

# HEAT RECOVERY SILENCER RADIAL

The HRS Radial waste heat recovery silencer is a module configuration package with 176 standard models available. It packages standard features such as: full exhaust bypass, full heating surface access, factory insulation, hard shell exterior, stainless interior, 3" thickness factory insulation, and a variety of finned tube types and fin spacings to fit the proper application. The HRSR is designed to receive the total exhaust and liquid flow from a single source and control exit temperatures to the desired performance levels. During full operation, the radial design channels the exhaust flow through an hour glass expansion flow pattern which provides for significant dBA reduction.

The full port exhaust bypass is located at the top for convenient installation. Depending on space considerations, the unit may be installed in the horizontal position as shown below. The unique configuration of the single row design heating surface allows for reduced fouling potential. The full access to the core with optional hinged doors also allows for fast routine inspection and/or manual cleaning. Finned tube replacement requires no overhead cranes, special rigging, special crews, or extra roof height above the unit. Individual finned tube replacement if required, is fast and easy with minimum down time.

**OPTIONAL EQUIPMENT:**

- Liquid temperature indicating control assembly
- Hinged inspection doors for immediate access
- Timed automatic timed sootblowers
- Modulating damper actuator (pneumatic or electric)
- Compression fitted tube to header attachment requiring no welding for fin tube replacement

*Fully packaged for micro-cogen applications through the large turbines*



**OEM PACKAGER,**  
 Model HRSR-112C26.5ALS  
 Recovering Btu from (1) 75 kW Micro Turbine Generator, natural gas engine.  
 Reducing each 500°F @ 1,198 SCFM to 213°F;  
 Raising 35 GPM hot water from 160°F to 181°F.

**Engine Exhaust Application**

- Capacity: 200kW – 6MW
- Entering gas temps: to 1,250°F
- Heat sink types: Engine jacket water, process water, boiler water, or ethylene glycol



**AIRPORT,** Detroit, Michigan. (3) Model HRSR-472H28CSS  
 Recovering Btu from (3) Wärtsilä 345G, 5.7MW natural gas engines.  
 Reducing each 698°F @ 18,373 SCFM to 320°F.  
 Raising 175 GPM hot water from 250°F to 350°F.

**FEATURES:**

- Full exhaust gas bypass assembly
- Sound attenuation
- Stainless steel interior lining
- Internal heating surface expansion design
- No joint welds within the heating surface in contact with the exhaust gas stream
- 10ga. hard shell seal welded exterior
- Single row design for complete and full access
- Ease of tube replacement requiring no overhead cranes or special rigging.





**HOSPITAL, Ontario**  
(2) Model HRSR-336B28CSS  
Recovering Btu from (2) Cummins Wäertsilä CW180, natural gas engines.  
Reducing each 968°F @ 3,666 SCFM to 339°F.  
Raising 175 GPM hot water from 195°F to 229°F.



**(2) MOBILE TRAILERS,**  
(2) Model HRSR-216826SSS  
Recovering Btu from a diesel fueled N14 Cummins engine  
Reducing each 865°F @ 1,188 SCFM to 465°F. Raising 70 GPM 50% Ethylene Glycol from 70°F to 90°F.



*Premium footprint space is realized with rectangular variety*



**GOLD & SILVER MINE,**  
Eskay Creek, British Columbia.  
(3) Model HRSR-316A26CSP  
Recovering Btu from (3) Caterpillar 3512, 900kW diesel engines.  
Reducing each 870°F @ 2,100 SCFM to 417°F.  
Raising 265 GPM 50% ethylene glycol from 187°F to 197°F.

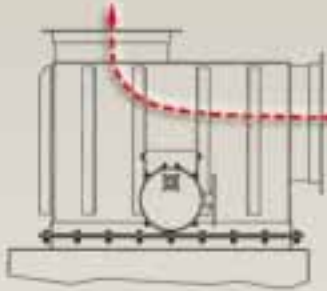


**HRSR SERIES FOR:  
LARGE ENGINES &  
FULL FEATURE DESIGN**

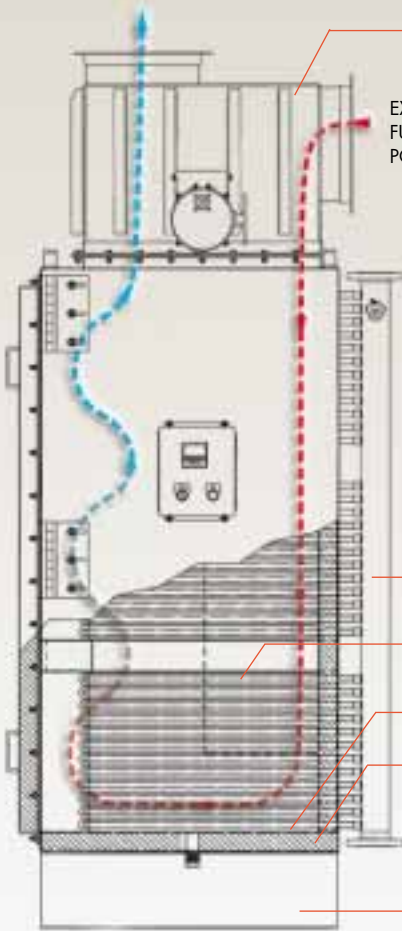
**ASME & National Board  
stamped - Sec.VIII, Div.1**



*Single row tube  
configuration for  
easy cleaning  
and maintenance.*

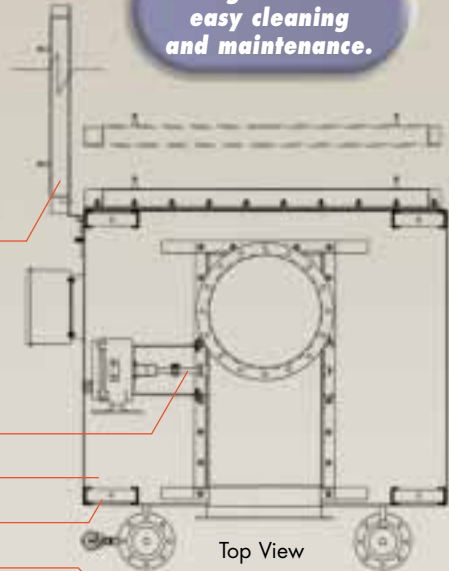


EXHAUST FLOW:  
FULL BYPASS POSITION



Left Side View

EXHAUST FLOW:  
FULL OPERATING  
POSITION



Top View



Header View

Inspection door assembly,  
for finned tube inspection,  
clean out, or removal  
(optional hinged version)

Stainless steel damper shaft

10ga thickness. exterior

Lifting lug

Stainless steel bypass damper

Exhaust bypass assembly

Modulating actuator  
(optional pneumatic or electric)

Thermocouple

3/4 NPT vent

ASME Stamp (optional)

Control panel  
(used with Automatic Sootblower  
Assembly and/or Liquid  
Temperature Control - optional)

Header manifold  
(low liquid pressure drop)

Finned tube\* assembly (single row design  
for complete access to heating surface)

Stainless steel interior

3" THKS. insulation

3/4 NPT drain

1 1/2 NPT cleanout

H-Beam support

\*Available tube materials: carbon steel, TP316 stainless  
Available fin type: carbon steel, TP304 stainless, aluminum  
Methods of attachment: nickel brazed, welded, Al-Fuse

## TIMED AUTOMATIC SOOTBLOWER (optional)

The exclusive Cain Industries Timed Automatic Sootblower design is applied to combustion sources 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 engine down time.

The blowdown sequence occurs while the engine 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' as attached to a manifolded flexible steel hose assembly, is powered up and down by a pneumatic drive cylinder. Dual timing relays allow complete control for 30 second cycle duration and intervals specific to each application. Final results are controlled double cleaning action, insuring that the maximum Btu recovery and anticipated savings are achieved.

## LIQUID TEMPERATURE CONTROL (optional)

Operating Sequence: 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 exhaust bypass damper 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, bypassing 99% of the exhaust flow (100% bypass cannot be attained due to some leakage and residual heat in contact with the fin tubing). Included is a 4-20 mA output controller, thermocouple, thermocouple weld and wire, and modulating bypass actuator installed, wired, and tested, for a single 120 volt, 1ph, 60hz power connection.



## HRSR: SPECIFICATION

A general specification, shown as a guide for design & construction.

### 1.0 General Design:

- 1.1 Furnish and install a heat recovery silencer radial (HRSR) in the exhaust duct of the engine in accordance with the following specifications as designed and manufactured by Cain Industries, Inc.
- 1.2 The HRSR shall be a light weight design for easier installation, rectangular with counterflow heat transfer design.
- 1.3 The HRSR shall be designed to include as standard, an external Exhaust By-Pass Assembly to provide for: full emergency bypass, requiring no additional exhaust piping for controlling either: Turn Down Performance - Excessive flue gas back pressure due to fouling.
- 1.4 A manual bypass adjusting plate and arm assembly shall be provided to lock the damper assembly in a desired operating position (optional: modulating damper assembly).
- 1.5 The HRSR shall have removable, gas tight inspection doors, providing complete access to the entire heating surface for inspection, tube removal, and/or cleaning (optional hinged doors available).
- 1.6 The HRSR 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"

- shall be flanged. The liquid header manifolds shall also contain 3/4" 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 to minimize potential vessel failure.
- 1.9 The finned tubing shall be a single row design for ease of cleaning and inspection.

### 2.0 Construction:

- 2.1 Design Pressure (water side): 150 PSIG @650 F.; Test Pressure: 225 PSIG; Max. Flue Gas Inlet Temperature: 1250 F.; Design Pressure (exhaust side): 10 inches water column
- 2.2 Tube: outside diameter: 1.0"; wall thickness: .085"; material: SA178 GrA. ERW
- 2.3 Fins: 0.030" thks. carbon steel, nickel brazed/welded to the tube
- 2.4 Headers: thickness: Sch 80; material: SA53 GrB
- 2.5 3" thickness factory installed, high temperature insulation shall be contained within the exterior less the liquid headers and exhaust bypass assemblies.
- 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 and/or CSA.