BOILER FEED AND CONDENSATE RECOVERY SYSTEMS

Extend the life and efficiency of your steam boiler system

CleaverBrooks®

Integrate Boiler Feed and Recovery to Get the Most From Your Boiler System

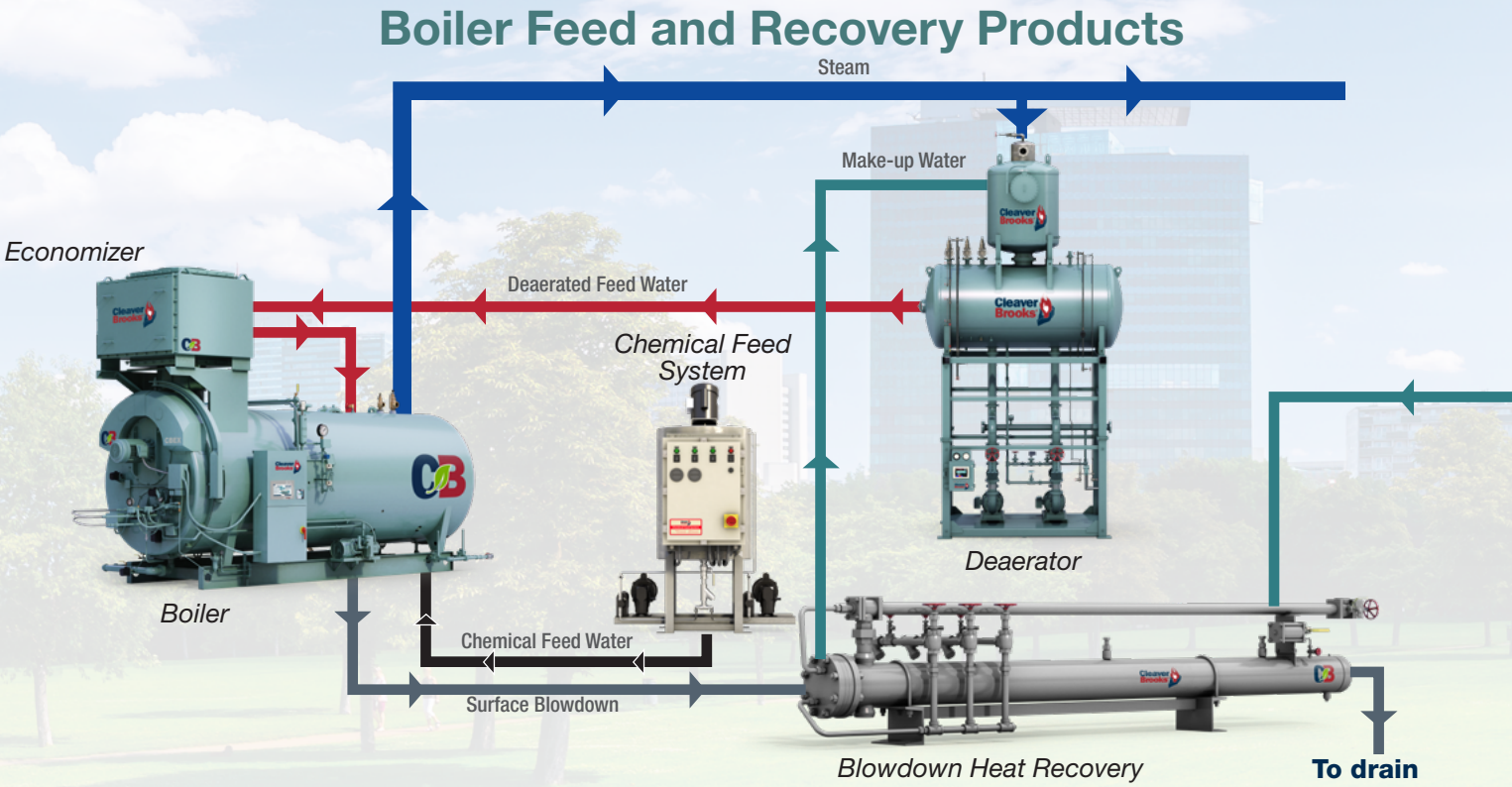
Increase the safety, reliability, and useful life of your system with deaerators, surge tanks, feedwater systems, and water treatment that can integrate into any system, regardless of size or application. It's an example of Cleaver-Brooks Total Integration—more efficiency, lower emissions, higher reliability. Untreated water contains as much as ten cubic centimeters of corrosion-causing dissolved oxygen per liter – which, left untreated, will lead to premature piping and tube failure. Implementing a boiler feed system can reduce the need for certain chemical treatments, and by preheating boiler feedwater, will also reduce the effects of thermal shock to the boiler. Treating your boiler feed water will ensure longer equipment life, reduced maintenance, and lower operating costs.

We build our deaerators so all internal surfaces that come in contact with undeaerated water are constructed with corrosion-resistant alloys for a lifetime of service, and employ the basic principles of gas removal proven most effective and economical to every boiler owner.

Cleaver-Brooks surge tank products provide additional storage time and handle volume swings in condensate returns. Because condensate return volume is largely unpredictable, a surge tank provides a means to collect intermittent condensate returns and supply water at a relatively constant volume, while limiting wasteful discharge to drain.

From the initial fuel inlet to the stack outlet, Cleaver-Brooks can fully design, engineer, manufacture, and integrate every component of a boiler system. Total integration of components provided by Cleaver-Brooks engineering can ensure that your boiler system is operating at peak efficiency.

The Steam System



Boiler Feed and Recovery Products

Deaerators

	Capacity	Features
Traymaster (Vertical)	30,000–500,000 lb/hr	Vertical heater column with trays for deaeration.
Traymaster (Horizontal)	500,000–1,000,000 lb/hr	Horizontal heater column with trays for deaeration. Most effective deaeration for large boilers.
Spraymaster	7,000–280,000 lb/hr	Spray-type scrubber cone design with a compact footprint.
Duo Tank	7,000–280,000 lb/hr	Combined Spraymaster deaerator and surge tank in multiple configurations.
Boilermate	1,500–135,000 lb/hr	Packed-column design for deaeration.

Boiler Room Systems

	Capacity	Features
Boiler Feed System	Up to 2,200 gallons	Preheats boiler feedwater.
Surge Tank	300–3,000 gallons	Collects condensate for reuse, which reduces fuel costs.
Condensate Return System	10-135-gallons	Standard and custom systems available, with a variety of optional features.

Water Treatment Products

Dealkalizer *Water Softener* *Water Filter*

Water Systems Applications	Process Steam, Sterilization, Hospital/Healthcare, Laundry and Drycleaning, Industrial Process, Humidification, Power Utilities, Building Heat, Waste-water Recovery, Refineries and Petrochemical

Traymaster Deaerator

Our pressurized, low-maintenance tray-style systems are designed to remove dissolved oxygen in boiler feedwater and eliminate carbon dioxide. Our deaerators are pre-designed standard for faster delivery, however, both vertical and horizontal configurations are flexible for custom configurations as requested. The tray design is recognized as the most versatile and efficient method of reducing dissolved oxygen content in boiler feedwater to levels less than .005 cc/liter (7 ppb) while also removing carbon dioxide. A typical Traymaster package includes a deaerator tank mounted on a stand of appropriate height, along with all operating controls, and feed pumps, fully factory assembled and piped.

Protects the Boiler

Mechanically reduces corrosive oxygen content from incoming feedwater to less than .005 cc/liter (7 ppb), thereby protecting the boiler tubes from oxygen corrosion.

Saves Fuel and Reduces Water Use

Permits recovery of valuable, high-purity, pretreated condensate return to be used as boiler feedwater.

Saves Fuel and Reduces Chemical Use

By using mostly mechanical means rather than purely chemical methods to remove dissolved oxygen from the feedwater, the need for additional chemical treatment will be reduced. This also reduces the amount of boiler blowdown required.

Protects the Entire System

Mechanically eliminates corrosive carbon dioxide from incoming feedwater to lower the possibility of carbonic acid attack on the entire steam system.

Traymaster Vertical

Traymaster Vertical (TMV)

30,000–500,000 lb/hr

Vertical tray column design requires no maintenance and is best for handling high-temperature condensate returns.

Traymaster Horizontal (TMH)

500,000–1,000,000 lb/hr

Horizontal tray column design requires less vertical space and provides a larger capacity level.

Features (TMV and TMH)

- Carbon dioxide concentration is reduced to zero, oxygen concentration is reduced to 7 ppb in solution
- Counter-flow deaeration in a common vessel with no recycle pump needed
- Stainless steel deaeration assembly for longer life of wetted materials in contact with corrosive liquids and gases
- Pressurized tank reduces flashing and minimizes venting to save BTUs that would normally be exhausted
- Trays are constructed of 430 stainless steel to provide long service life
- Handles high temperature condensate better than spray/scrubber design deaerators

Traymaster Horizontal

Spraymaster Deaerator

The Cleaver-Brooks Spraymaster deaerator provides high purity effluent by removing oxygen and other dissolved gases in the boiler feedwater, and preheats condensate for energy savings. Built of corrosion-resistant alloys for a lifetime of service, the deaerator employs the proven principles of gas removal to economically extend boiler and steam system life while saving considerable energy in the process. Spraymaster design also allows installation in lower ceiling height boiler rooms or where there are overhead restrictions. A typical Spraymaster package includes a deaerator tank mounted on a stand of appropriate height, along with all operating controls, and feed pumps, fully factory assembled and piped.

Spraymaster

7,000–280,000 lb/hr

The Spraymaster deaerator is a compact, pressurized, low-headroom, spray-type deaerator system designed to remove dissolved oxygen in boiler feedwater and eliminate carbon dioxide. The Spraymaster is built to Cleaver-Brooks specifications with our high standards for efficiency and performance. It's delivered fast and competitively priced.

Features

- Stainless steel deaeration assembly
- Pressurized tank reduces flashing and minimal venting
- Recovery of flash steam, exhaust, and provides turbine steam
- Exceeds ASME recommendations for oxygen level
- Internal pump suction vortex breakers
- Allows for pre-engineered custom ordering to occur so that special components can be selected
- Counter-flow deaeration in a common vessel with no recycle pump needed

Duo Tank

7,000–280,000 lb/hr

The Duo Tank combines a deaerator and surge tank in one package, providing water treatment and protection from boiler load swings in one component. The combination allows for a compact design for both units, which are engineered to work together in tandem. The Duo Tank is also available as two separate vessels on a single skid either end-to-end or stacked vertically in a piggy back configuration. A typical duo-tank package includes deaerator and storage tank mounted on a stand of appropriate height, along with all operating controls, and feed pumps, fully factory assembled and piped.

Features

- Double inner head separates the deaerator pressure vessel from surge tank
- Vented and insulated gap between the deaerator and surge tank
- Low-profile design
- Two-stage deaeration in a common vessel
- Packaged units for cost-effective installation
- Stand alone or combination deaerator and surge tank
- Ability to bypass a deaerator
- One control system for both tanks

Packed Column Deaerators

The Boilermate® and Minimate™ deaerators economically effect oxygen removal through a design that is trouble-free in performance. A typical deaerator package includes the packed column and storage tank mounted on a stand of appropriate height, along with all operating controls, and feed pumps, assembled and piped.

Boilermate

1,500–135,000 lb/hr

A pressurized packed-column deaerator system designed to remove dissolved oxygen in boiler feedwater.

Boilermate

Minimate

2,000–7,000 lb/hr

A small-scale, pressurized packed-column type deaerator system designed to remove dissolved oxygen in boiler feedwater.

Minimate

Features

- Less mechanical movement of deaerator components.
- Counter-flow deaeration in a common vessel
- Variety of tank sizes to handle volume-swings in condensate return
- Internal stainless steel vent condenser
- Stainless steel deaeration assembly for longer life of wetted materials in contact with corrosive liquids and gases
- Handles high temperature condensate better than scrubber design deaerators

Boiler Feed System

For any boiler system to operate at its optimal performance, the Cleaver-Brooks atmospheric boiler feed has to be specially conditioned to filter out any impurities that may lead to significant problems in the system. Cleaver-Brooks boiler feed systems help maintain peak efficiency and prolong the life of boilers where investment in a deaerator cannot be justified.

Boiler Feed

1,500–55,200 lb/hr

Consisting of one or more feed pumps and a corrosion-resistant receiver tank, the system automatically supplements condensate with makeup water to replace system losses.

Features

- Boiler horsepower max: 800 HP per pump
- Allowable boiler operating pressures: 10 psi to 200 psi
- Tank sizes available: 45, 75, 100, 200, 270, 340, 500, 750, 1000, 1200, 1400, 1800 and 2200 gallon
- NEMA 1 control panel includes:
  - Magnetic motor starters
  - Pump control selector switches
  - Motor overload resets
  - Dedicated electronic pump and level controls are available
- Level float switch
- Solenoid-operated makeup water valve
- Gauge glass with shutoff valve
- Sample and chemical feed tappings
- Thermometer
- Piping with flexible coupler
- Available in stainless steel or galvanized tank options

Surge Tank

A surge tank is accessory equipment for a steam system designed to accommodate pressure changes and neutralize peaks and drops in pressure to prevent system failures and energy waste. Cleaver-Brooks surge tanks collect condensate for reuse in the boiler, greatly reducing energy usage and dependence on replacing boiler system losses with cold, untreated, raw water. Dedicated surge tanks are required when intermittent peak loads of condensate can exceed the surge capacity of the deaerator.

Surge Tank

300–3,000 gallons

Features

- 1/4" thick shell (minimum)
- Boosts condensate return
- Accepts gravity and pressure returns
- ASME tanks (optional)

High Pressure Condensate Receiver (HPCR)

300–3,000 gallons

Features

- Heavy duty ASME pressure vessel
- Durable, industrial pumps with variable speed drives included as standard
- Proven ADAC feedwater control system with gradual startup sequencing for easy operation
- Eliminate heat and water losses from flashing condensate
- Reduce dependency on legacy flash tanks
- Increase steam capacity of the boiler by up to 10%

Packaged Water Controls

Engineered to work seamlessly with other Cleaver-Brooks boiler system controls, our packaged water controls monitor and manage all of your system's water-related touch points, including pumps and levels. With three flexible controls options, Cleaver-Brooks provides a solution for any system.

ADAC (Advanced Deaerator Control)

Packaged water control manages deaerators, duo tanks, and surge tanks for steam applications. Provides level control and alarms, pump control and alarms, steam pressure control and alarms, and is available for new equipment and conversions, even if it is not equipment manufactured by Cleaver-Brooks.

Features

- Allen-Bradley Compact Logix PLC
- Variable Frequency Drive
- Soft Starter or Contactor
- Color Touch Screen
- Remote External Communications
- Automatic Pump Lead/Lag Rotation
- Interface Building Automation Systems
- Level and Pressure Alarms and Control

LCS150e.1

- Single deaerator, surge or boiler feed system
- Provides level control and alarms
- Available for new equipment and conversions

LCS250e.1

- A simple and flexible two-tank level controls and alarms system for deaerator and surge combination applications
- Available for new equipment and conversions

PCS140e

- Pump control system for up to 4 pumps for single deaerator, surge and boiler feed system
- Simplify your pump control lead lag and alternation
- Available in new applications and retrofit
- Can be used with pumps featuring VSD

The power of total integration.

The Power of Total Integration is how Cleaver-Brooks delivers the world's broadest range of integrated, sustainable thermal solutions. In addition to our products, this includes Cleaver-Brooks global authorized sales representatives and independent service contractors, training resources, and trusted expertise that add significant value to your Cleaver-Brooks investment.

CleaverBrooks®

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