failure.
1.9 The finned tubing shall be a single row design (maximum 2 row depth in the direction of the exhaust flow) for ease of cleaning and inspection. Tube to header joint shall be compression tube fittings requiring no welding for fast/easy tube replacement.

2.0 Construction:
2.1 Design Pressure (water side): 250 PSIG @650°F; Test Pressure: 375 PSIG; Max. Flue Gas Inlet Temperature: (see below); Design Pressure (exhaust side): 10 inches water column
2.2 Tube & Fin Designs:
   • SA178GrA ERW x 1.0" OD x .085" wall thks. with carbon steel .030 Fin thks x .50 Hgt Nickel Brazed/welded to the tube. (Max. Flue Gas Inlet Temperature: 1250°F)
   • TP316L x 1.0" OD x .065" wall thks. with aluminum .020 fin thks x .50 hgt AL-FUSE™ bonded to the tube. (Max. Flue Gas Inlet Temperature: 750°F)
   • TP316L x 1.0" OD x .065" wall thks. with 304 stainless steel .020 Fin thks x .50 hgt Nickel Brazed/welded to the tube. (Max. Flue Gas Inlet Temperature: 1800°F)
2.3 Compression fitting design: 1000 PSI @ 400°F
2.4 Headers: thickness: Sch 80; material: SA106 GrB
2.5 2" thickness factory installed, high temperature insulation shall be contained within the exterior less the liquid headers.
2.6 Exterior surfaces shall be 10ga. carbon steel seam welded and the inner casing shall be 304 stainless steel.
2.7 Special codes (optional): design specifications of ASME Code: Section VIII Division I; ‘UM’, ‘U’, or ‘S’ symbol; National Board registered; CRN.

3.0 Optional System Component Equipment:
(see Engineering Sales Manual for optional equipment specifications)
EXHAUST STACK ADAPTERS
allow the RTR to provide maximum heat recovery while mating perfectly with an existing exhaust stack sizes. Adapters also allow the rectangular RTR to work with a round exhaust stack.

REMOVABLE ACCESS DOORS
provide a complete view of the finned tube heating surface for inspection, repair or maintenance. This reduces down time and labor expenses.

MOUNTING FLANGES & ADAPTERS
are integral to the Cain Industries economizers, reducing installation time and providing a superior connection between the existing stack and the Cain unit.

EXTERIOR LIQUID MANIFOLDS
maintain very low liquid pressure drop, eliminating the need for extra pumps/HP. This manifold is connected to the finned tubes with Swagelok® compression fittings which allow a finned tube to be removed for inspection or replacement without requiring any welding.

SINGLE ROW FINNED TUBING
design (maximum of 2 rows in the path of the exhaust flow) allows full access to the entire heating surface and provides ease of cleaning and maintenance. Each finned tube row has no welds in the exhaust gas stream which greatly minimizes the chance of tube failure.

BYPASS DAMPER
allows the amount of exhaust gas diverted through the economizer to be modulated to achieve desired heat recovery. This becomes an important safety feature when you recover more heat than required by the existing system.

TIMED AUTOMATIC SOOTBLOWER
The exclusive Cain Industries Timed Automatic Sootblower design is applied where sulphur content is high or combustion is poor. The special flood-jet type nozzles achieve maximum cleaning velocity using steam or air discharged through an electric control valve. Together they form a “continuous knife edge concentrated spray pattern” surrounding the heating surface. This “ring nozzle assembly” is attached to a manifolded flexible steel hose assembly and is powered back and forth by a pneumatic drive cylinder. Dual timing relays allow full control of cycle duration and interval. Cleaning the finned tubing ensures maximum Btu recovery and maximum cost savings. Fouled finned tubing can reduce heat recovery by up to 50%.

Proper sootblowing is necessary when fuel has a high sulphur content or combustion is poor (such as No. 6 fuel oil). Without sootblowing, the finned tubing will become fouled and the maximum heat recovery cannot be achieved.

The traveling Ring Assembly with Flood-Jet Nozzles, form a unique high velocity knifing action to allow full penetration of the complete heating surface. The Cain Industries sootblowing system is unsurpassed in the marketplace for effectiveness and efficiency.

Built-in timing relays allow you to customize the interval and duration to suit your application.

Vertical flow RTR shown with optional timed automatic sootblower assemblies. This unit uses three sets of traveling carriages with high velocity cleaning nozzles.
**FIN TUBE RECOVERY SERIES**

The FTR is a cylindrical economizer with header manifolds for low liquid side pressure drop. It can be used in applications with confined area restrictions. Heating surfaces are offered in stainless, carbon, or AL-FUSE™ finned tubing. The large number of standard models provide height and diameter combinations that work in applications with space constraints, while still achieving maximum heat recovery. Stack-to-FTR adapters are required when the gas connection diameters do not match. The FTR 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.

**COMBUSTION SOURCES**

Steam boilers, hot water boilers, hot oil heaters, combustion sources with round stack diameters 14"-72" and liquid flow rates of 50-500 gpm.

**FEATURES**

- Mounting flanges for bolting to mating flanges or adapters
- Header manifold for high liquid flow rates
- Hinged stainless steel access door panels
- Quick release tension latches for doors
- Manual bypass control lever
- Stainless steel internal bypass assembly
- Internal thermal expansion design
- Optional sootblower assembly

The FTR has standard hinged, stainless steel access doors with quick release tension latches. It is ideal for large volumes of flue gas while minimizing liquid side pressure drops.

**Boiler Exhaust Application**

- Capacity: 100 - 30,000 SCFM
- Entering gas temps: 325°F to 1,400°F
- Heat sink types: Boiler feedwater, makeup water, process water, hot water return, potable water, thermal fluids, run-around systems

**Hospital, Flint, Michigan**

(2) FTR-160E28SSS each recovering BTU from (1) 435 BHP steam boiler; Reducing 450°F @ 4251 SCFM to 279°F; Raising 30 gpm boiler makeup water entering at 50°F to 109°F.
exhaust heat recovery

THE CAIN ADVANTAGE

Cain Industries can provide you with the ultimate heat recovery solution: lightweight design, smaller, more efficient, more cost effective. Each unit is engineered to maximize your heat recovery and thus your return on investment. Size options, finned tube configurations, and finned tube material options allow Cain engineers to specify economizers that will work in applications that have size and access limitations. This flexibility makes Cain the best choice for retrofit installations as well as new construction.

Stainless steel hinged access doors allow for rapid and easy inspection and maintenance of the FTR, which in turn lowers your operating costs.
FIN COIL RECOVERY SERIES

The FCR is a custom-designed heat exchanger which can be applied in confined areas, and is offered in stainless steel, carbon steel, or ALFUSE™ finned tubing. Design flexibility allows specific engineering requirements to be met such as fin spacing for fouling conditions and low gas pressure drops.

COMBUSTION SOURCES

Steam boilers, hot water boilers, hot oil heaters, combustion sources with round stack diameters 4”-36” and a maximum liquid flow rate of 50 gpm.

FEATURES

- Internal thermal expansion design
- Cylindrical heat transfer coil(s) design
- Mounting flanges for bolting to mating flanges
- Quick release tension latches
- Stainless steel internal bypass
- Condensate drain catch ring assembly
- Hinged stainless steel access door panels

OPTIONAL EQUIPMENT

- Exclusive manual or timed automatic ring-type sootblower assembly
- Stack corrosion control assembly including temperature-regulated modulating exhaust gas bypass and remote indicators
- Circulating pump kit to maintain desired liquid flow rate
- Vertical pressurized storage tank, to create a “bulge” or temporary heat sink in the event of no-water-flow conditions
- Feedwater preheater corrosion control assembly designed to maintain the desired water inlet temperature to the economizer - preventing cold-end corrosion at the heat transfer surface

WASTE WATER TREATMENT PLANT, Fond du Lac, Wisconsin

[2] FCR-12025A1S each recovering Btu from [2] 150 BHP steam boilers; Reducing 700°F @ 1603 SCFM. to 246°F; Raising 18 gpm boiler feedwater entering at 100°F to 201°F.

FCR shown with optional sootblower assembly

FCR: SPECIFICATION

A general specification, shown as a guide for design & construction. (see Engineering Sales Manual for detailed specification data sheets)

1.0 General Design:
1.1 Furnish and install economizers on each of the combustion sources (boilers, hot water heaters, hot oil heater, fume incinerator, etc.) as designed and manufactured by Cain Industries, Inc.
1.2 The Economizer shall be a light weight design for easier installation, cylindrical with counterflow heat transfer design manufactured and tested in accordance with the requirements of Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code, and is stamped to a minimum 250 PSIG design pressure.
1.3 Each Economizer shall be designed to include as standard, a stainless steel, internal, Flue Gas Bypass Diverter to provide for full emergency by-pass, requiring no additional ductwork for controlling:
1.4 Each Economizer shall have continuous hinged, gas-tight, stainless steel inspection panels, which provide for complete access to the entire heating surface for inspection and/or cleaning. The inspection panels shall be secured by adjustable, quick release tension latches and no tools shall be required for the opening of the inspection panels.
1.5 Heat Recovery unit shall be either a single, multiple, or parallel coil design and must be completely drainable when mounted vertically.
1.6 Header manifolds where used shall be SA53 GrB schedule 80 or SA105, connections shall be screwed or flanged as specified.
1.7 Exterior surfaces other than stainless steel shall be primed and painted with a high temperature metallic paint rated for 1000°F.

2.0 Construction:
2.1 Design Pressure (water side): 250 PSIG @650°F; Test Pressure: 375 PSIG; Max. Flue Gas Inlet Temperature: (see below); Design Pressure (exhaust side): 10 inches water column
2.2 Tube & Fin Designs:
   • SA178GrA ERW x 1.0” OD x .085” wall thks with carbon steel .030 Fin thks x .50 Hgt Nickel Brazed/welded to the tube. (Max. Flue Gas Inlet Temperature: 1250°F)
   • TP316L x 1.0” OD x .065” wall thks. with aluminum .020 fin thks x .50 hgt AL-FUSE™ bonded to the tube. (Max. Flue Gas Inlet Temperature: 750°F)
   • TP316L x 1.0” OD x .065” wall thks. with 304 stainless steel .020 Fin thks x .50 hgt Nickel brazed/welded to the tube. (Max. Flue Gas Inlet Temperature: 1800°F)
2.3 Headers: thickness: Sch 80; material: SA53 GrA and/or 2000# Forged Steel
2.4 Exterior surfaces other than stainless steel shall be primed and painted with a high temperature metallic paint rated for 1000°F.

3.0 Optional System Component Equipment:
(see Engineering Sales Manual for optional equipment specifications)
exhaust heat recovery

**BEFORE AND AFTER**

A Cain Industries FCR boiler economizer can often be installed in-line with your existing stack, resulting in a relatively quick and cost-efficient installation process with minimal retrofitting, labor, materials and down time. Generally, because of their lighter weight and smaller size, the FCR requires little, if any, additional support (usually suspended from the ceiling). In applications where additional support is required, Cain Industries can offer a structural support stand. Economical in-line installation - another Cain Advantage.

**PRINTING FACILITY, Lomira, Wisconsin**

(2) Model FCR-112C16ALS each Recovering Btu from a 500 BHP steam boiler; Reducing 400°F @ 4205 SCFM to 252; Raising 34.5 gpm boiler feedwater entering at 120°F to 164°F.
B SERIES

The B Series boiler economizer is comprised of 14 standard models. An “off the shelf” unit, it is designed primarily for boilers with round stacks and a combustion capacity of 40 to 800 BHP with entering gas temperatures between 300° and 700°F. The standard stack connections can be easily modified to fit specific boiler stacks with 10” to 34” diameters, alleviating the cost of stack adapters. The units come standard either with 4 or 6 fins per inch (fpi) spacings for operation with No. 2 fuel oil and/or natural gas, and depending on the efficiency of the combustion. With its lightweight design and exclusive AL-FUSE™ heat transfer surface, installation is fast and costs are kept to a minimum. Use the chart on the next page to select the B Series unit that is best suited to your application.

COMBUSTION SOURCES
Steam boilers, hot water boilers

FEATURES
• Hinged stainless steel access door panels
• Internal thermal expansion design
• Mounting flanges for bolting to mating flanges or adapters
• Stainless steel internal exhaust bypass assembly
• Quick release tension latches for doors
• Optional sootblower assembly

Boiler Exhaust Application
• 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

Boiler rooms of all sizes and with limited installation space, horizontal or vertical, can be accommodated with the cylindrical B Series or FCR economizer product lines.
EM

ENERGY MANAGER SERIES
The EM is designed to recover heat from combustion sources with atmospheric burners from 200 to 6400 MBH. Ten standard models are designed to operate with low static gas pressure drop for safe, automatic operation on atmospheric or power burners.

COMBUSTION SOURCES
Steam boilers, hot water boilers, dryers, ovens

FEATURES
- Built to rigid CSA quality control standards
- Highest heat transfer efficiency with AL-FUSE™ finned tubing
- Quick release access door latches for ease of maintenance/inspection
- Packaged design includes all basic control hardware to properly operate unit in the field
- Adjustable internal stainless steel damper and diverter
- Guaranteed heat recovery performance

Boiler Exhaust Application
- 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

College Campus, Long Beach, California
(10) EM Series boiler economizers preheating hot water return loops.

EM Series package includes all basic control hardware for simplified installation, and includes CSA certification
EM SERIES MODEL SELECTION

The following model selections are determined by stack diameters and Btu/hr input, using this simple selection chart. After the correct Energy Manager has been selected, contact your Cain representative to determine your fuel savings and provide a complete proposal with payback period. Stack diameters smaller than standard EM sizes can be accommodated simply with a pair of EM Model to Stack Transitions.

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Burner Input (Btu/hr)</th>
<th>Stack Diameter</th>
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<tbody>
<tr>
<td>EM-6</td>
<td>200,000</td>
<td>6&quot;</td>
</tr>
<tr>
<td>EM-8</td>
<td>400,000</td>
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<td>EM-10</td>
<td>600,000</td>
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<td>EM-12</td>
<td>800,000</td>
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<td>EM-14</td>
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<td>EM-16</td>
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<td>EM-28</td>
<td>5,000,000</td>
<td>28&quot;</td>
</tr>
<tr>
<td>EM-32</td>
<td>6,400,000</td>
<td>32&quot;</td>
</tr>
</tbody>
</table>
SYSTEM COMPONENTS

Cain Industries offers a wide range of system components, pre-engineered specifically for each application. Every product has been tested, shown to be of the highest quality, and proven to be fully compatible with all Cain heat recovery products.

MATING FLANGES, AND GASKETS
Cain offers round, square, and rectangular mating flanges, transitions, and gasket sets to suit most any application. Flanges are black steel, or stainless steel where appropriate.

CIRCULATING PUMP KIT ASSEMBLY
Cain offers all necessary pumps and related fittings for your heat recovery application – whether you need Shut off valves, Check valves, Relief valves, Vent valves, Steam Stop valves, Pressure or Temperature Control valves, or Drain valves.

DRAIN CATCH RING ASSEMBLY
This assembly safely drains away possible condensation accumulating within the economizer or stack, on the outlet of the economizer. Includes various NPT drain connection sizes, depending on application.

SUPPORT STANDS
Cain offers structural steel support stands that easily bolt together for low cost and ease of field assembly.

LIQUID TEMPERATURE CONTROL
Cain Industries offers a sophisticated liquid temperature control which functions as follows: During a cold startup, the exhaust bypass will be powered to the normal operating position. As the liquid temperature rises and approaches a preset point, the Liquid Temperature Control signals the exhaust bypass damper which will begin to move to the temperature control position. When the desired temperature is completely satisfied, the damper actuator will move to the maximum open position. The heat recovery can be reduced by up to 50%. Included is a 4-20mA output controller, thermocouple, thermocouple weld and wire, as well as a modulating bypass actuator installed, wired, and tested (for a single 120 volt, 1ph, 60 hz connection).

STACK CORROSION CONTROL ASSEMBLY
This assembly includes: Control panel with digital controller, modulating damper actuator and thermocouple. The Cain Stack Corrosion Control assembly senses a minimum exhaust gas temperature leaving the economizer. During a cold startup, the damper will be powered to the "Maximum Open Position". As the temperature rises above a preset minimum temperature, the damper will begin to close to the "Normal Operation Position". As the percent of exhaust load conditions fluctuate to lower outputs, the damper actuator will open accordingly to maintain a minimum preset outlet "Temperature Control Position".

RTR Control panel shown with optional Modulating Bypass Damper Actuator which powers the damper to the desired position for maximum heat recovery.
REPLACING THE COMPETITION

Beyond the 5 boiler economizer product lines including over 500 boiler exhaust economizers, the ‘unique application’ is no problem. Our team concept with the specifying engineer provides the solutions for the complete engineered system. These systems have ranged from modifying the RTR model to all stainless for condensing natural gas combustion below 150°F to preheating boiler feedwater from coal fired boilers or pulverized wood burning boiler exhaust.

Impossible to some, but for one of the largest hospitals in Manhattan we designed and manufactured a large customized RTR unit that could be shipped in small components and reassembled in the field. The objective was to provide a boiler economizer which would retrofit the exhaust of two of the five 125,000 pph boilers as located 3 stories below the street. All the components were shipped on two flat bed trucks. Upon jobsite arrival the components were manually carried down through a 3x3 foot square manway in the middle of the sidewalk. They were then assembled together as a single 250,000 pph boiler economizer within the two boiler’s manifolded exhaust breeching. Since the boiler feedwater piping had been completed prior, the installation was finished in two weeks.

EXCLUSIVE OPTIONAL TIMED AUTOMATIC SOOTBLOWERS

The exclusive Cain Industries Timed Automatic Sootblower design is applied where the sulphur content is high and/or combustion efficiency is poor. When a soot layer accumulates on the heating surface to a thickness of 1/8”, fuel consumption is increased by 8.5%. The sootblower is also applied when it is not cost-effective to open inspection doors and clean the exchanger by other means. The sootblower system will continually keep the heating surface at a high performance level and eliminate the day-to-day operator expense and operation down time. The blowdown sequence occurs while the boiler is in full operation and is fully adjustable. The special flood-jet type nozzles achieve maximum cleaning velocity using steam or air as discharged through an electric control valve (included).

Together they form a ‘continuous knife edge concentrated spray pattern’ surrounding the heating surface. This “ring nozzle assembly” is attached to a manifolded flexible steel hose assembly and powered up and down by a pneumatic drive cylinder. Dual timing relays allow complete control for cycle duration and interval specific to each application. The final results are a controlled double cleaning action, insuring that the maximum Btu recovery and anticipated savings are achieved.
general applications

**PREHEATING BOILER FEEDWATER**
Steam Boiler Exhaust

For boilers with continuous, modulating feedwater.

**PREHEATING BOILER FEEDWATER**
Firetube Steam Boiler Exhaust

For boilers with continuous, modulating feedwater.

**PREHEATING HOT WATER RETURN**
Hot Water Boiler

**PREHEATING MAKEUP WATER**
Steam Boiler Exhaust
(Circulating tank system)
**PREHEATING BOILER FEEDWATER**
Water Tube
Steam Boiler Exhaust

For boilers with continuous, modulating feedwater.

**PREHEATING BOILER FEEDWATER**
(Circulating tank system)
Steam Boiler Exhaust

For boilers with on/off feedwater.

**PREHEATING PROCESS WATER**
Steam Boiler Exhaust
(Circulating tank system)

**PREHEATING POOL WATER**
Steam Boiler Exhaust
Savings comparison data is based on a conservative 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.

### Data without a Cain System

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<tr>
<th>Fuel Type</th>
<th>Waste Exhaust Temp</th>
<th>Water Temp. Inlet</th>
<th>SCFM</th>
<th>Water Temp. Outlet</th>
<th>Excess Air</th>
<th>Combustion Efficiency</th>
<th>Fuel Cost Per Therm</th>
<th>Annual Operating Hours</th>
<th>Model Selection</th>
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<tbody>
<tr>
<td>Natural Gas</td>
<td>405°F</td>
<td>200°F</td>
<td>50,212,000</td>
<td>82.8%</td>
<td>$0.80</td>
<td>6,000</td>
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### Performance with a Cain System

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<th>Fuel Type</th>
<th>Waste Exhaust Temp</th>
<th>Water Temp. Inlet</th>
<th>SCFM</th>
<th>Water Temp. Outlet</th>
<th>Excess Air</th>
<th>Combustion Efficiency</th>
<th>Fuel Cost Per Therm</th>
<th>Annual Operating Hours</th>
<th>Model Selection</th>
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<tbody>
<tr>
<td>Natural Gas</td>
<td>20°F</td>
<td>195°F</td>
<td>3,667</td>
<td>968°F</td>
<td>5,222</td>
<td>195°F</td>
<td>0.47” WC</td>
<td>6%</td>
<td>3.5%</td>
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### Savings Comparison

- **Steam Boiler**
  - Annual Savings: $70,472
  - Annual Return on Investment: 184%
  - Payback: 6.5 mo.
  - Total Cost Installed: $38,380
  - Btu/hr saved: 1,468,200
  - Btu/hr recovered: 1,210,000
  - Pressure Drop, Exhaust: 0.49” WC
  - Pressure Drop, Water: 1.0 psig
  - Water Temp. Outlet: 250°F
  - Final Exhaust Temp: 307°F
  - Boiler Feed Water Flow: 1,468,200 gpm
  - Model Selection: RTR-160H26ALS

- **Steam Boiler**
  - Annual Savings: $76,229
  - Annual Return on Investment: 202%
  - Payback: 5.9 mo.
  - Total Cost Installed: $37,700
  - Btu/hr saved: 1,588,100
  - Btu/hr recovered: 1,267,000
  - Pressure Drop, Exhaust: 0.47” WC
  - Pressure Drop, Water: 1.0 psig
  - Water Temp. Outlet: 257.7°F
  - Final Exhaust Temp: 335°F
  - Boiler Feed Water Flow: 1,267,000 gpm
  - Model Selection: RTR-148H26ALS

- **Steam Boiler**
  - Annual Savings: $176,227
  - Annual Return on Investment: 304%
  - Payback: 3.9 mo.
  - Total Cost Installed: $57,960
  - Btu/hr saved: 3,671,400
  - Btu/hr recovered: 2,864,000
  - Pressure Drop, Exhaust: 1.75” WC
  - Pressure Drop, Water: 8.3 psig
  - Water Temp. Outlet: 232.3°F
  - Final Exhaust Temp: 330°F
  - Boiler Horsepower: 68 BHP
  - Circulating Liquid Flow: 175 gpm
  - Model Selection: ESG1-62001BCCSS

- **Steam Boiler**
  - Annual Savings: $139,635
  - Annual Return on Investment: 123%
  - Payback: 9.8 mo.
  - Total Cost Installed: $113,600
  - Btu/hr saved: 2,909,000
  - Btu/hr recovered: 2,269,000
  - Pressure Drop, Exhaust: 1.55” WC
  - Equivalent Evaporation: 2,339 pph
  - Pressure Drop, Water: 8.3 psig
  - Operating Steam Pressure: 150 PSIG
  - Model Selection: ESG1-62001BCCSS

### Market Specific Product Lines

- **Gas & Diesel Cogeneration Systems**
- **Boiler Economizer Systems**
- **Fume Incineration Systems**

Your Authorized Cain Representative

**THERMAL TRANSFER SYSTEMS, INC.**


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