



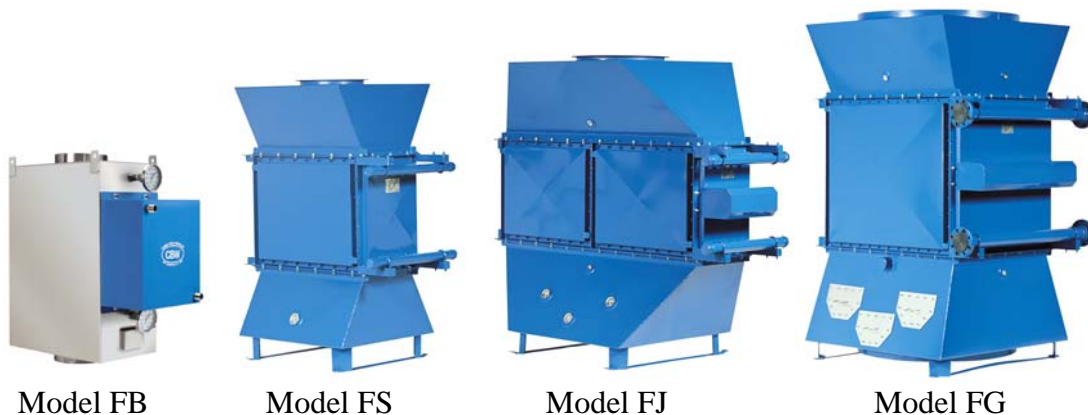
Information on selection of an economizer, and resulting payback due to changes in inlet water temperature.

The primary design parameter when choosing an economizer is ensuring the flue gas restriction (of adding the economizer) does not adversely affect the operation of the boiler. In other words, we have to make sure the economizer does not harm the normal operation of the boiler.

The second design consideration is the amount of corrosion caused by cooling the flue gasses, and this is directly related to the inlet gas and water temperatures.

- 1) The least expensive option to purchase is also the least corrosion potential in normal operation. Hot flue gasses on the outside of the tubes, and deaerated water on the inside of the tubes. This low corrosion potential allows the use of all carbon steel in construction. The average internal temperature of the economizer is around 250F.
- 2) Hot well tanks are used in operations that do not have a deaerator. The water in these tanks ranges from 150 to 200F. The cooler water pulls more heat out of the flue gasses, and in turn increases the corrosion potential. So the materials are upgraded to stainless
- 3) Cold softened water at approximately 60-90F is used when customers have not invested in water treatment equipment, normally on smaller boiler systems. Or when a customer wants to condense the latent heat from the flue gas for additional recovery.

Assumptions used for the purpose of comparison: A natural gas burning steam boiler operating at 125psig. We are holding the flue gas at 400F in all cases; this will vary with load in actual operation. Boiler efficiency without economizer = 80%. Natural gas price = \$10/MCF. This unit will operate for short periods (a few months) of time on #2 oil, used as a backup fuel.





Subject: (1) 125hp boiler Cannon quotation 070501A1 (227 deg water inlet)

We welcome the opportunity to submit a price for a CANNON Feedwater Heater Model FS-5-CC5 for your heat recovery application. The price includes a Feedwater Heater with fully removable carbon steel tubes with carbon steel fins. The transitions are designed with a system of baffles and drains to keep rain and condensate from falling into your boiler. Easily removable stainless steel side and end panels are a standard. The unit meets A.S.M.E. Code requirements and is registered with the National Board.

Estimated fuel savings of \$9,240/year equals a system payback of 0.98 years

Based on the boiler operating conditions below, \$1.00/therm natural gas and 80% boiler efficiency. Pricing for equipment only, not including installation.

Load Conditions:

100% Load	Water Side	Flue Gas Side
Mass Flow (lbs/hr)	4,313	4,959
Inlet Temperature(F)	227	400
Outlet Temperature(F)	262	284
Specific Heat(btu/lb F)	1.0125	0.268
Pressure Drop	0.17 psi	0.09 in WC*
Fouling Factor	0.0005	0.001
Unit Duty (btu/hr)	154,950	
Hours of operation	0	
Savings per Hour	\$1.93	

*not including transition losses. This unit is designed for a boiler with minimum of 0.25" WC flue gas pressure at the economizer.

50% Load	Water Side	Flue Gas Side
Mass Flow (lbs/hr)	2,157	2,480
Inlet Temperature(F)	227	400
Outlet Temperature(F)	267	268
Unit Duty (btu/hr)	88,041	
Hours of operation	8,400	
Savings per Hour	\$1.10	

Pricing Summary:

Base Price - (1) model FS-5-CC5

(1) CS Blind flange kit (includes 2 flanges, gaskets, and all bolts)

(1) Carbon steel transition flanges matching boiler outlet

(1) Safety relief valve

Total budget price for single unit \$9,066.00



Subject: (1) 125hp boiler, Cannon quotation 070501 A2 (150 deg water inlet)

We welcome the opportunity to submit a price for a CANNON Feedwater Heater Model FS-5-DC5 for your heat recovery application. The price includes a Feedwater Heater with fully removable duplex stainless steel tubes with carbon steel fins. The transitions are designed with a system of baffles and drains to keep rain and condensate from falling into your boiler. Easily removable stainless steel side and end panels are a standard. The unit meets A.S.M.E. Code requirements and is registered with the National Board.

Estimated fuel savings of \$13,104/year equals a system payback of 1.12 years

Based on the boiler operating conditions below, \$1.00/therm natural gas and 80% boiler efficiency. Pricing for equipment only, not including installation.

Load Conditions:

100% Load	Water Side	Flue Gas Side
Mass Flow (lbs/hr)	4,313	4,959
Inlet Temperature(F)	150	400
Outlet Temperature(F)	201	235
Specific Heat(btu/lb F)	1.0012	0.268
Pressure Drop	0.15 psi	0.09 in WC*
Fouling Factor	0.0005	0.001
Unit Duty (btu/hr)	219,426	
Hours of operation	0	
Savings per Hour	\$2.74	

*not including transition losses. This unit is designed for a boiler with minimum of 0.25" WC flue gas pressure at the economizer.

50% Load	Water Side	Flue Gas Side
Mass Flow (lbs/hr)	2,157	2,480
Inlet Temperature(F)	150	400
Outlet Temperature(F)	208	212
Unit Duty (btu/hr)	124,928	
Hours of operation	8,400	
Savings per Hour	\$1.56	

Pricing Summary:

- Base Price - (1) model FS-5-DC5
- (1) CS Blind flange kit (includes 2 flanges, gaskets, and all bolts)
- (1) Carbon steel transition flanges
- (1) Safety relief valve

Total budget price for single unit \$14,701.00



Subject: (1) 125hp boiler, Cannon quotation 070501 A3 (60 deg water inlet)

We welcome the opportunity to submit a price for a CANNON Feedwater Heater Model FS-5-DS5 for your heat recovery application. The price includes a Feedwater Heater with fully removable duplex stainless steel tubes with stainless steel fins. The transitions are designed with a system of baffles and drains to keep rain and condensate from falling into your boiler. Easily removable stainless steel side and end panels are a standard. The unit meets A.S.M.E. Code requirements and is registered with the National Board.

Estimated fuel savings of \$16,716/year equals a system payback of 1.36 years

Based on the boiler operating conditions below, \$1.00/therm natural gas and 80% boiler efficiency. Pricing for equipment only, not including installation.

Load Conditions:

100% Load	Water Side	Flue Gas Side
Mass Flow (lbs/hr)	4,313	4,959
Inlet Temperature(F)	60	400
Outlet Temperature(F)	124	194
Specific Heat(btu/lb F)	0.9975	0.268
Pressure Drop	0.16 psi	0.09 in WC*
Fouling Factor	0.0005	0.001
Unit Duty (btu/hr)	274,205	
Hours of operation	0	
Savings per Hour	\$3.43	

*not including transition losses. This unit is designed for a boiler with minimum of 0.25" WC flue gas pressure at the economizer.

50% Load	Water Side	Flue Gas Side
Mass Flow (lbs/hr)	2,157	2,480
Inlet Temperature(F)	60	400
Outlet Temperature(F)	134	160
Unit Duty (btu/hr)	159,975	
Hours of operation	8,400	
Savings per Hour	\$1.99	

Pricing Summary:

Base Price - (1) model FS-5-DS5

(1) SS Blind flange kit (includes 2 flanges, gaskets, and all bolts)

(1) Safety relief valve

(1) Stainless steel frame

(1) Stainless steel header

(1) Stainless steel top transition

(1) Stainless steel bottom transition

(1) Stainless steel transition flanges matching boiler outlet

Total budget price for single unit \$22,749.00



Subject: (1) 600hp boiler, Cannon quotation 070501 B1 (227 deg water inlet)

We welcome the opportunity to submit a price for a CANNON Feedwater Heater Model FJ-12-CC5 for your heat recovery application. The price includes a Feedwater Heater with fully removable carbon steel tubes with carbon steel fins. The transitions are designed with a system of baffles and drains to keep rain and condensate from falling into your boiler. Easily removable stainless steel side and end panels are a standard. The unit meets A.S.M.E. Code requirements and is registered with the National Board.

Estimated fuel savings of \$45,108/year equals a system payback of 0.63 years

Based on the boiler operating conditions below, \$1.00/therm natural gas and 80% boiler efficiency. Pricing for equipment only, not including installation.

Load Conditions:

100% Load	Water Side	Flue Gas Side
Mass Flow (lbs/hr)	20,700	23,805
Inlet Temperature(F)	227	400
Outlet Temperature(F)	263	282
Specific Heat(btu/lb F)	1.0125	0.268
Pressure Drop	0.90 psi	0.08 in WC*
Fouling Factor	0.0005	0.001
Unit Duty (btu/hr)	756,704	
Hours of operation	0	
Savings Per Hour	\$9.45	

*not including transition losses. This unit is designed for a boiler with minimum of 0.25" WC flue gas pressure at the economizer.

50% Load	Water Side	Flue Gas Side
Mass Flow (lbs/hr)	10,350	11,903
Inlet Temperature(F)	227	400
Outlet Temperature(F)	268	266
Unit Duty (btu/hr)	429,662	
Hours of operation	8,400	
Savings Per Hour	\$5.37	

Pricing Summary:

- Base Price - (1) model FJ-12-CC5
- (1) CS Blind flange kit (includes 2 flanges, gaskets, and all bolts)
- (1) Carbon steel transition flanges matching boiler outlet
- (1) Safety relief valve

Total budget price for single unit \$28,381.00



Subject: (1) 600hp boiler, Cannon quotation 070501 B2 (150 deg water inlet)

We welcome the opportunity to submit a price for a CANNON Feedwater Heater Model FJ-12-DC5 for your heat recovery application. The price includes a Feedwater Heater with fully removable duplex stainless steel tubes with carbon steel fins. The transitions are designed with a system of baffles and drains to keep rain and condensate from falling into your boiler. Easily removable stainless steel side and end panels are a standard. The unit meets A.S.M.E. Code requirements and is registered with the National Board.

Estimated fuel savings of \$64,428/year equals a system payback of 0.51 years

Based on the boiler operating conditions below, \$1.00/therm natural gas and 80% boiler efficiency. Pricing for equipment only, not including installation.

Load Conditions:

100% Load	Water Side	Flue Gas Side
Mass Flow (lbs/hr)	20,700	23,805
Inlet Temperature(F)	150	400
Outlet Temperature(F)	202	231
Specific Heat(btu/lb F)	1.0012	0.268
Pressure Drop	0.79 psi	0.08 in WC*
Fouling Factor	0.0005	0.001
Unit Duty (btu/hr)	1,078,930	
Hours of operation	0	
Savings Per Hour	\$13.48	

*not including transition losses. This unit is designed for a boiler with minimum of 0.25" WC flue gas pressure at the economizer.

50% Load	Water Side	Flue Gas Side
Mass Flow (lbs/hr)	10,350	11,903
Inlet Temperature(F)	150	400
Outlet Temperature(F)	209	208
Unit Duty (btu/hr)	613,541	
Hours of operation	8,400	
Savings Per Hour	\$7.67	

Pricing Summary:

- Base Price - (1) model FJ-12-DC5
- (1) CS Blind flange kit (includes 2 flanges, gaskets, and all bolts)
- (1) Carbon steel transition flanges matching boiler outlet
- (1) Safety relief valve

Total budget price for single unit \$32,601.00



Subject: (1) 600hp boiler, Cannon quotation 070501 B3 (60 deg water inlet)

We welcome the opportunity to submit a price for a CANNON Feedwater Heater Model FJ-12-DS5 for your heat recovery application. The price includes a Feedwater Heater with fully removable duplex stainless steel tubes with stainless steel fins. The transitions are designed with a system of baffles and drains to keep rain and condensate from falling into your boiler. Easily removable stainless steel side and end panels are a standard. The unit meets A.S.M.E. Code requirements and is registered with the National Board.

Estimated fuel savings of \$83,496/year equals a system payback of 0.57 years

Based on the boiler operating conditions below, \$1.00/therm natural gas and 80% boiler efficiency. Pricing for equipment only, not including installation.

Load Conditions:

100% Load	Water Side	Flue Gas Side
Mass Flow (lbs/hr)	20,700	23,805
Inlet Temperature(F)	60	400
Outlet Temperature(F)	126	186
Specific Heat(btu/lb F)	0.9975	0.268
Pressure Drop	0.84 psi	0.08 in WC*
Fouling Factor	0.0005	0.001
Unit Duty (btu/hr)	1,367,063	
Hours of operation	0	
Savings Per Hour	\$17.08	

*not including transition losses. This unit is designed for a boiler with minimum of 0.25" WC flue gas pressure at the economizer.

50% Load	Water Side	Flue Gas Side
Mass Flow (lbs/hr)	10,350	11,903
Inlet Temperature(F)	60	400
Outlet Temperature(F)	137	151
Unit Duty (btu/hr)	795,971	
Hours of operation	8,400	
Savings Per Hour	\$9.94	

Pricing Summary:

- Base Price - (1) model FJ-12-DS5
- (1) SS Blind flange kit (includes 2 flanges, gaskets, and all bolts)
- (1) Safety relief valve
- (1) Stainless steel frame
- (1) Stainless steel header
- (1) Stainless steel top transition
- (1) Stainless steel bottom transition
- (1) Stainless steel transition flanges matching boiler outlet

Total budget price for single unit \$47,680.00



Subject: (1) 1200hp boiler, Cannon quotation 070501 C1 (227 deg water inlet)

We welcome the opportunity to submit a price for a CANNON Feedwater Heater Model FJ-20-CC5 for your heat recovery application. The price includes a Feedwater Heater with fully removable carbon steel tubes with carbon steel fins. The transitions are designed with a system of baffles and drains to keep rain and condensate from falling into your boiler. Easily removable stainless steel side and end panels are a standard. The unit meets A.S.M.E. Code requirements and is registered with the National Board.

Estimated fuel savings of \$87,528/year equals a system payback of 0.52 years

Based on the boiler operating conditions below, \$1.00/therm natural gas and 80% boiler efficiency. Pricing for equipment only, not including installation.

Load Conditions:

100% Load	Water Side	Flue Gas Side
Mass Flow (lbs/hr)	41,400	47,610
Inlet Temperature(F)	227	400
Outlet Temperature(F)	262	286
Specific Heat(btu/lb F)	1.0125	0.268
Pressure Drop	1.39 psi	0.11 in WC*
Fouling Factor	0.0005	0.001
Unit Duty (btu/hr)	1,453,669	
Hours of operation	0	
Savings Per Hour	\$18.17	

*not including transition losses. This unit is designed for a boiler with minimum of 0.25" WC flue gas pressure at the economizer.

50% Load	Water Side	Flue Gas Side
Mass Flow (lbs/hr)	20,700	23,805
Inlet Temperature(F)	227	400
Outlet Temperature(F)	267	269
Unit Duty (btu/hr)	834,116	
Hours of operation	8,400	
Savings Per Hour	\$10.42	

Pricing Summary:

- Base Price - (1) model FJ-20-CC5
- (1) CS Blind flange kit (includes 2 flanges, gaskets, and all bolts)
- (1) Carbon steel transition flanges matching boiler outlet
- (1) Safety relief valve

Total budget price for single unit \$45,599.00



Subject: (1) 1200hp boiler, Cannon quotation 070501 C2 (150 deg water inlet)

We welcome the opportunity to submit a price for a CANNON Feedwater Heater Model FJ-20-DC5 for your heat recovery application. The price includes a Feedwater Heater with fully removable duplex stainless steel tubes with carbon steel fins. The transitions are designed with a system of baffles and drains to keep rain and condensate from falling into your boiler. Easily removable stainless steel side and end panels are a standard. The unit meets A.S.M.E. Code requirements and is registered with the National Board.

Estimated fuel savings of \$124,992/year equals a system payback of 0.42 years

Based on the boiler operating conditions below, \$1.00/therm natural gas and 80% boiler efficiency. Pricing for equipment only, not including installation.

Load Conditions:

100% Load	Water Side	Flue Gas Side
Mass Flow (lbs/hr)	41,400	47,610
Inlet Temperature(F)	150	400
Outlet Temperature(F)	200	238
Specific Heat(btu/lb F)	1.0012	0.268
Pressure Drop	1.23 psi	0.11 in WC*
Fouling Factor	0.0005	0.001
Unit Duty (btu/hr)	2,071,903	
Hours of operation	0	
Savings Per Hour	\$25.89	

*not including transition losses. This unit is designed for a boiler with minimum of 0.25" WC flue gas pressure at the economizer.

50% Load	Water Side	Flue Gas Side
Mass Flow (lbs/hr)	20,700	23,805
Inlet Temperature(F)	150	400
Outlet Temperature(F)	207	214
Unit Duty (btu/hr)	1,190,597	
Hours of operation	8,400	
Savings Per Hour	\$14.88	

Pricing Summary:

- Base Price - (1) model FJ-20-DC5
- (1) CS Blind flange kit (includes 2 flanges, gaskets, and all bolts)
- (1) Carbon steel transition flanges matching boiler outlet
- (1) Safety relief valve

Total budget price for single unit \$52,679.00



Subject: (1) 1200hp boiler, Cannon quotation 070501 C3 (60 deg water inlet)

We welcome the opportunity to submit a price for a CANNON Feedwater Heater Model FJ-20-DS5 for your heat recovery application. The price includes a Feedwater Heater with fully removable duplex stainless steel tubes with stainless steel fins. The transitions are designed with a system of baffles and drains to keep rain and condensate from falling into your boiler. Easily removable stainless steel side and end panels are a standard. The unit meets A.S.M.E. Code requirements and is registered with the National Board.

Estimated fuel savings of \$161,280/year equals a system payback of 0.46 years

Based on the boiler operating conditions below, \$1.00/therm natural gas and 80% boiler efficiency. Pricing for equipment only, not including installation.

Load Conditions:

100% Load	Water Side	Flue Gas Side
Mass Flow (lbs/hr)	41,400	47,610
Inlet Temperature(F)	60	400
Outlet Temperature(F)	123	196
Specific Heat(btu/lb F)	0.9975	0.268
Pressure Drop	1.30 psi	0.10 in WC*
Fouling Factor	0.0005	0.001
Unit Duty (btu/hr)	2,604,966	
Hours of operation	0	
Savings Per Hour	\$32.56	

*not including transition losses. This unit is designed for a boiler with minimum of 0.25" WC flue gas pressure at the economizer.

50% Load	Water Side	Flue Gas Side
Mass Flow (lbs/hr)	20,700	23,805
Inlet Temperature(F)	60	400
Outlet Temperature(F)	134	160
Unit Duty (btu/hr)	1,536,330	
Hours of operation	8,400	
Savings Per Hour	\$19.20	

Pricing Summary:

- Base Price - (1) model FJ-20-DS5
- (1) SS Blind flange kit (includes 2 flanges, gaskets, and all bolts)
- (1) Safety relief valve
- (1) Stainless steel frame
- (1) Stainless steel header
- (1) Stainless steel top transition
- (1) Stainless steel bottom transition
- (1) Stainless steel transition flanges matching boiler outlet

Total budget price for single unit \$74,022.00