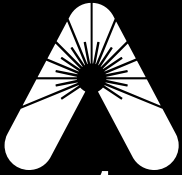


Flo-Direct[®]
Water Heater

Armstrong



Armstrong[®]

Intelligent System Solutions[™]

STEAM • AIR • HOT WATER

Flo-Direct® Complete Thermal Exchange Gas Fired Water Heater

Armstrong Flo-Direct® CTE gas fired water heaters offer a complete range of high efficiency, compact, all stainless steel water heaters which are remarkably dependable, simple in design and operation, and suitable for a wide variety of hot-water applications.

With standard operating capacities between 1 million and 15 million BTU per hour and customized systems up to 25 million BTU per hour, Flo-Direct® often deliver fuel savings as high as 30-60% when compared to steam/water heating systems.

With a small footprint, 99.7% or greater heat transfer efficiencies, remarkable dependability, ease of maintenance, and the ability to operate well with poor water quality Armstrong Flo-Direct® CTE gas fired water heaters are the product of choice for companies seeking to achieve Energy Conservation Measure (ECM) and Reduced Carbon Footprint objectives.

Primary Markets include:

Hot Water

Food Process Industries

- Washdown
- Batch Production
- Vessel Filling
- Tank Cleaning

Concrete Plants

- Pre-Heated Water for batch production.

Space Heating

- Greenhouses
Re-Circulated HW for general space heating
- Light Manufacturing/Warehouses
Re-Circulated HW for general space heating

General Industry

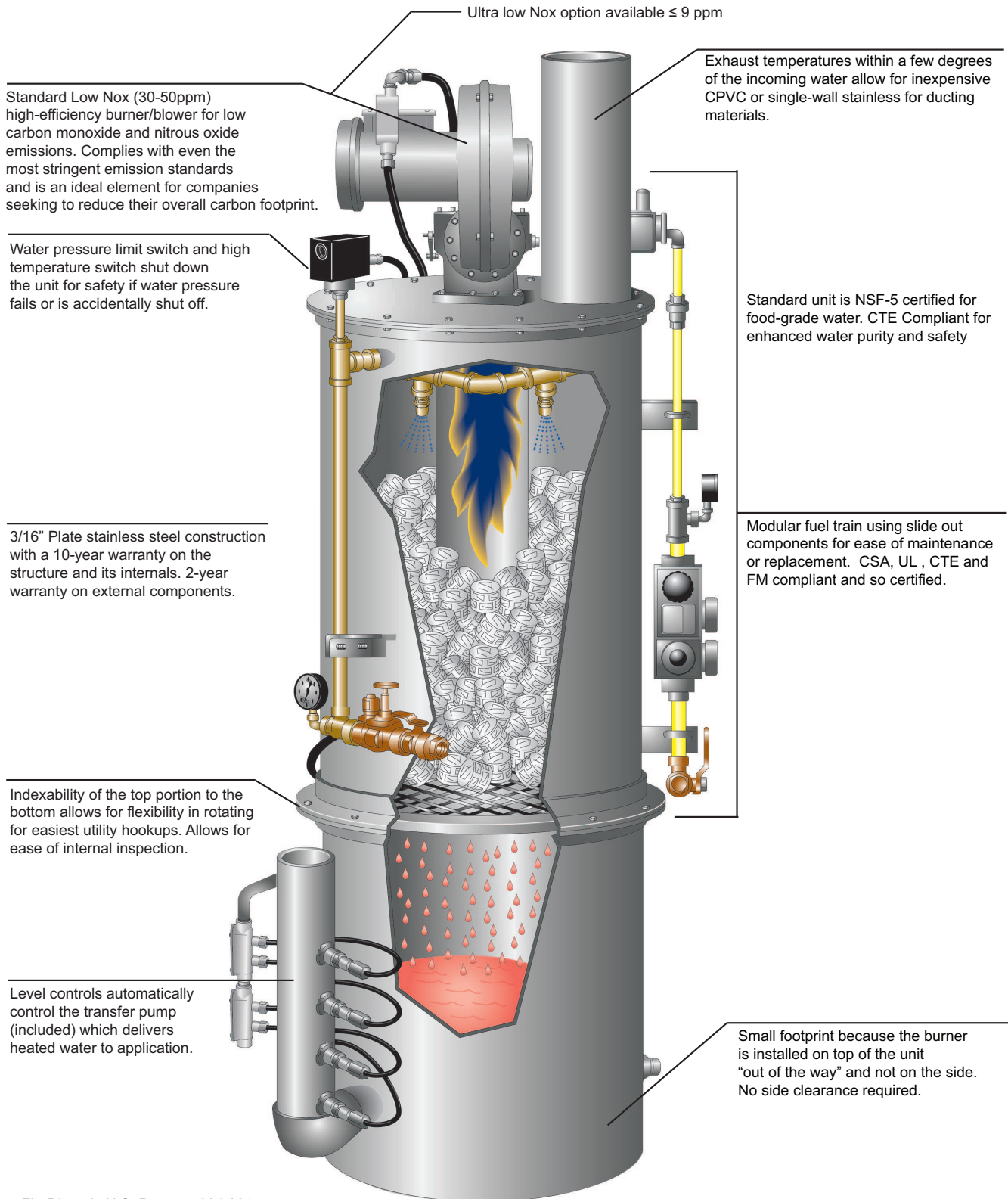
- Boiler Make-Up Water

Customized Hot Water System Solutions are our specialty. Multiple orientations, configurations and options are available.

Hot Water System Solutions which include transfer pumps, storage tanks variable frequency drive (VFD), pump skid-packaged solutions, hose stations, circulating pumps, downstream digital water temperature controls/loops with BAS/DDC interface along with a multitude of performance matched components can be application engineered specifically to meet the projects requirements.

Additionally, where appropriate, Armstrong can integrate engineering services, turn key installation and project management, system assessment and optimization along with energy conservation measure (ECM) capability through Armstrong Service Incorporated.

Flo-Direct® Complete Thermal Exchange Gas Fired Water Heater



Flo-Direct is U.S. Patent 5,924,391

Flo-Direct® Complete Thermal Exchange Gas Fired Water Heater

How the Flo-Direct® Complete Thermal Exchange Gas-Fired Water Heater delivers unrivaled Performance and Efficiency.

Incoming water is introduced into the top of the water heater through a series of calibrated dispersion nozzles. Cold water travels down through a bed of multifaceted stainless steel packing rings (Pall Rings) which break the water into smaller and smaller droplets.

A burner is mounted on top of the unit, firing downward through a centrally located flame tube. The flame tube is cooled by incoming cold water, and all of the fuel gasses are consumed within this flame tube. The design allows all combustion to take place within a dry and cool environment, and produces very low levels of nitrous oxide (NO) and carbon monoxide (CO).

Heat from the flame enters the lower chamber from the bottom of the flame tube, and travels slowly upward through the packing rings. Efficient heat transfer occurs as the descending water comes in contact with the rising hot gasses as both pass through the bed of packing rings in opposite directions.

This "rain" of hot water then falls into the lower chamber and is pumped out to a storage tank. Water temperatures up to 185°F are available within a minimum of 30 seconds after the unit starts. Outlet water temperature is set with a valve controlling the incoming water flow.

More incoming water results in cooler outlet water temperatures, and less incoming water produces hotter outlet water temperatures. The products of combustion are vented out of the top of the unit, and this exhaust is typically within a few degrees of incoming water temperature.

The Result

The Armstrong Flo-Direct® CTE gas fired water heater produces potable hot water instantaneously. There is no fuel consumed for warm-up or idle time. No energy is lost through steam conversion or within a heat exchanger. Virtually all of the fuel energy is transferred to the water.

Features

- CTE Compliant
- NSF certified for food-grade water
- No internal moving parts
- Low-temperature exhaust
- Water temperature differential from 10°F to 140°F
- 99.7% or greater efficiency
- Water treatment not required
- Stainless steel construction
- Takes up minimal floor space
- Ten year warranty on structure/two years on all other components

CTE Technology

Developed from direct contact water heating science that was first introduced more than two decades ago, Complete Thermal Exchange (CTE) has revolutionized high efficiency water heating methods. Today CTE enjoys a proven record and has rapidly become the new standard in energy savings.

While traditional direct contact water heating offers energy savings from 40% to nearly 60% over conventional boiler systems, Armstrong Flo-Direct® CTE gas fired water heaters, using CTE technology feature a 99.7% efficiency rating throughout each phase of its operation cycle. The sustained efficiency of Flo-Direct® CTE gas fired water heaters are clearly the most energy efficient method of hot water production on the market today.

Flo-Direct® Complete Thermal Exchange Gas Fired Water Heater

No Scale Build-Up

The Flo-Direct® CTE gas fired water heater’s unique design prevents scale build-up because there are no “hot spots” internally or externally, and because calcium is prevented from completely falling out of suspension during operation. As a result, if you have hard water entering the Flo-Direct® CTE gas fired water heater, you will have the same hard water coming out.

Armstrong Flo-Direct® CTE gas fired water heaters meet CTE Standards

CTE direct contact water heaters, such as the Flo-Direct®, meet five standards not found in older, traditional-method direct contact water heater technology:

1. CTE units maintain a minimum of 99.7% efficiency in all modes of operation not just under optimal conditions.
2. CTE units have multiple thermal passes. Water and the combustion gasses (or heat from the combustion) come in contact more than once. This ensures all of the heat or energy from combustion is transferred to the water.
3. CTE units have a dry combustion chamber. This is vital to maintaining complete combustion at all times during operation.
4. CTE units maintain complete combustion at all times.
5. CTE units must have a “Fail Safe” water integrity system for water quality. In any mode of failure the CTE unit will maintain the quality of the water coming out of the heater.

Complete Combustion = Complete Water Quality.

While many traditional-method direct contact water heaters spray water directly on the flame – sometimes called “flame quenching” – Flo-Direct®, using CTE technology, avoids this process altogether. According to the Industrial Heating Equipment Association’s “Combustion Technology Manual*,” flame quenching promotes incomplete combustion, and produces alcohols, aldehyde, formic acid, higher order acids, carbon monoxide, as well as carbon dioxide and water vapor. Because it uses CTE technology, Flo-Direct® maintains 99.7% combustion efficiency, while maintaining water quality at all times. In addition, Flo-Direct® has a built-in fail-safe system for heating water that maintains water quality despite any type of failure.

It is impossible to get the full BTU value from the fuel unless you have complete combustion.

Costs for Heating 10,000 Gallons of Water				
Type of Heater	Typical Sizes Btu/hour Available	Total System Efficiency †	Max. gpm*	Cost to Heat 10,000 Gallons**
Commercial water heater (atmospheric burner)	0.1 - 2.0 MM	70 - 85%	34 gpm	\$159.93 @ 75%
Steam Boiler	1.0 - 50.0 MM	55 - 75%	833 gpm	\$184.54 @ 65%
Flo-Direct®	1.0 - 25.0 MM	99.7%	416 gpm	\$120.31 @ 99.7%

*Maximum gallons per minute with a 120°F rise using largest heater.
 **Direct fuel costs are calculated using \$12.00 per MMBtu and a 120°F rise.
 †System defined from natural gas in to hot water out.
 Note: Use the Flo-Direct® sizing tool at www.armstronginternational.com/flo-direct

Sizing Formulas

$$\frac{\text{gpm}}{2} \times \Delta T = \text{AFD Model}$$

$$\frac{(\text{AFD model}) \times 2}{\Delta T} = \text{gpm}$$

$$(\text{AFD model}) \times 2 = \Delta T$$

Formula Key

- gpm = Gallons per minute
- ΔT = Temperature rise (°F)
- AFD = Armstrong Flo-Direct®