Boiler Economizer Specification – Rectangular Design

This specification defines the minimum requirements that must be met for the design and fabrication of vertical gas flow, horizontal tube economizers. No deviation from this specification is permissible without documented approval.

I. Description of Operation

The purpose of the equipment is to recover waste heat using the established principle of a gas to liquid heat exchanger. The economizer should be a bare, welded, or extruded finned tube coil assembly installed either inside or parallel to the boiler exhaust stack or duct. Feedwater under pressure will circulate in the tubes of the coil and heat will be transferred from the flue gases to the water.

II. The Heat Exchanger

A. Furnish ( ) economizer(s), as described below, to recover waste heat from the boiler exhaust stack.

B. The economizer shall be a rectangular box type, completely packaged unit, utilizing baretube or extended surface.

C. The economizer shall be counterflow type arranged to allow the boiler exhaust gas to travel vertically upward, while the feedwater travels vertically downward (or vice versa).

D. Structural steel, inlet and outlet transitions, when required, shall be provided with the economizer. The structural steel shall be designed to support the economizer, inlet and outlet transition, and stack.

III. Construction Features

A. All pressure parts shall conform to the applicable provisions of the current ASME Power Boiler Code. The economizer shall be properly name plated and code stamped. The design pressure shall meet or exceed the design pressure of the boiler.

B. Tubes shall of the welded type, 2” O.D. with a minimum wall thickness of .120”.

C. Return bends shall be cold bent or manufactured by a forging process. Cold bends shall be assumed to have a 30% thinout or less for code calculation purposes; hot forged bends shall have no thinout of wall thickness.

D. Terminal connections shall be ( ) lb RFWN flanged. Headers shall be SA 106 B material, Sch. 80 minimum. Vent, drain, and safety relief valve connections shall be a minimum of ¾" npt and shall include a plug.

E. The method of tube-to-header attachment shall be welded. Compression fittings, as they are not an accepted Section I joint, shall not be used.

F. All coils shall be completely drainable by gravity.

G. Method of tube supports shall allow for free flow of hot gases around the welds, return bends and manifolds.

H. The outlet feedwater temperatures shall be at least 30°F below the saturation temperature. The tubes shall be arranged for tube internal acid cleaning, and tube external sootblowing (for fuels other than natural gas).

I. For fuels other than natural gas, the economizer shall be provided with a sootblower lane, sootblower wallbox(es), and distal bearings. Sootblowers shall be installed transverse to the tubes.

J. A gas tight inner seal welded 10 Ga. steel shall be insulated and covered with 30 Ga. thick corrugated, galvanized, carbon steel metal lagging.

K. Finned tubes:

1. The tube pitch shall be square to ensure ease in cleaning for fuels other than natural gas or the equivalent in which case triangular (staggered) tube pitch is allowable.

2. Fin pitch shall be: 6 fins/inch for natural gas, 4 fins/inch for #2 fuel oil, and 3 fins/inch for #6 fuel oil. For solid fuels such as coal or wood, a maximum of 2 fins/inch shall be used.

3. The fin attachment shall be by high frequency weld process. Tension wrapped, embedded, or brazed finned tubes are not acceptable.

4. The fin material shall be carbon steel.

L. All exterior surfaces not galvanized shall be painted with high temperature black paint.

M. Economizer shall be protected to prevent damage during shipping.

N. Maximum allowable pressure drops will be 15 PSIG for the feedwater and 1.5” W. C. for the flue gas.

O. Insulation shall be 8 lb density mineral wool and of sufficient thickness to yield a skin temperature no greater than 140°F.

P. As a minimum, 10% of the tube to tube welds will be radiographed.

Q. The economizer’s performance, while in a commercially clean condition, shall be guaranteed by the manufacturer.

R. Three sets of operating and instruction manuals shall be furnished at time of shipment to include: ASME Code Report; material test reports; nameplate facsimile; economizer assembly drawings; other as required by customer or engineering specifications.

S. Economizer shall be designed to operate at 100 percent load without bypassing any flue gas or feedwater.

T. Fouling factors (gas side) to be used are:

- Coal or solid fuels .01
- #5/6 oils .005
- #2/4 oils .002
- NG or clean fuel .001