

## TECHNICAL OVERVIEW

### Waste Heat Boilers & Sulfur Condensers

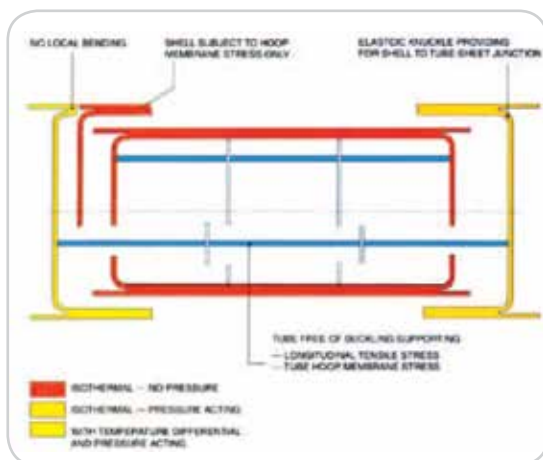
#### Overview

Struthers Wells, a division of Thermal Engineering International (USA) Inc., a Babcock Power Inc. company, has an unparalleled reputation and successful history in designing and manufacturing fired heaters and heat recovery equipment for the extraction of heat from high temperature process or flue gas systems worldwide.

#### Waste Heat Boilers Design Parameters

Struthers Wells waste heat boilers can be designed to cool process gases with temperatures above 2,600 degrees F (1,400 degrees C) and pressures above 3,000 psi (210 kg/cm<sup>2</sup>), generating high quality steam to pressures higher than 2,100 psi (150 kg/cm<sup>2</sup>) and for steam generation rates up to 500,000 lb/hr (230,000 kg/hr).

- Fire tube boilers
- Water tube boilers
- Single & dual compartment design
- Oil heaters
- Steam separators



*To control the outlet temperature, the shell is designed with a gas bypass.*

#### Flexible Tubesheet Design Solution

Struthers Wells pioneered the flexible, supported, stayed, thin tubesheet design which has been applied extensively under modern plant's severe conditions.

#### Tubes and Tubesheets

- Thin tubesheet, typically 1 inch (25mm) thick, allows good cooling by the water on the rear face and as such, operates at low temperature.
- The tubes, which act as stays, are all at the same temperature, therefore, the tubesheet stays flat with no bending between tube holes.
- Flexible connection of tubesheet to shell provides for differential expansion between shell and tubes, acts as a flexible element and gives good fatigue resistance.
- Full thickness tube-to-tubesheet weld provides tubesheet integrity, eliminates the crevice on water side and ensures the stress in the weld is the same as in the tubesheet.

#### Benefits

- Pioneers of the flexible, supported, stayed, thin tubesheet boiler design
- Current and advanced technology
- Reduce energy consumption
- Cost effective designs
- Custom designs to fit needs of customer

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#### Sulfur Condensers

##### Sulfuric Acid & Sulfur Plants

Struthers Wells extensive experience in the design of high pressure fire tube boilers has increasingly been utilized in the cooling of sulfurous gases in sulfuric acid and sulfur recovery plants. High demand for sulfuric acid production for fertilizer plants and desulphurization of refined oil products has resulted in many large boilers being installed.

- Economizers
- Superheaters
- Tail gas incinerators
- Gas-gas exchangers

#### Steam Drums

##### Steam Separation

Struthers Wells waste heat boilers are typically supplied with an overhead steam drum for water and steam circulation with a large recirculation rate to ensure effective cooling although a variety of separation media can be supplied depending on the process fluid fouling characteristics.

#### Kettle Boilers

Two kettle type boilers are offered by Struthers Wells, the kettle type with integral steam separation for low or medium steam pressures or the natural circulation design with separate steam drum for higher pressures.

#### Technology

As one of the original founders of the Tubular Exchanger Manufacturers Association (TEMA) and a charter member of Heat Transfer Research Institute (HTRI), Struthers Wells has available the most current and advanced technology for the design and manufacture of shell and tube heat exchangers. Additionally, Struthers Wells has contributed to the development of numerous standard mechanical, thermal, fluid, and vibration algorithms and calculation methods that have been the basis for many current modern computer programs used by many industry leaders.

For mechanical design analysis, Struthers Wells uses sophisticated finite element analysis software to perform detailed mechanical design.



#### Safety<sup>3</sup>

People. Power. Projects. We're giving safety the third degree. Babcock Power Inc. and its subsidiaries place the safety, health and security of our people at the core of our company values. Our team is our most valuable resource, generating solutions everyday to deliver safe, clean, reliable energy globally. With a keen focus on safety, Babcock Power Inc. conducts business in a manner that protects our people, our customers and the environment. From innovation to generation, we are proud of our award-winning safety record and are committed to operating with integrity and excellence.

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