



The world's new standard in efficiency.

# CBEX

**FIRETUBE**

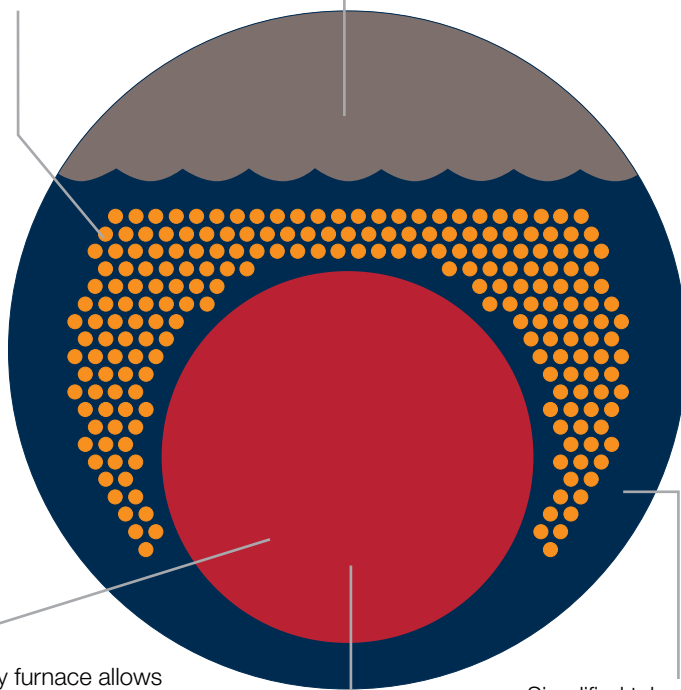
# EX TECHNOLOGY MAKES IT THE MOST ADVANCED AND THE MOST EFFICIENT FIRETUBE LINE EVER MANUFACTURED.

But what makes **EX Technology** so unique?

## An engineered design from the ground up.

Advanced heat transfer tubes enable fuel-to-steam efficiency up to 85%

Large steam disengaging area optimized for 99.9% pure steam



Large primary furnace allows improved combustion, resulting in high turndown, minimum excess air, and low emissions

Simplified tube sheet design with uniform temperature gradient without multi-pass baffles

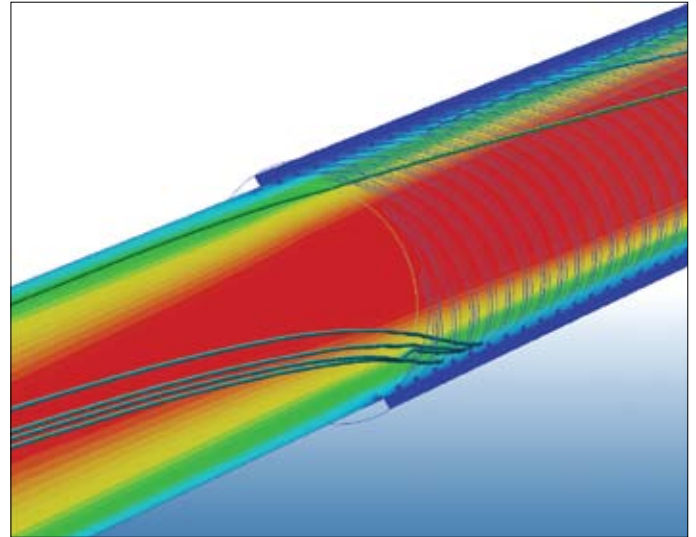
Oversized furnace captures up to 70% of the total energy

*CBEX optimized design*

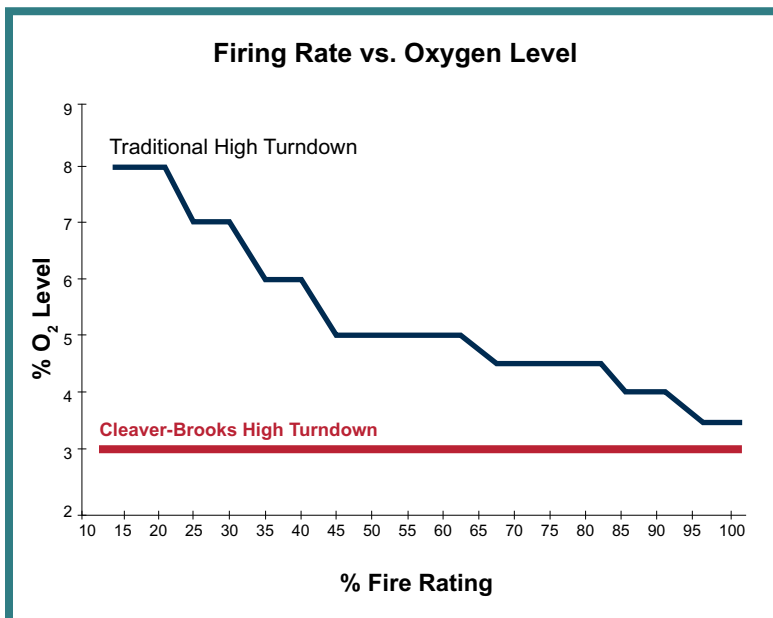
Cleaver-Brooks engineers used finite element analysis to design and optimize every component of the boiler, including the burner, the furnace and the tubes. Each component was designed to create an optimal boiler that has uniquely balanced temperatures and heat loads. Only Cleaver-Brooks could revolutionize a boiler from the ground up, because only Cleaver-Brooks designs and manufactures every optimized component.

# A new approach to extended heat transfer surfaces.

Cleaver-Brooks designed and manufactures a revolutionary extended heat transfer tubing only found in EX systems. Through Computational Fluid Dynamics (CFD) calculations, we optimized the geometry of the tube to increase heat transfer by 85%. The CBEX furnace was enlarged and the design honed to allow better heat transfer and improved combustion. The boiler features a water-cooled combustion turn-around area with minimum refractory. The result of the advanced heat transfer design is higher efficiency and lower emissions in a 15% smaller footprint.



CFD model of advanced heat transfer tube.



*Only boiler package in the world to maintain 3% oxygen across the full operating range with 30 ppm NO<sub>x</sub> performance while firing natural gas.*

## Lean burn technology provides near-stoichiometric combustion.

With an integrated burner and control, the fuel and air mixture is controlled at a 3% oxygen level throughout an industry-first 10:1 modulation. The CBEX provides the best-in-industry in-use fuel efficiency, and guaranteed improved fuel efficiency over any other system, period.

**All these innovations lead to a simplified design with reduced thermal gradients and stresses, increasing pressure vessel life. So you get unprecedented efficiency with a 15% smaller footprint, without sacrificing an ounce of power. We're so confident in the quality and performance, you'll get a limited 15-year warranty on the pressure vessel.**

# The New CBEX Elite:

Delivering the best efficiency and emissions control in the world.

## CBEX ELITE



**Best fuel efficiency** of any firetube ever built

**Completely integrated** boiler, burner, control and heat recovery system

**Minimum excess air** across the operating range

**Can meet 5 ppm NOx** emissions requirements without Selective Catalytic Reduction (SCR)

**Can meet 1 ppm CO** emissions requirements

**15% smaller footprint** than traditional designs

### 100–1200 HP

Exclusive Cleaver-Brooks integral burner

Integral burner design now available with 50% more capacity

Air-cooled integral front head

| HP        | Burner   | Integrated Control |
|-----------|----------|--------------------|
| 100–1200  | Integral | Hawk               |
| 1300–2200 | Packaged | Available          |

Our new EX technology is at the heart of a whole new way to experience efficiency, but that's only the beginning. The new CBEX Elite is our flagship system. Every core component has been designed and built by Cleaver-Brooks to work together, resulting in the most efficient and lowest-emission firetube system ever built.



**1300–2200 HP**  
 System-matched Cleaver-Brooks packaged burner  
 Maintains a small footprint in large capacities  
 Affordable alternative to industrial watertube boilers

| Heat Recovery         | NOx Level        | CO Level      | Fuel                    |
|-----------------------|------------------|---------------|-------------------------|
| Integrated Economizer | 5, 9, or 30 ppm  | down to 1 ppm | NG, #2 Oil, Combination |
| Available             | 9, 30, or 60 ppm | down to 1 ppm | NG, #2 Oil, Combination |

# The New CBEX Premium:

Get EX advantages with a packaged burner.

The CBEX Premium also includes our revolutionary EX technology, along with a completely integrated boiler and burner system. Extraordinarily efficient and capable of meeting very low NOx requirements, the CBEX Premium provides a high-value solution with next-generation engineering.

## CBEX PREMIUM

**EX technology** in a high-value solution

**Completely integrated** boiler and burner system

**High-efficiency,** next-generation firetube

**Can meet 9 ppm NOx** and low emissions requirements

**Smaller footprint** than traditional firetubes



### 100–1200 HP

High-quality Cleaver-Brooks packaged burner

Available up to 1200 HP with a traditional packaged burner

Add available heat recovery and controls for a completely integrated package

| HP       | Burner   | Integrated Control | Heat Recovery | NOx Level        | Fuel                    |
|----------|----------|--------------------|---------------|------------------|-------------------------|
| 100–1200 | Packaged | Available          | Available     | 9, 30, or 60 ppm | NG, #2 Oil, Combination |



# The integration is the key in a CBEX system.

## Hawk Control

**The brain of the EX system, the Hawk Control allows you to run your boiler at the absolute maximum efficiency.**



- Completely integrated boiler/burner control for maximum reliability and efficiency
- Automatically tunes boiler to changes in environmental conditions
- Easily pays for itself in fuel savings
- Linkageless control with air and fuel load following capabilities
- Reduced fan horsepower load with VSD control
- Control emissions with NOx trim
- Advanced communication options provide easy access to information and building automation system integration
- Unlimited options for system customization and optimization
- NPFA and UL® compliant for maximum safety

*Standard on the Elite / Available on the Premium*

## Economizer

**A stack economizer will reduce fuel use by recovering waste heat from flue gases and using it to preheat boiler feedwater.**



- Versatility of fuel choices and fin-to-tube combinations
- Available for steam and hot water boilers
- Stainless steel access doors for easy maintenance
- Built to last, with stainless steel inner casing and carbon steel exterior
- Condensing designs available

*Standard on the Elite / Available on the Premium*

## LevelMaster

**The LevelMaster low water cutoff and pump control is the safest control available.**

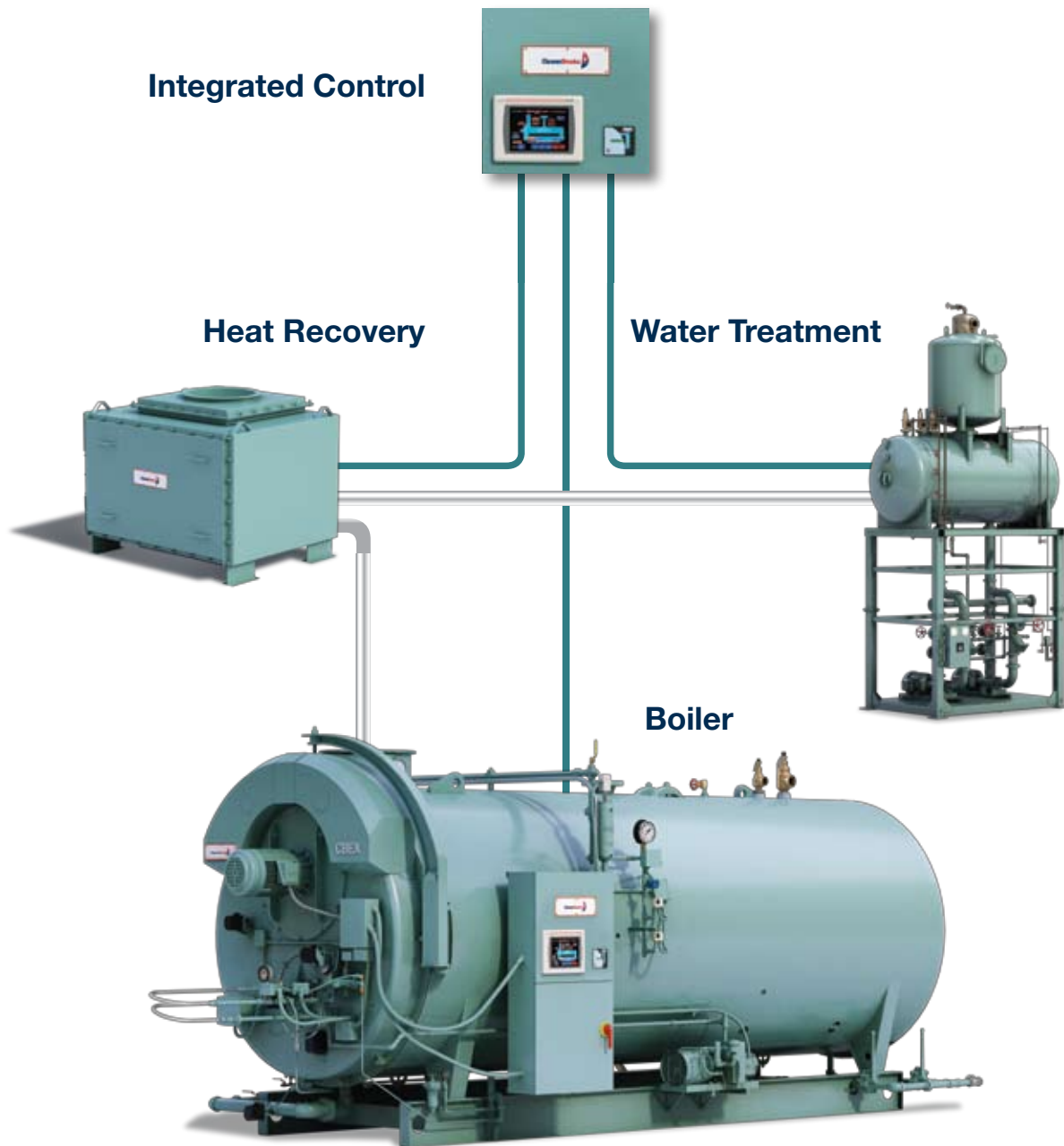


- User-friendly interface
- Magnetorestrictive technology eliminates levers and switches
- Multiple safety backups and redundancies constantly monitor float movement
- Secure and dependable blowdown and alarm log are password-protected
- Adaptable for any steam boiler
- Provides feedwater modulation signal and safety cutoff alarms

*Standard on both the Elite and the Premium*

## Engineered integration from the ground up.

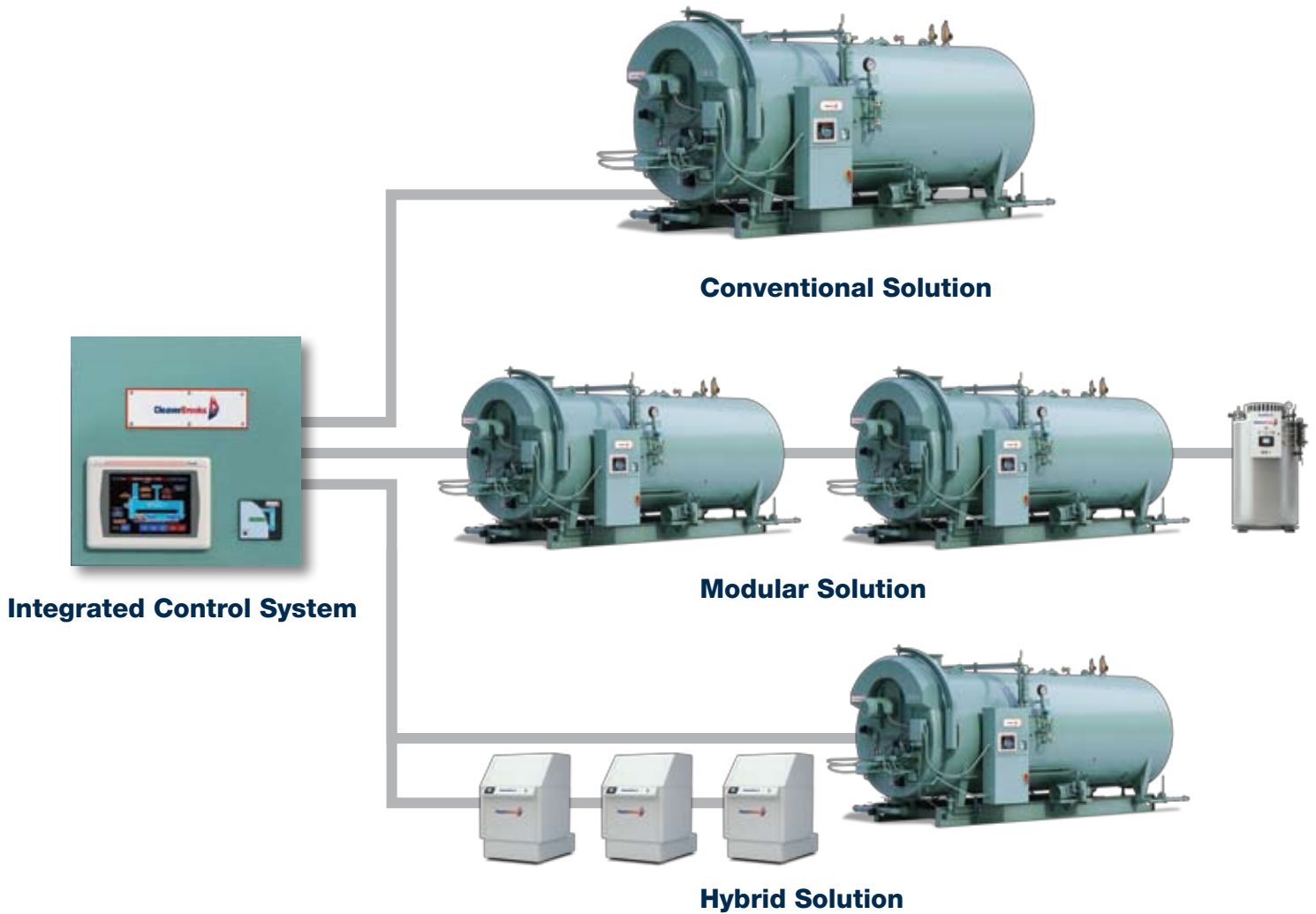
Cleaver-Brooks has once again brought its 90 years of experience and exclusive engineered integration to a series of boiler systems that only Cleaver-Brooks could have built. We can integrate any firetube system from burner to stack, and we are the only manufacturer of fully integrated boiler systems in the world. Add additional Cleaver-Brooks manufactured accessories like water treatment and heat recovery to make your systems work even harder and more efficiently. Our engineered integration ensures that all system components are designed, spec'd, built and guaranteed to work together. We are the only manufacturer in the world who can say that.





# Flexible Solutions

As the demand for more efficient and sustainable steam and hot water systems increases, differing combinations of boilers are required to deliver the best solution. Modular boiler systems that divide system load among boilers of similar size and type allow for more flexibility, because only the boilers you need to meet system demand will be operating at any given time. Not only can we provide you with modular systems, we can combine different types of Cleaver-Brooks boilers in a hybrid system for additional flexibility and ever-increasing efficiency.



## Conventional

Traditional, single-boiler solutions.

## Modular

Divide the load between different size boilers for more flexibility. Only the boilers you need to meet demand will be operating at any given time.

## Hybrid

Combine steam, hot water and condensing boilers in hybrid systems for additional flexibility.

# After-Sale Support

Whether it's our proprietary BOOST<sup>SM</sup> program for evaluating your boiler system, our boiler room training seminar and service, our global sales network or simply the most complete resource for boiler room parts, accessories, maintenance or emergency service, no one provides you with more or better support than Cleaver-Brooks.

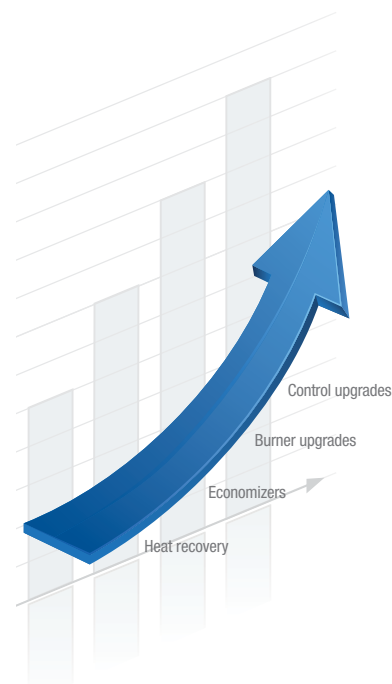


## Training

Cleaver-Brooks is committed to helping you maximize the safety and performance of your boiler room and steam or hot water system, and is the only boiler manufacturer with a dedicated Training Department focused on satisfying your specific needs. We offer comprehensive, in-depth training that teaches how to operate and maintain boiler systems at maximum safety and performance. If you're responsible for the day-to-day operation or maintenance of your company's boiler room, if you're a plant engineer, maintenance supervisor, operating engineer, facilities manager, plant manager or boiler room supervisor, we have a boiler room training seminar that can help. All courses are taught by experts and are designed to provide the interaction required to solve your specific needs.

## See how a new CBEX can maximize your efficiency and minimize costs with **BOOST.**

With our proprietary BOOST report, you can determine the exact upgrades and accessories your existing boiler system needs to increase its efficiency to its absolute maximum and decrease emissions. By installing the right burners, controls, heat recovery, or a brand new CBEX, you can realize substantial savings immediately. And our financial report details the cost savings in real numbers, so you can prove it's the right thing to do. No one else has BOOST, and no one else makes the accessories and components engineered specifically to operate together at peak efficiency. We know you want to make the most of every dollar, and we can help.

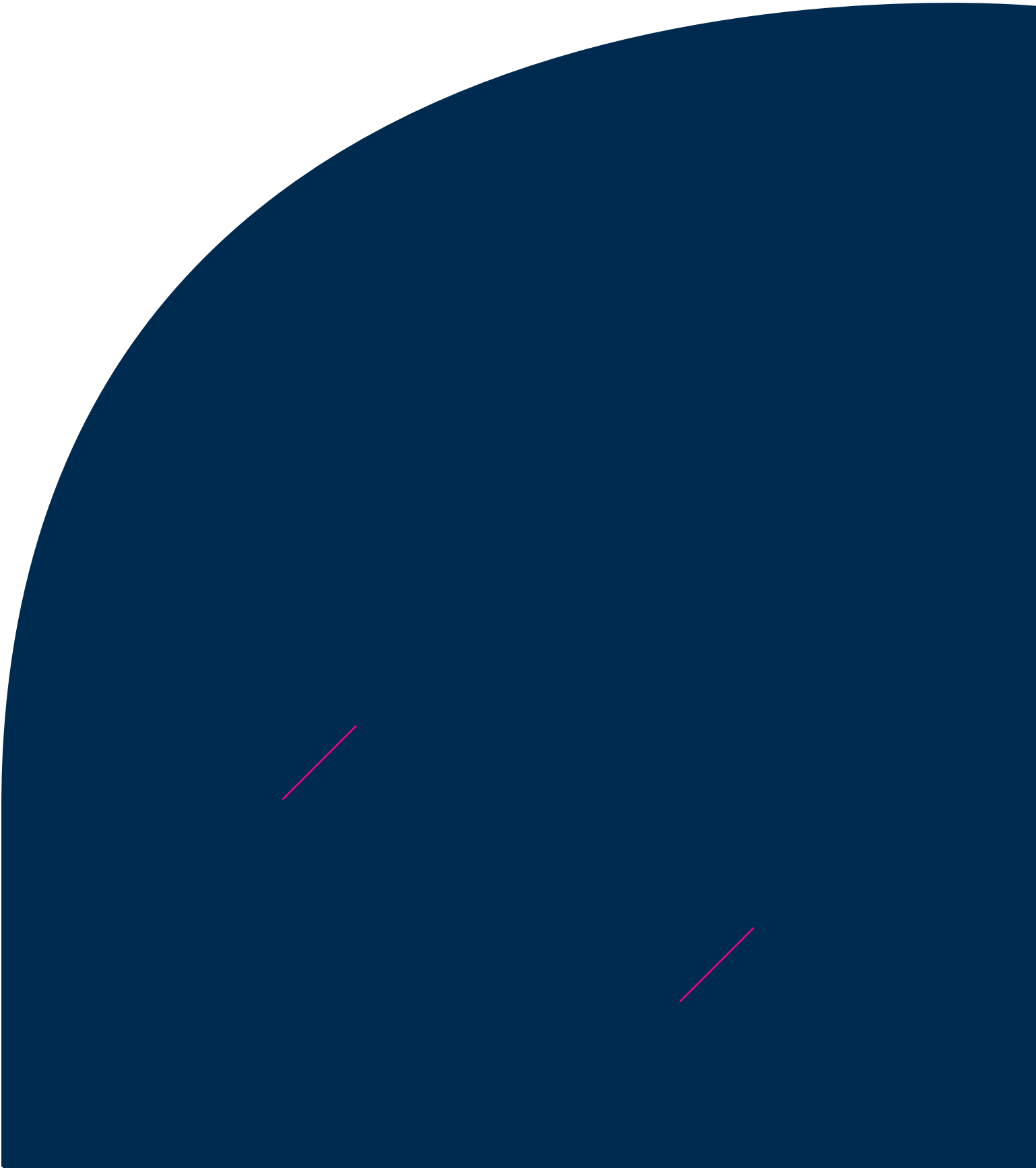


## Worldwide Industry-Leading Network



The Cleaver-Brooks Representatives Association (CBRA) is the first and only dedicated alliance of sales and service representatives in the industry. More than 1,500 CBRA representatives across the globe provide unparalleled, ongoing

support—from commissioning your system, to providing parts and service after the sale, to extensive product training and knowledge sharing.





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