



# CBEX-3W

Steam Firetube Boiler  
250 to 800 HP



**Most Efficient  
Firetube Boiler in  
the Market**

A Cleaver-Brooks  
Sustainable Solution



# Sustainable for the Environment, Strategic for Your Bottom Line

CBEX technology is unmatched in the industry. That means greater advantages for your company now and into the future.

The CBEX is the result of decades of boiler engineering experience, and our commitment to the four cornerstones of a successful plant operation: Safety, Efficiency, Reliability and Sustainability.

## The CBEX firetube boiler:

- » Achieves **higher operating efficiency** than competitors' boilers, leading to lower fuel consumption over its lifetime
- » Can burn **renewable fuels** and meets the lowest possible emissions without SCR to achieve sustainability goals
- » Delivers the **highest part-load efficiency** on the market for the lowest operating costs in real-world applications
- » Offers the **lowest total cost of ownership** considering maintenance, unplanned downtime and years of service



Our CBEX boiler meets the strict performance and sustainability criteria required to earn the Cleaver-Brooks Sustainability Seal. Find out more at [cleaverbrooks.com/sustainability](https://cleaverbrooks.com/sustainability).



# The Most Efficient Firetube Ever Built

Many attributes make the CBEX the most unique and technologically advanced firetube design. Our EX technology provides for a revolutionary boiler system, featuring ultra low emissions and optimal combustion, making it the **most efficient firetube boiler on the market today**. It achieves 10:1 turndown while maintaining 3% O<sub>2</sub> across the full operating range and meets 9 ppm NO<sub>x</sub> without SCR.

85%  
EFFICIENCY



## Furnace Designed for Optimal Combustion

The larger furnace area in the CBEX allows for lower heat release rates, resulting in reduced thermal stresses within the furnace and a longer lifespan. The furnace dimensions have also been optimized to allow for low NO<sub>x</sub> emissions without SCR.

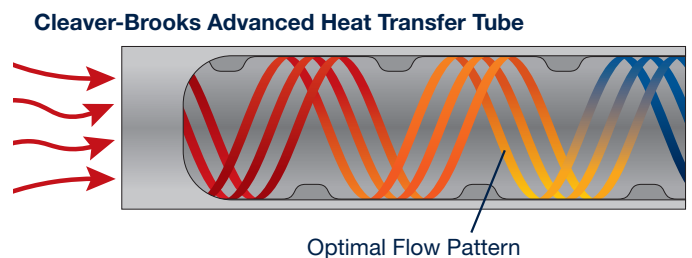
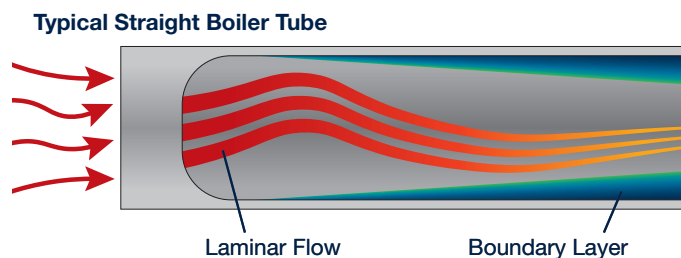
## Burner and Controls Package

With technology in mind, Cleaver-Brooks designed a burner and controls package for a single-source, factory-tested setup to ensure that your boiler will operate at peak efficiency with the lowest-possible emissions. Our research, design and testing result in a reliable and safe boiler system for your plant.



## Advanced Heat Transfer Tube

With the use of advanced engineering methods, Cleaver-Brooks designed the EX tube technology to increase heat transfer up to 85% over traditional boiler tubes. This allows for optimal furnace design and helps provide the lowest possible emissions.

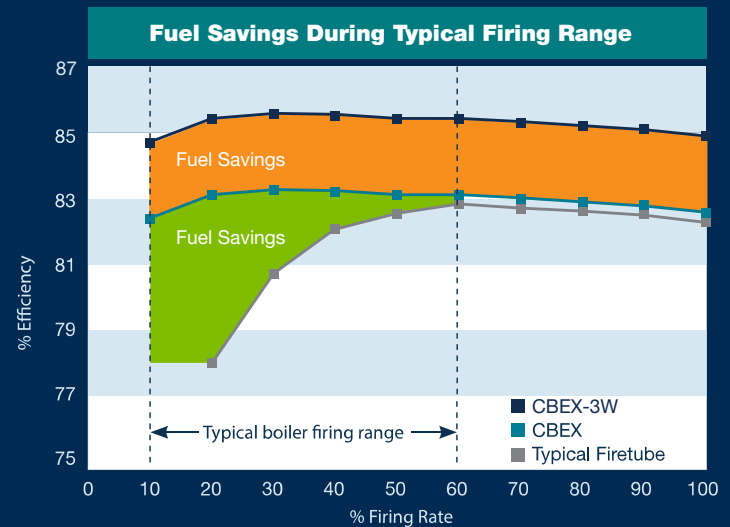


# Highest Operating Efficiency of Any Firetube



## 10:1 turndown while maintaining 3% O<sub>2</sub> across the firing range

To achieve the best operating efficiency, boiler engineers strive to maintain the lowest excess air throughout the firing range. Maintaining low excess air translates into higher efficiency. The CBEX is the only firetube to achieve 3% O<sub>2</sub> across the entire 10:1 turndown range\*, making it the most efficient firetube boiler ever built. The high operating efficiency paired with the high turndown rate means the boiler cycles less, minimizing the purging of energy caused by boiler cycling.



## Industry Leading Boiler — Backed by Cleaver-Brooks

Only Cleaver-Brooks can offer **performance guarantees** and **enhanced warranties** on every CBEX boiler because we design, manufacture, and test every part of every boiler to our exacting standards.

### Performance Guarantees:

- » Efficiency
- » Emissions
- » Steam Quality
- » Turndown

### Enhanced Warranties:

- » CBEX Pressure Vessel
- » Integral Burner

\*See website or contact your local representative for detailed information

## Integral Economizer Option

- » Economizer is built in accordance with Section VIII, Div. 1 of ASME code
- » Recover sensible heat from boiler exhaust to add heat to boiler feedwater
- » Single-stage economizer includes pre-piped feedwater supply
- » Access to economizer coil on side of boiler for ease of access for maintenance

# Exclusive Burner Technology

CBEX boilers are available with the Cleaver-Brooks exclusive integral burner. Cleaver-Brooks tests every single boiler and burner combination at our research and development facility to ensure the highest performance and reliable, repeatable operation. We are so confident in the reliability of our integral burner that Cleaver-Brooks is the only manufacturer to offer an extended 10-year burner warranty as standard.



## 250 to 800 HP Integral Burner

- » Reliable performance
- » Long lifespan
- » Quiet operation
- » Small footprint
- » Easy maintenance
- » Up to 10:1 turndown

Cleaver-Brooks exclusive integral burner technology has led the industry for more than 60 years.

## NTI Series Integrated Burner

The NTI series features a unique flame pattern enabling the burner to operate with low emissions throughout the turndown range. Advanced technology allows the NTI series to offer 9 ppm NO<sub>x</sub>, low CO emissions and 30% excess air up to 5:1 turndown.



## Additional Benefits of the Integral Burners

- » Verification testing has been reviewed and approved by Underwriter's Laboratory for the Integral Burner, Pressure Vessel and Controls, so a UL Listed label for the entire boiler package is included as a standard.
  - Only manufacturer with UL listed boiler package.
- » Low NO<sub>x</sub> emissions are achieved with the use of internal Flue Gas Recirculation, which eliminates the added cost to install external FGR ductwork.
- » Combustion air make-up requirements are easily accommodated for high altitude or 50 Hertz applications.

# Integral Economizer Features

- » Built in accordance with Section VIII, Div. 1 of ASME Code
- » Factory mounted ASME Code feedwater piping
- » Sensible heat from boiler exhaust is recovered and added to boiler feedwater
- » Lowers fuel usage
- » Environmental sustainability by reducing exhaust emissions
- » Single stage
- » Can accommodate low boiler ceiling height
- » Easy access from ground floor
- » Structurally supported within boiler vessel



## Integral economizer benefits

- » Increase boiler efficiency 1.5% to 2%
- » Reduce rigging time
- » Reduce on-site installation costs because:
  - ASME feedwater piping is factory-mounted to the boiler
  - Feedwater valve control wiring is included
  - Specially engineered economizer support is not required
  - Easier stack installation with less transitions.
- » Additional height in the boiler room is not required
- » Ladder with access platform is not required to maintain economizer
- » Economizer maintenance is performed off of the boiler room floor



# Hawk Integrated Controls System

The Hawk Control, which serves as the brain of the EX system, enables you to run your boiler safely and efficiently.

- » Completely integrated boiler/burner control is fully tested during development
- » Automatically tunes boiler for changes in environmental conditions
- » Combustion air fan vibration monitoring
- » Linkageless control eliminates single-point control hysteresis
- » Optional VSD control reduces fan horsepower load
- » Advanced emissions controls with NOx trim option
- » Unlimited options for system customization and optimization
- » NFPA and UL® compliant for maximum safety
  - Return to Pilot functionality for immediate ignition
  - Hawk water level control, draft control, third fuel option
  - Integrated deaerator and Host Panel controls



## Industry Leading Interface

The Hawk is the most powerful boiler control system available in the industry. Its user-friendly interface features:

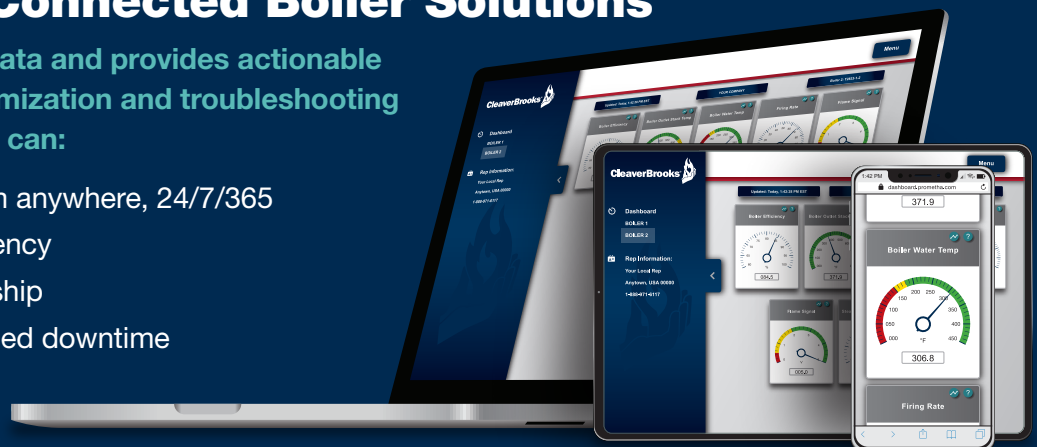
- » Highest resolution screen on the market
- » Intuitive navigation
- » Built-in maintenance manual
- » E-mail and text alerts



## Prometha® IoT-Connected Boiler Solutions

Prometha collects critical data and provides actionable insights, making boiler optimization and troubleshooting simple. With Prometha, you can:

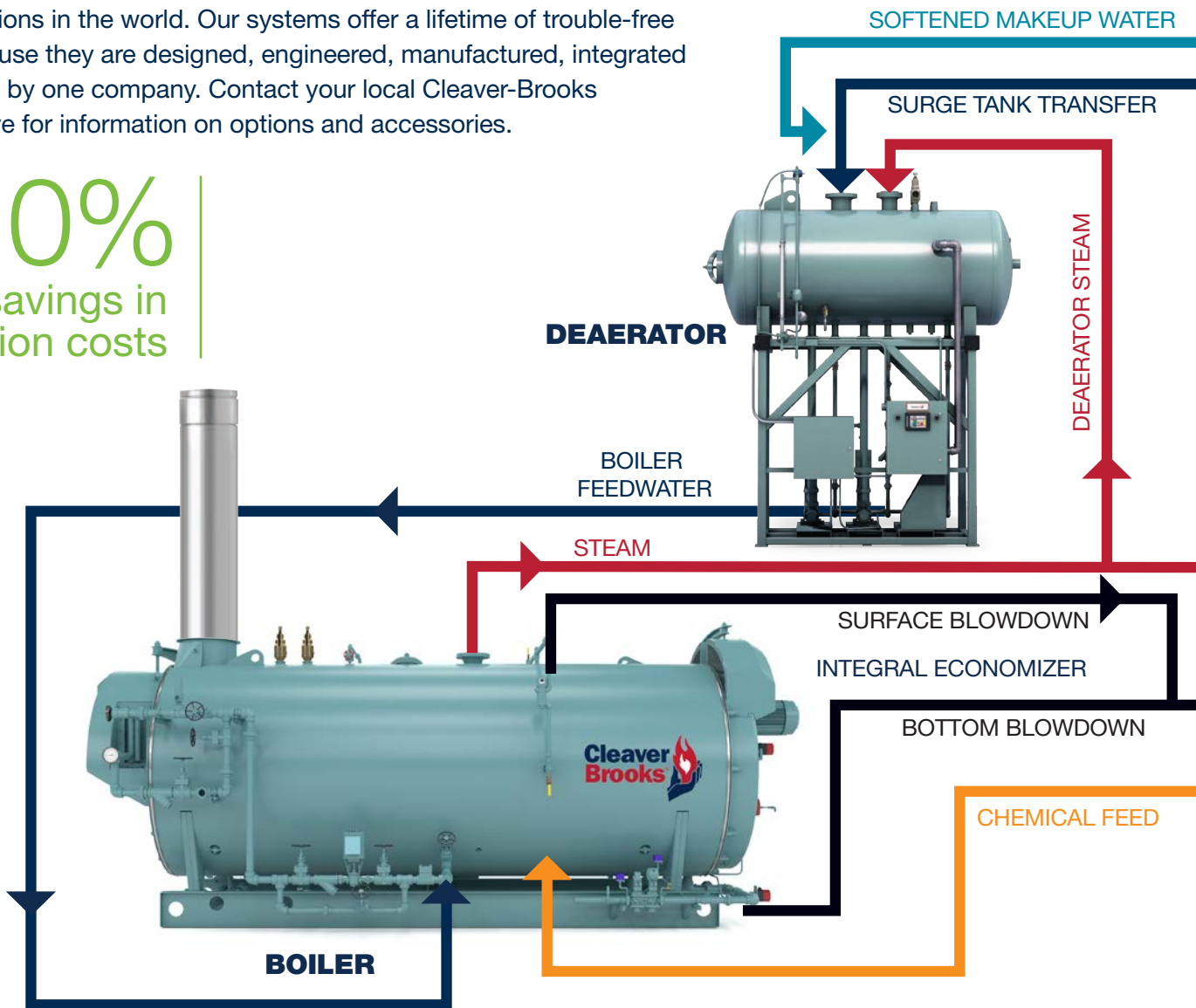
- » Access boiler insights from anywhere, 24/7/365
- » Increase operational efficiency
- » Lower total cost of ownership
- » Prevent or reduce unplanned downtime



# Take Optimization to the Limit

Cleaver-Brooks complete system integration produces the most efficient, reliable solutions in the world. Our systems offer a lifetime of trouble-free service because they are designed, engineered, manufactured, integrated and serviced by one company. Contact your local Cleaver-Brooks representative for information on options and accessories.

**5-10%**  
savings in  
installation costs



## Advanced Controls

- » Hawk boiler controls
- » Prometha® IoT Solutions
- » Advanced deaerator controls
- » Host Panel

## High-Pressure Condensate Systems

- » Improves overall system efficiency
- » Integrated controls for high-pressure operation

## Deaerators

- » Preheats boiler feedwater
- » Removes dissolved gases
- » Improves lifespan and efficiency of boilers

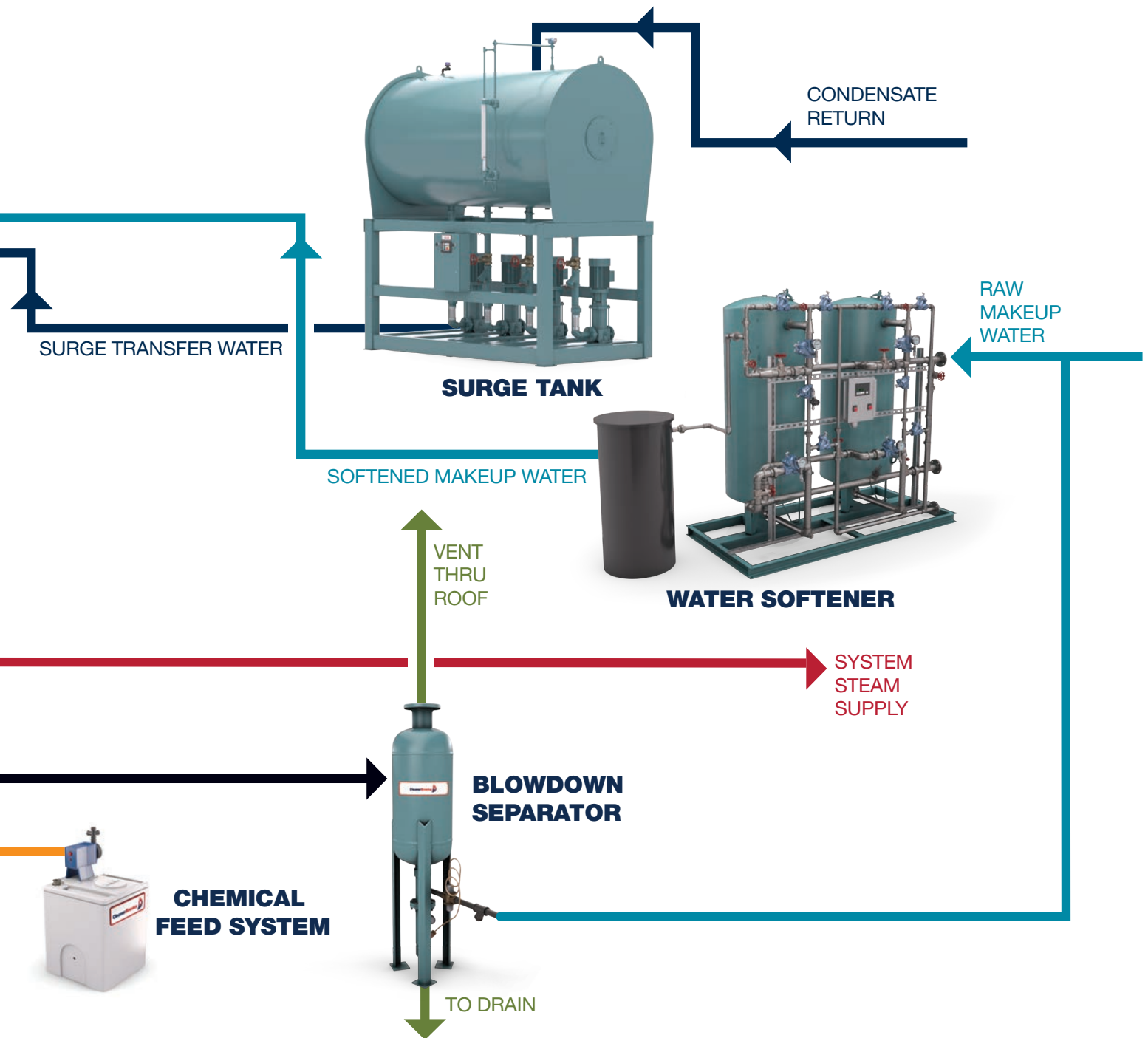
## Surge Tanks

- » Collects and stores condensate
- » Reduces makeup water and chemical usage

## Chemical Feed Systems

- » Chemicals treat the boiler system to maintain peak efficiency and reliability
- » Variety of options available depending on system specifics





## Duo Tank Systems

- » Combines spray-type deaerator and surge tank
- » Simplifies installation

## Water Softeners

- » Removes minerals that will create scale within boilers
- » Ensures long equipment life

## Blowdown Separators and Tanks

- » Cools blowdown water to safe temperature for discharge to drain
- » Required by code for most steam systems

# Waterback Configuration

Offered in a three-pass, waterback design, the CBEX-3W boiler package is engineered for long life, highest fuel-to-steam/water efficiency, maximum safety and lowest emissions. Its quiet operation, ease of maintenance and the ability to add desired options further enhance the package.

## Waterback



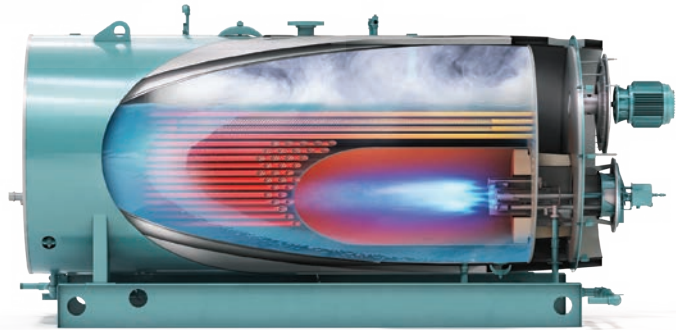
- » Less refractory maintenance at rear of boiler
- » Water-cooled rear turnaround
- » Limited rear clearance area required
- » Small footprint
- » About 8% less weight than standard models

### SMALL FOOTPRINT

8-10%  
less length

## Versatile Vessel Design

The optimized pressure vessel design allows for reduced thermal stresses, leading to longer boiler life and maximized operational efficiency.



## Reliable and Consistent Manufacturing

As a single-source provider, we control the manufacturing process of the burner, boiler, and controls, delivering consistency, reliability, and repeatability in all products.

# CBEX-3W Dimensions and Ratings

## CBEX-3W Waterback (250-800 HP)

	250	300	350	400	500	600	700	800
Boiler Output (HP)	250	300	350	400	500	600	700	800
Firing Rate, Btu/hr	10,205,793	12,246,951	14,288,110	16,329,268	20,411,585	24,493,902	28,576,220	32,658,537
Rated Capacity (lb-steam/hr at 212F)	8,625	10,350	12,075	13,800	17,250	20,700	24,150	27,600
Btu Output (1000 Btu/hr)	8,369	10,043	11,716	13,390	16,738	20,085	23,433	26,780
Overall Length (30 PPM System)	228.6"	236.3"	241.4"	260.3"	246.6"	266.6"	257.5"	272.2"
Overall Length (30 PPM System) with Economizer	249.1"	256.8"	261.9"	280.8"	267.1"	287.1"	279.6"	294.3"
Overall Width	97.4"	97.4"	103.5"	103.5"	117.33"	117.33"	131.5"	131.5"
Base to top of Front Head Bolt	108"	108"	114"	114"	130.64"	130.64"	144.8"	144.8"
Base to Steam Outlet	96.4"	96.4"	101.75"	101.75"	118"	118"	130.6"	130.6"
Feedwater Inlet (Both Sides)	2	2	2	2	2.5	2.5	2.5	2.5
Steam Nozzle, 150 psig Design Pressure(300# Flange)	6	6	6	6	8	8	8	8
Blowdown-Front & Rear	1.5	1.5	1.5	2	2	2	2	2
Vent Stack Diameter (Flanged)	20	20	24	24	24	24	24	24

### Weights and Water Volume with Economizer

Total Dry Weight, lbs.	21,918	22,753	26,816	28,716	36,855	39,783	46,834	49,287
Water Volume - Operating, Gal.	1,500	1,519	1,734	1,930	2,255	2,536	3,621	3,802
Water Volume - Flooded, Gal.	1,746	1,774	2,082	2,314	2,769	3,110	4,405	4,635
Water Weight - Operating, lbs.	12,498	12,657	14,446	16,076	18,783	21,129	30,167	31,671
Water Weight - Flooded, lbs.	14,547	14,777	17,341	19,275	23,062	25,903	36,693	38,613
Total Weight - Operating, lbs.	34,416	35,410	41,262	44,792	55,638	60,912	77,001	80,958
Total Weight - Flooded, lbs.	36,465	37,530	44,157	47,992	59,917	65,686	83,527	87,900

### Without Economizer

Total Dry Weight, lbs.	21,364	22,199	26,208	28,108	36,011	38,938	45,724	48,177
Water Volume - Operating, Gal.	1,496	1,514	1,728	1,923	2,246	2,526	3,610	3,788
Water Volume - Flooded, Gal.	1,742	1,769	2,076	2,307	2,760	3,099	4,393	4,622
Water Weight - Operating, lbs.	12,462	12,614	14,396	16,019	18,712	21,044	30,068	31,558
Water Weight - Flooded, lbs.	14,511	14,734	17,291	19,219	22,991	25,818	36,594	38,500
Total Weight - Operating, lbs.	33,826	34,813	40,605	44,127	54,723	59,982	75,792	79,735
Total Weight - Flooded, lbs.	35,875	36,933	43,500	47,327	59,002	64,756	82,318	86,676

### Minimum Clearances, inches

Tube Removal - Front from Head Flange	122.7	127.0	131.2	148.4	131.4	151.4	149.0	183.5
Tube Removal - Rear from Rear Head Flange w/o Econ	151.25	157.25	161.25	179.25	162.25	182.25	176.25	188.25
Tube Removal - Rear from Rear Head Flange with Econ	130.75	136.75	140.75	158.75	141.75	161.75	154.2	166.2
Front Door Swing *	82	82	89	89	102	102	118	118
Rear Door Swing without Econ *	45	45	46	46	54	54	60	60
Rear Door Swing with Econ*	66	66	67	67	75	75	82	82
Econ Minimum Removal Clearance from Boiler Center w/o Pipe**	88.22	88.22	94.11	94.11	115.25	115.25	136	136

\*250 and 800 HP are davited

\*\*left side standard; contact CB for right side access





## The power of total integration.

The **Power of Total Integration** is how Cleaver-Brooks delivers the world's broadest range of integrated, sustainable boiler plant solutions. In addition to our products, this includes our global representative and service network, training resources, and trusted expertise that add significant value to your Cleaver-Brooks investment.



Click or scan the QR code to access CBEX-3W resources



Product designs, specifications and/or data in this document are provided for informational purposes only and are not warranties of any kind. Product designs and/or specifications may be changed at any time without notice. The only warranties that apply to sales of products and services are Cleaver-Brooks standard written warranties, which will be furnished upon request.

Cleaver-Brooks and other trademarks and service marks used herein are the property of The Cleaver-Brooks Company, Inc. © 2021 The Cleaver-Brooks Company, Inc. All rights reserved.

Printed in the USA  
CB-8654  
12/2024