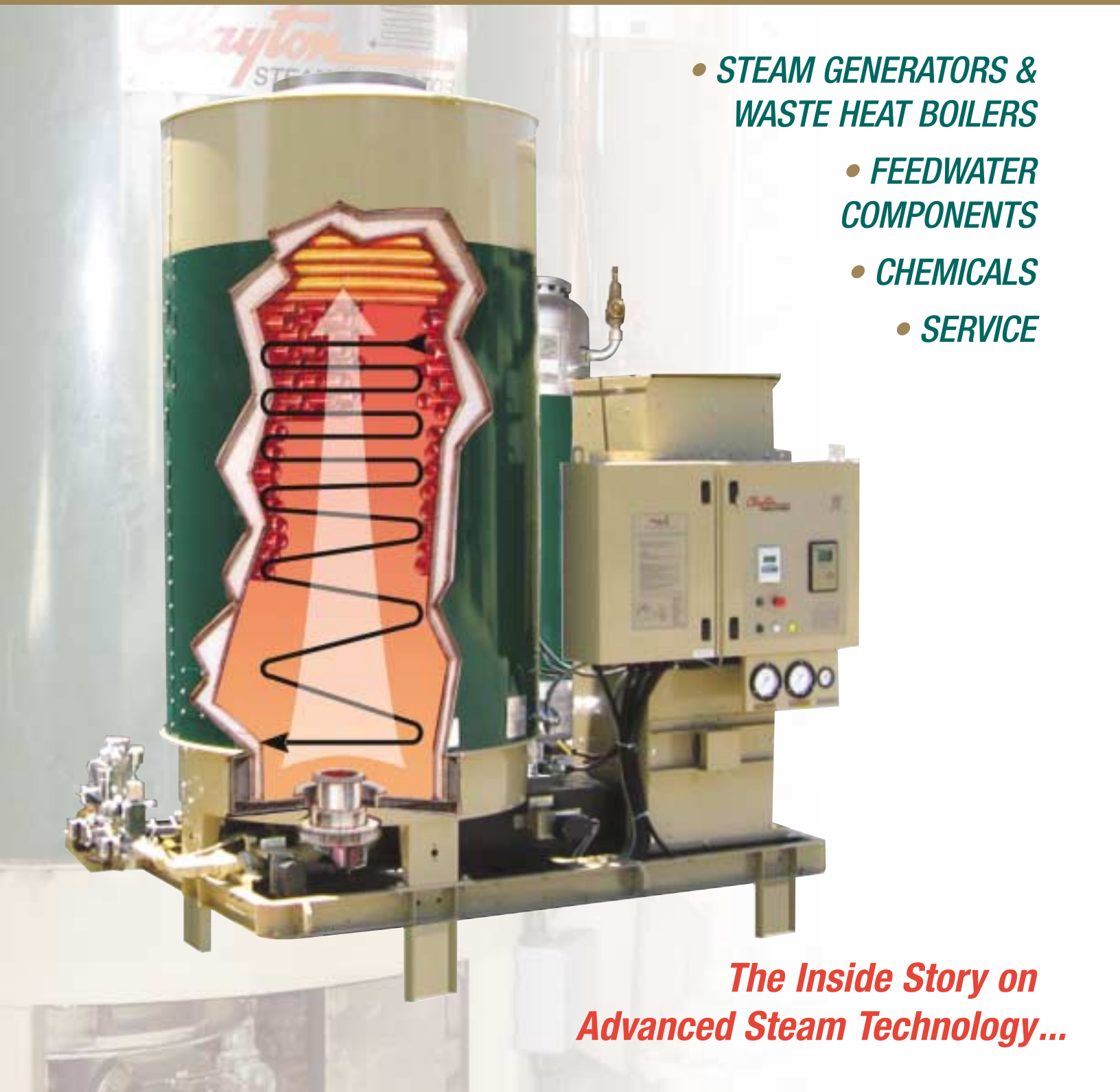
Clayton INDUSTRIES

Your Single Worldwide Source For Steam Technology



- STEAM GENERATORS & WASTE HEAT BOILERS
- FEEDWATER COMPONENTS
- CHEMICALS
- SERVICE

The Inside Story on Advanced Steam Technology...

Increasing the Productivity of Steam

Making steam is not difficult.

In a manufacturing environment, however, the challenge lies in harnessing the energy of steam in a manner that makes it available quickly, cost-effectively and safely.

This is where Clayton Industries excels.

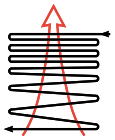
The design of conventional boilers has changed little since the 19th Century. In simplistic terms, water in a vessel or tube is heated by surrounding hot gases. After sufficient heating, the resultant steam is discharged.

All Clayton steam generators and waste heat boilers employ more sophisticated principles: Controlled Circulation and Counterflow heat transfer. A pump continuously supplies feed water to a helical coil heat exchanger, which transfers its heat to the water. The flow of feedwater is counter to the flow of combustion gases, an engineering principle that contributes to high fuel-to-steam efficiency. Water leaving the heat exchanger passes through a mechanical separator where the liquid and vapor are separated. Steam exits the separator to the steam header. The principles of Controlled Circulation and Counterflow and the resultant low water content result in many of the advantages provided by Clayton Steam Generators.

Making steam is simple. Making steam with maximum efficiency is Clayton's specialty.

Spiral Spring Coil Construction allows rapid start-up without thermal stress.

Exclusive Counterflow Controlled Circulation Technology



Performing With Drill Team Precision

Each component of a Clayton steam generator is designed for optimal utility. The result is a remarkably efficient unit that functions as smoothly and precisely as a drill team. A heavy-duty positive displacement diaphragm pump provides precise water control.

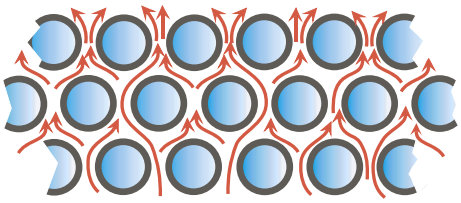
Superbly engineered and ruggedly constructed, a Clayton pump is pack-less and seal-less: features that contribute to its remarkable dependability.

A single high-grade carbon steel continuous-coil heat exchanger employs a staggered configuration and spacing of coil sections to help ensure turbulent and high velocity gas flows that facilitate high rates of heat transfer.

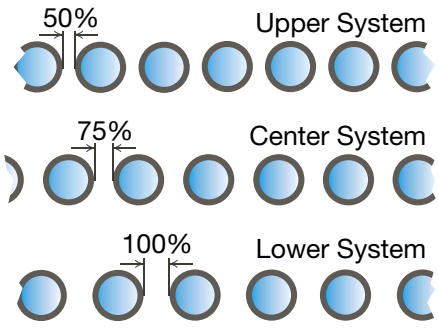
A feedwater cooled combustion chamber extracts radiant energy and maintains a cool outer shell.

The third critical component in a Clayton steam generator is a fixed-vane separator that yields the driest saturated steam available. Exceptional water separation is achieved at all steam production rates when high velocities of steam and water pass through the separator nozzle. A steam trap diverts excess water to a feedwater receiver where it is used to preheat feedwater.

Other components include a burner and blower assembly that assure complete combustion and delivery of maximum heat to the coil.

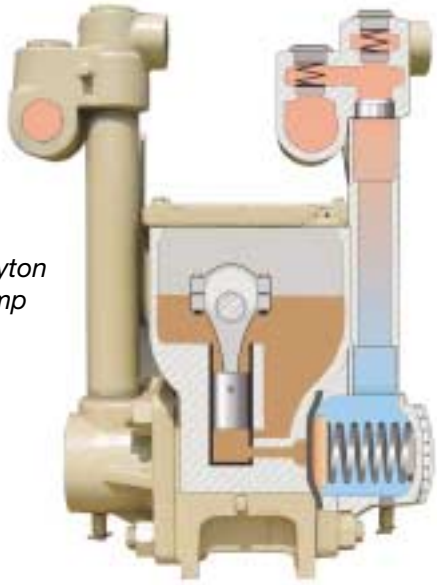


Staggered tube spacing creates turbulent gas flow

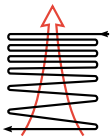


Varying tube spacing ensures high gas velocity

Steam Separator



Clayton Pump



Efficiency by Design

Fuel Efficient, Quality Steam, Low Blowdown

The Clayton focus on innovation in steam generation technology pays off for users in an abundance of very practical ways … benefits that translate into improved performance on the production or processing line, and in measurable cost savings as well.

As a result of unique design and easily proven operational advantages, Clayton steam generators are noted for fuel efficiency, rapid start-ups, compact size and reduced weight, delivery of high quality steam, safety, and fuel burning versatility. Clayton generators run on natural gas, light oil, heavy oil, propane, bio-gas, hydrogen, or combinations of these fuels.

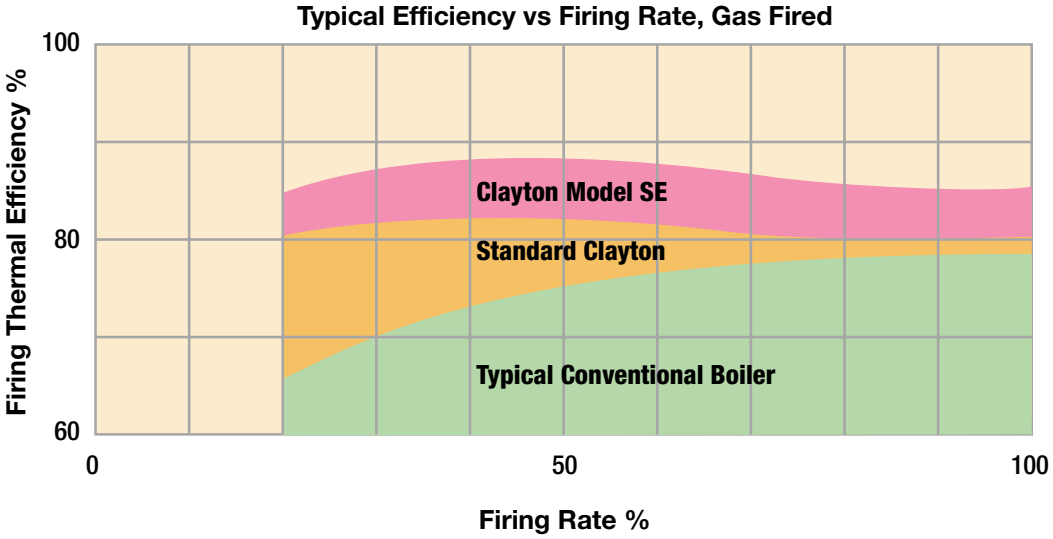
Another benefit of innovative design: reduced blowdown. The amount of water removed from the system to maintain an acceptable level of total dissolved solids (TDS) is greatly reduced compared to conventional boilers. This results in significant savings in fuel, water and chemicals – savings in blowdown are typically 90% or greater!

Clayton delivers efficiency by design.

Beijing CCTV Installation.

Wide Range of Sizes, Uses

Clayton steam generators and fluid heaters are available in 15 sizes, ranging from 10 to 700 Boiler Horsepower (BHP), 100 to 6800 KW and producing from 345 to 24,150 pounds of high quality steam per hour. Steam design pressures range up to 3,000 psig. Clayton Superheat Units deliver superheated steam and are also available in a variety of sizes, and for a range of steam pressures and temperatures. Clayton equipment provides steam for many purposes, including processing, building heating and equipment cleaning.



Start Fast, Finish Strong

Fast Start, Rapid Response

Efficiency is proven on the factory floor. Among the operating features of Clayton steam generators that are valued most by industrial customers are quick starts and rapid response to changing load demands.

Where conventional boilers require extended start-ups, a Clayton steam generator can be brought to a full head of steam in as little as five minutes. The quick start and response capabilities result primarily from the low water content, forced circulation and helical coil design.

What's more, corporations worldwide frequently favor multiple Clayton generators over a single, high capacity conventional boiler. Why? Because Clayton units, with their small "footprints," can be added to a production line with minimal disruption. Steam remains available when a single unit is down for maintenance or repair. Best of all, fluctuating loads are not a problem. A single Clayton generator can be fired to meet low demand, and others brought on line rapidly as steam requirements increase.

Clayton steam generators are conclusive proof that time saved is fuel saved and time and fuel cost money.

A 600 BHP Steam Generator in a U.S. Cosmetics Plant.

A 300 BHP Steam Generator.

Preventing Problems Boosts Efficiency

Scale and Soot Control

Clayton recognizes that controlling familiar steam production problems contributes to production or processing line efficiency. That's why a Clayton steam generator has features designed to inhibit the build-up of scale and soot.

Because scale and soot act as insulators that inhibit heat transfer, both result in wasted fuel. One-sixteenth of an inch of scale requires 15% more fuel; 1/32 of an inch of soot requires 12% more. Thicker build-ups affect fuel consumption more drastically.

Further, a Clayton steam generator provides an automatic indication of scale build-up: an increase in feed pump pressure. When a pressure increase is noted, the operator can take immediate corrective action. In addition, Clayton offers an optional built-in steam soot-blower that permits fast, easy cleaning of the heating surface.

Two 100 BHP steam generators mounted on a single skid with the feedwater components operating in a U.S. candy manufacturing plant.

Three 600 BHP and one 300 BHP steam generators in a midwestern utility plant.

Consider the Advantages of Small

Low Weight/Space, Safety

"Good things come in small packages," right? And if proof is ever needed, it's as close as the nearest Clayton steam generator.

Because every Clayton unit, from smallest to largest, incorporates counterflow and controlled circulation design, they occupy considerably less floor space than conventional boilers of equal capacity. Additionally, a Clayton steam generator is considerably lighter than its conventional counterpart. The weight difference can be as much as 75%.

The economic advantages to the user are apparent. Clayton steam generators can be installed more quickly. Their small footprint requires less space on the plant floor or utility room.

Another advantage: The Clayton design provides unparalleled safety. There has never been, nor can there be, a steam explosion of a Clayton steam generator.

Clayton steam generators: Smaller size. Bigger results.

Three 250 BHP, 450 psig, steam generators in a steel vacuum de-gassing application.

100 BHP SigmaFire packaged boiler room.

Heat Recovery Delivers Additional Cost Benefits

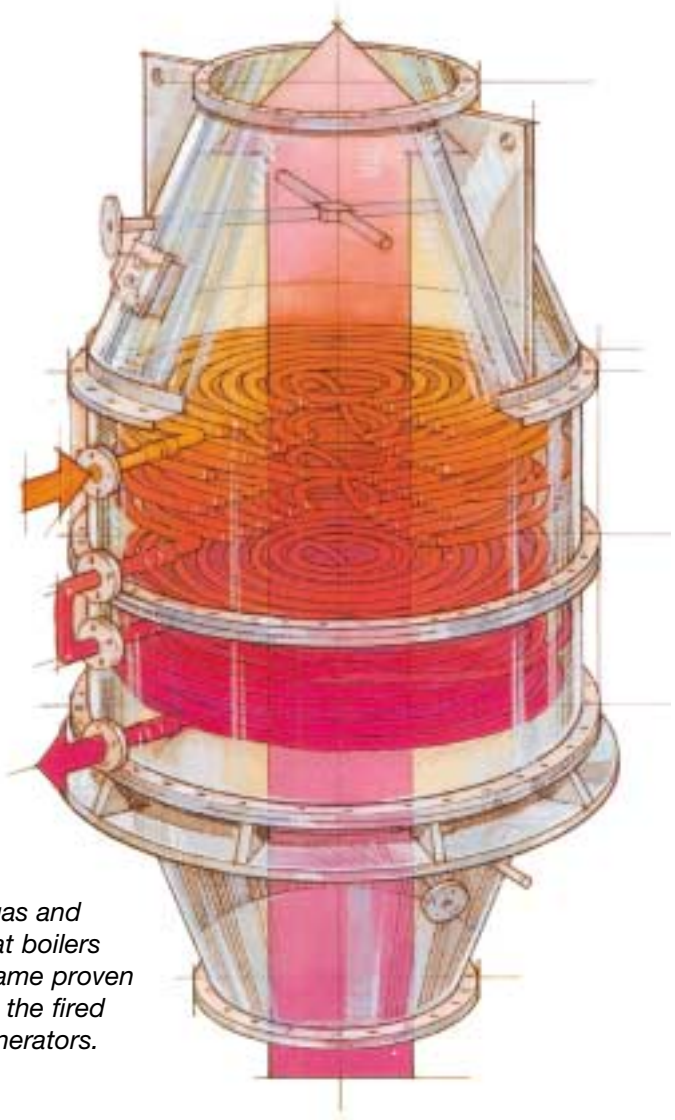
In a great many applications, heat is a necessity. In any application, wasted heat is wasted money. That's why Clayton offers a complete line of heat recovery systems used worldwide in marine, industrial and power plant operations.

Recovering heat from engines, turbines, ovens and furnaces, Clayton Waste Heat Steam Generators (WHSGs) and Exhaust Gas Boilers (EGBs) work with input temperatures as low as 480°F (250°C), and as high as 3,500°F (1,925°C). Available in a variety of steam/water flow configurations, WHSGs and EGBs, like the company's standard steam generators, employ the proven Counterflow and Controlled Circulation heat exchanger concept. They are equally simple, durable and reliable.

Co-generation makes extensive use of this Clayton technology. Here EGB systems recover heat from reciprocating engines and put it to work meeting a factory's processing or production needs.

Recovering heat for productive purposes: another Clayton specialty.

Exhaust Gas Boiler



Exhaust gas and waste heat boilers use the same proven design as the fired steam generators.

Among the Reasons A Single Source Satisfies

A single source satisfies in a multitude of ways. Among the variety of creatively designed products and responsive services designed to meet the special needs of industry:

- SigmaFire™, a line of steam generators in the 10 to 200 boiler horsepower range (100 to 1,940 KW). SigmaFire steam generators use proven Clayton design features in small, light, quiet-running modular units that are quickly and easily installed.
- Emissions control units designed to meet whatever your emissions restrictions may be. These optional systems can reduce NOx levels to as low as 9 ppmv and CO to 50, depending on the particular generator and the emission control system chosen.
- Fluid heaters that produce steam in a manner that frequently eliminates the need for licensed boiler operators, that may be required by the operation of conventional boilers.
- Rental skid-mounted steam generation systems configured to meet emergency or temporary steam requirements. This popular program includes packages from 30 to 300 BHP.
- Compusteam PLC Control Systems for automated steam generator control, standard on many models. This system offers numerous advantages, including a simplified panel, improved steam pressure management, and compatibility with remote monitoring and plant control systems.
- Feedwater analysis and treatment that prolongs equipment life and helps assure optimal steam production. Specially trained Clayton personnel can recommend a program customized to meet your requirements and arrange delivery of the only chemicals compounded specifically for Clayton steam generators.

Operator Interface Unit

Fiber Metal Low NOx Burner

You're Covered by Clayton Service Every Step of the Way

Need help? We'll be right there. Wherever "there" may be.

Clayton delivers factory-direct service throughout North America, Mexico and most of Western Europe, and assistance is available in many other parts of the world through an extensive network of distributors.

Clayton service is available 24 hours per day, 7 days per week. As a customer you'll gain the benefits of service that continues through installation, training and start-up. Want supplemental training for your operators? That's available, too. Preventive maintenance contracts that help keep your equipment operating at peak efficiency can be tailored to your specific needs.

Further, Clayton's Chemical Division offers analysis and treatment of feed-water, essential for maximizing steam production and prolonging equipment life. You'll receive a scientifically prepared optimal treatment program, and Coilguard chemicals formulated specifically for Clayton steam generators.

You're covered in emergencies, too, with rental generators available in the United States, Mexico and Western Europe. Often you can have steam on-line within hours after a unit arrives on site.

Around the world and around the clock, Clayton service is happy to help.

Clayton's friendly customer service is available 24 hours per day, 365 days per year.

Clayton also supplies a complete line of boiler feedwater treatment chemicals.

Serving Major Industries

Since 1930 Clayton steam generators have met the needs of a multitude of industries and facilities around the world, including:

- Aerospace
- Animal Feed
- Automotive
- Beverage
- Chemical
- Construction
- Dairy
- Food Processing
- Hospitals/Hotels
- Marine & Offshore
- Mining
- Paper
- Petroleum
- Pharmaceutical
- Power Generation Plants
- Rubber
- Steel
- Textile
- Tobacco
- Wire & Cable
- General Manufacturing

Two 300 BHP steam generators in a Romanian soap plant.

Three 350 BHP steam generators in a Spanish pharmaceutical plant.

A 250 BHP steam generator in a U.S. food manufacturing plant.

We're Here to Help

Call on us for individualized applications engineering help based on the experience we've gained since 1930.

Visit our Web site for informative technical specifications:

www.claytonindustries.com

AROUND THE GLOBE: *A Single Source Satisfies*

Clayton INDUSTRIES

Your Single Source for Steam Technology Since 1930

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