



TEI

A BABCOCK POWER INC. SUBSIDIARY

SMART FUEL SYSTEMS

Combined Cycle Power Plant Heat Exchanger Solutions

when every MW counts



SMART PERFORMANCE FUEL GAS SYSTEMS

TEi's GT Fuel Gas Performance Heater Control packages are designed site-specific to provide heated gas at optimal temperatures for the GT operation. TEi's packaged heaters are also designed to eliminate excess moisture that may otherwise condense in the gas turbine combustor.

TEi's equipment meets or exceeds reciprocating engine and turbine manufacturers' fuel gas quality specifications; providing clean, dry fuel that increases the life of the equipment.

TEi fabricates the Fuel Gas Performance Heater Smart Skid systems in our dedicated facility located in Joplin, Missouri. Our ability to supply a domestic product from our centrally located manufacturing facility allows us to support the United States economy, ease of accessibility to customers for witness hold points during fabrication, and provides more competitive and risk-free shipping arrangements.

STANDARD PACKAGING:

- » Electric/instrumentation parts rated Class 1 Division 2
- » NEMA 4 Panels
- » Temperature control valve with actuator
- » Drain pot redundant level switching
- » Orifice flow meter with differential pressure transmitter
- » Pressure transmitter: Hart based (4-20 MA)
- » Carbon steel standard materials (shell, tubes, channel, and nozzles)
- » Carbon steel interconnecting piping
- » Drain tank
- » Factory acceptance testing (FAT)
- » Isolation/bypass valves as required
- » Valve instrument air manifold
- » 3-Way solenoid block & bleed valves

OPTIONS

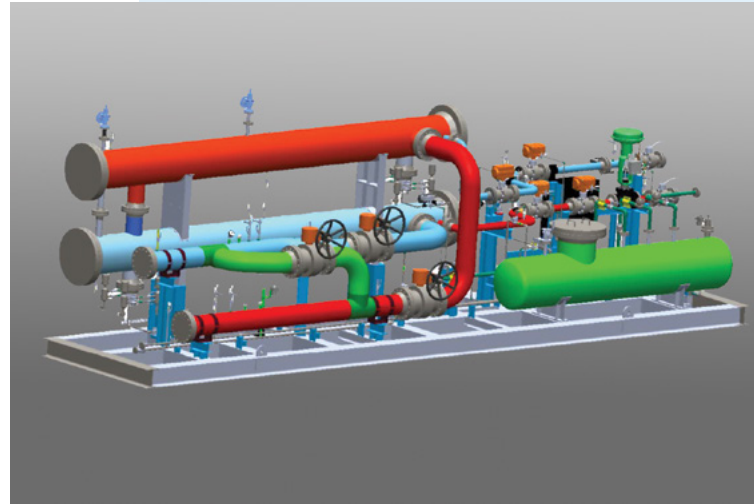
- » Triple redundant drain pot level switching
- » Junction box for customer DCS connection point
- » Alloy materials upon request
- » Heat tracing / Insulation
- » Relief valves
- » Start-up commissioning services
- » Solidworks 3-D model / FEA / Cyclic design
- » Coalescing Filter Skid
- » Start-Up Electric Super Heater Skid
- » Fuel Gas Scrubber Skid

GOVERNING SPECIFICATIONS

- » Vessel: ASME Section VIII Div 1/Div 2 AR
- » TEMA C
- » HEI power plant heat exchangers
- » Piping: ASME B31.1

FUEL GAS PERFORMANCE HEATER SKID CRITERIA

- » Heated fuel meeting CGT requirements
- » Provide early tube failure indication
- » Prevent fuel from entering feed water system
- » Remove gas entrained particulate
- » Provide over pressure protection CGT system
- » Prevent water from being admitted to CGT



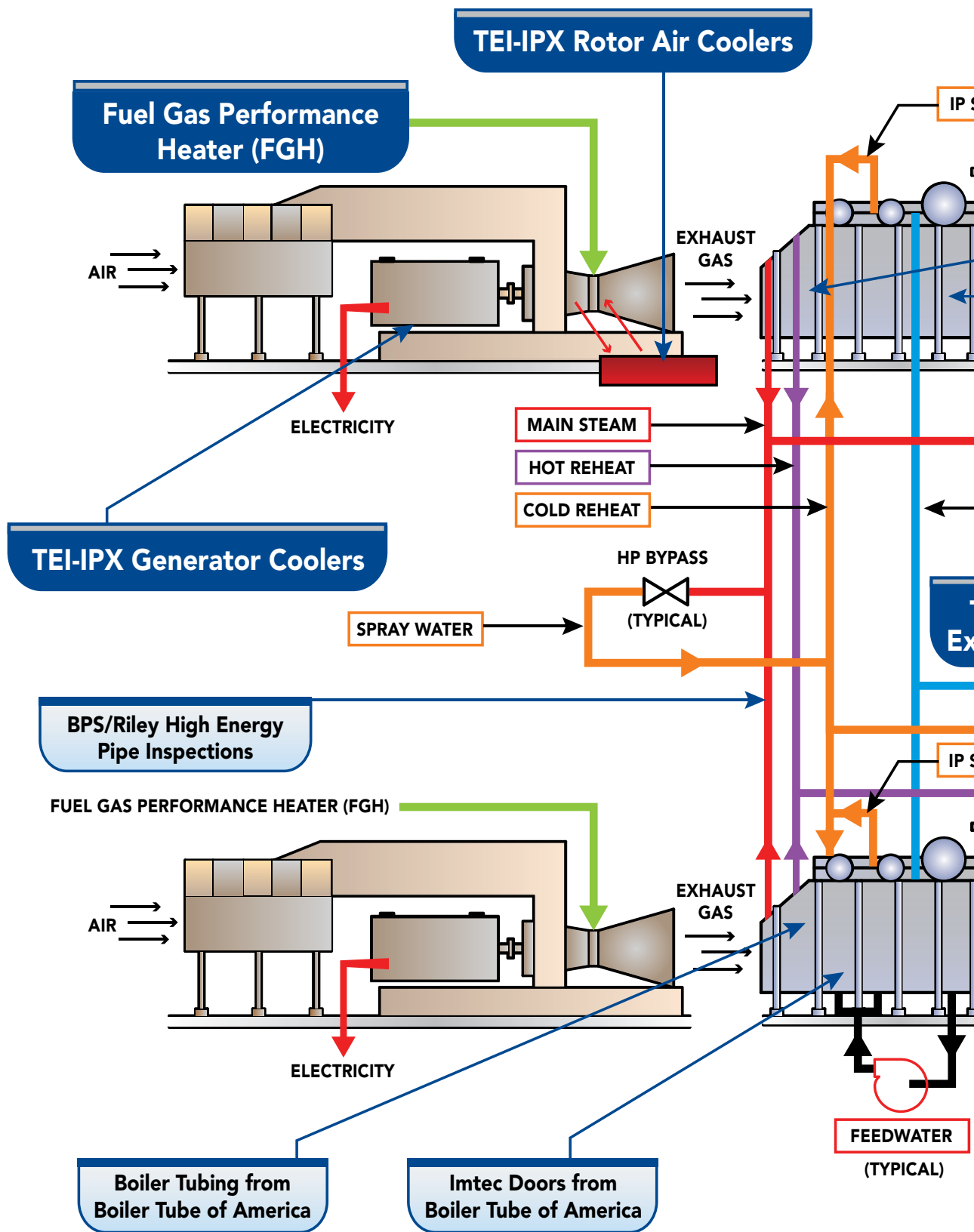
FEATURES

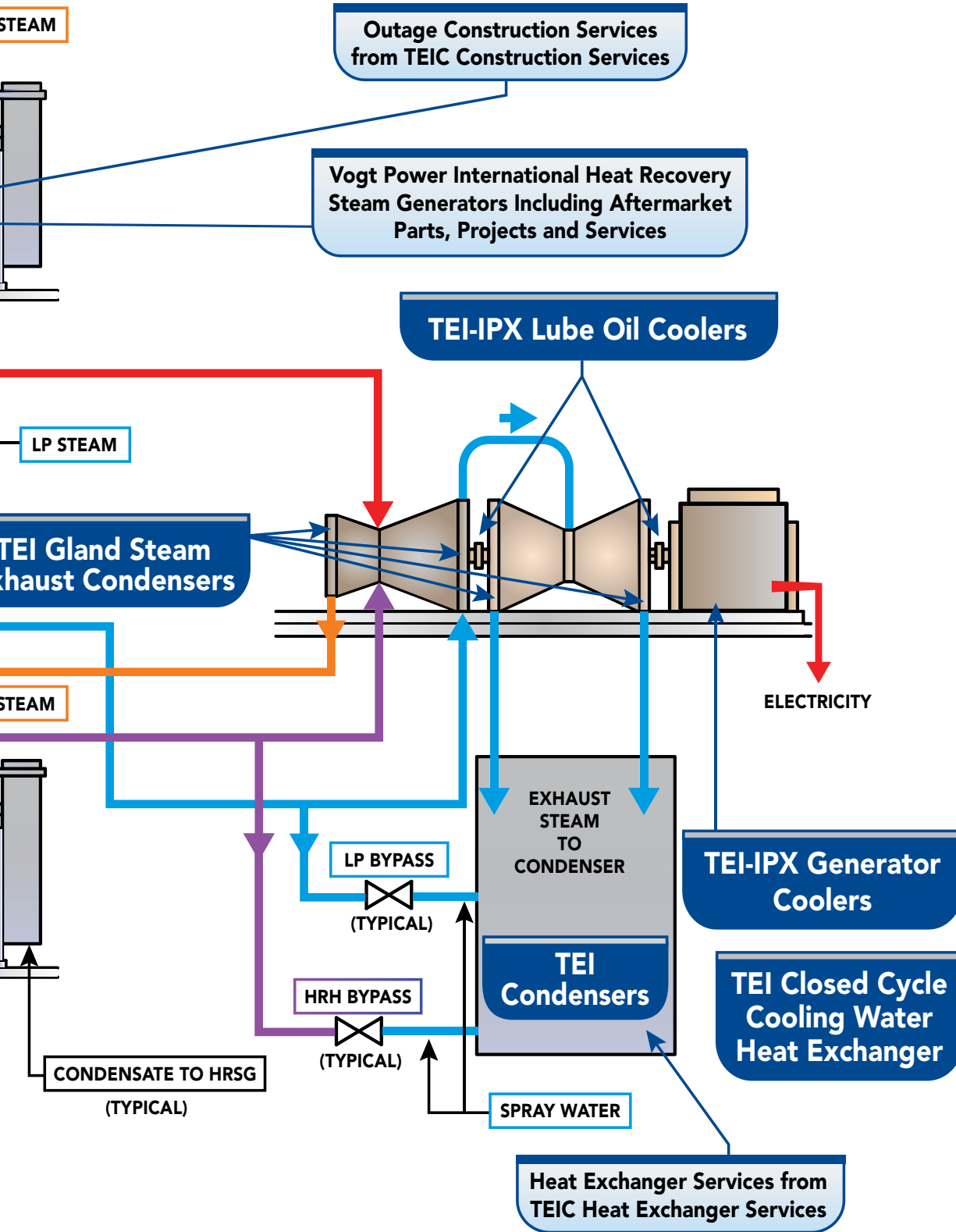
- » Local control panel
- » Electric/instrument parts rated Class 1 Division 2
- » Site specific for outdoor equipment
- » Performance heaters made from carbon steel
- » Factory acceptance testing (FAT)

BENEFITS

- » Pre-packaged design more cost-effective than component based site-build helping to reduce overall project cost
- » Field construction timeline reduced, shortening overall project delivery schedule
- » Complete function testing done prior to delivery and installation
- » Single source accountability
- » 24/7 customer service

COMBINED CYCLE STEAM SYSTEMS





CCW HEAT EXCHANGERS

CCW heat exchangers provide critical cooling necessary to maintain the temperature profile of the Power plant and maintain operable temperatures of critical equipment. Recognizing BOP heat exchangers are critical to power plant operations, TEi will collaborate with the client to ensure the HX design is optimized such that efficiency will be maximized while maintaining low cost. TEi has improved BOP and CCW designs and efficiencies by working with our material suppliers, heat transfer software designers and most importantly, our customers. This has given TEi an opportunity to collaborate and determine the optimal solution for a specific requirement.

ROTOR AIR COOLER (KETTLE BOILERS)

Rotor air coolers (RAC) are integrated into combined-cycle power plants and provide cooling for partial compressor air flow which cools the rotor blades and vanes in a gas turbine. There are two types, shell and tube air to water (kettle and non-kettle type), and fin fan type which is typically air to air, utilizing extended fin tubes. Typical configuration for the kettle type is single pass in the tubes and shell, with water on the shell-side. Shell-side water cools the tube-side rotor air and is in turn heated to saturation temperature. Steam from RACKB is then supplied to the HRSG. Materials noted below with asterisk are typical in applications where Chloride induced stress corrosion cracking may be prevalent.

MATERIALS OF CONSTRUCTION

- » Carbon Steel
- » 2205 Duplex
- » 507
- » AL6XN
- » Titanium
- » 304 SS
- » 316 SS
- » Incoloy(*)
- » Inconel(*)
- » 90/10 CuNi

FUEL GAS CONDITIONING SKID PACKAGED SOLUTIONS

Coalescing Filter Skid

The CFS provides initial removal of liquid and particulate from gas supply. Liquids collected in CFS are automatically discharged to common drain tank. The differential pressure alarm switch monitors the differential pressure across the filters and will signal alarm when dP threshold is exceeded, indicating filter cartridge replacement is necessary.

Start-Up Electric Super Heater Skid

The Start-Up Electric Heater skid is required when the fuel supply temperature does not meet minimum temperature requirements of Combustion Turbine.

Fuel Gas Scrubber Skid

The Gas Fuel Scrubber Skid provides the final level of filtration and clean fuel necessary for reliable and efficient GT operation. The scrubber will be designed such that performance will insure that the gas will contain no more than a predetermined amount of entrained liquid per million scf of gas at rated flow. An automatic drain valve is furnished as part of the system to insure liquid is discharged to the drain tank in a timely manner.



CCW Heat Exchangers



Rotor Air Cooler Kettle Boiler



Fuel Gas Heater Skid

| OTHER PRIMARY HEAT EXCHANGER EQUIPMENT FROM TEi:

Rotor Air Cooler Kettle Boilers (Combined Cycle); Rotor Air Cooler (Simple Cycle); and CCW Heat Exchangers (Combined Cycle).



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Thermal Engineering International (USA) Inc. (TEi), a Babcock Power Inc. company, is a leading supplier of heat transfer technology to the electric power generation and industrial markets. Backed by more than 50 years experience, we offer fully integrated design, engineering, manufacturing, construction, research and development services; including providing superior products to major manufacturers of compressors worldwide.