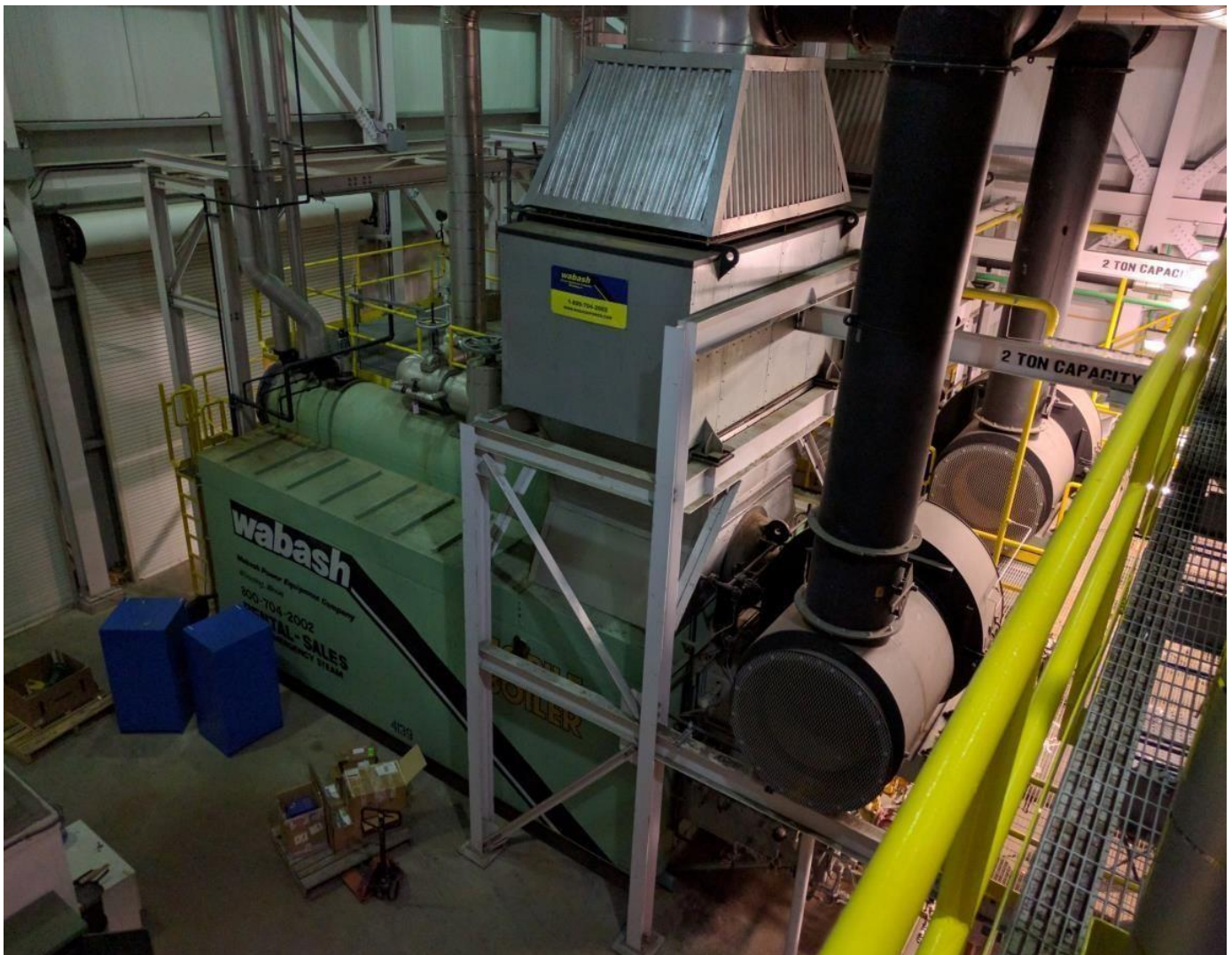


Cleaver Brooks Nebraska NOS-2A-67-HM 75,000 lb/hr Dual Fuel Package Boiler

Auxiliary Boiler Units



Boiler Specifications

Cleaver Brooks Nebraska Boilers	
Serial Numbers	U1 is RT-4139
	U2 is RT-4118
Capacity	75,000 lb/hr (34,019 kg/hr)
Design Pressure	350 psig (2,413 kPa)
Design Temperature	650°F (343°C)
Operating Pressure	175 psig (1,206 kPa) @ Generation Site
	Capable of 325 psig (2,240kPa)
Operating Hours	U1 approximately 2,100 hrs
	U2 approximately 2,100 hrs
Weight	61,350lb / 27,827kg Dry
	82,200lb / 37,285kg Operational
	89,050lb / 40,392kg Flooded
CRN	M4612.5C
OIN	5.1028474

- O-type saturated water boiler
- Manufactured in 2010
- Operating hours:
 - U1 approximately 2,100 hrs
 - U2 approximately 2,100 hrs
- Operated at 35% capacity factor from Dec 29, 2013 to April 19, 2014 and Dec 1, 2014 to April 18, 2015

Description

The Auxiliary Boilers are 2 identical 75,000 lb/hr Series NOS-2A-67-HM Cleaver Brooks Nebraska dual fuel (gas/oil) package boilers manufactured in 2010. They provided building heating to power generation assets to preserve the assets for future use. These boilers are ex-rental units procured from Wabash Power Equipment Company. The Deaerator and Deaerator Storage Tank are Kansas City Deaerator designed and manufactured by Advance Boiler and Tank. Other than the Auxiliary Boilers, all equipment including the Deaerator and Deaerator Storage Tank are new.

The Auxiliary Boilers were installed in the fall of 2013 at the site, operated for the winter of 2013/14 and 2014/15, and then shut down in the spring of 2015. The boilers have been operated only on natural gas; this is evident upon initial inspection. The Auxiliary Boilers are currently installed in a standalone building adjacent to the main Power House. The Water Treatment facility for the Auxiliary Boilers is in the same building but separated by a concrete wall. The Auxiliary Boiler is connected to the Main Building Systems via steam supply lines to the Building Heating System, Condensate returns, Service Water supply, Service Air supply, electrical power supply, communication hardware and control related hardware.

Each boiler comes complete with low NOx burner, Forced Draft fan, economizer, boiler trim piping and instrumentation, feedwater control valve station, safety valves, stop check valve, burner management system, boiler control panel and a common 120' tall stack.

Prior to initial operation, a thorough inspection was completed including the boil-out of U2 RT-4118 and a chemical clean of U1 RT-4139.

Boiler Equipment Specifications

Steam Drum:

- The Steam Drum is made of SA516-70 carbon steel plates; hence it will contain both longitudinal and circumferential seam welds. The waterwall tubes are rolled onto the Steam Drum.
 - Diameter: 36"
 - Length: 23'
 - Thickness: 0.875"

Mud Drum:

- The lower drum is made of SA106C pipe and there should not be any longitudinal seam welds, but there will be drum to head circumferential welds. The waterwall tubes are rolled onto the Mud Drum.
 - Diameter: 24"
 - Length: 23'
 - Thickness: 0.562"

Waterwalls:

- The waterwalls are made of membrane welded 2" x 0.105" SA-178-A boiler tubes.

Boiler Blowdown:

- Each auxiliary boiler is capable of continuous blow down from the steam drum to maintain boiler water quality. In addition, each boiler will be intermittently blown down from the mud drum to remove buildup of solids. The manual blowdown valves for both systems are supplied with the boiler. The continuous and intermittent blowdowns discharge into a common blowdown tank through separate blowdown headers. The blowdown tank is cooled by service water through the use of two modulating control valves. One control valve injects service water directly into the tank while the other control valve injects service water into the discharge line.

Deaerator & Storage Tank:

- Kansas City D & DS
- CRN: M10086.5, M10087.5, (Built 2013)
- Design Pressure: 5-30 psig
- Design Temperature: 400°F
- The Deaerator and Deaerator Storage Tank are a Kansas City Deaerator design manufactured by Advance Boiler and Tank.
- Supply: 206,000 lb/hr (200,000 lb/hr plus 3% blowdown) of feedwater
- Typically operates at 5 psig
- Two chemical injection nozzles with internal injection quills are supplied with the Deaerator.
- The nominal thickness for both the Deaerator and Storage Tank is 0.500" with a 0.125" corrosion allowance.
- Fabricated with SA516-70 carbon steel plates.

Condensate Tank:

- The condensate tank is horizontal at atmospheric pressure with a capacity of approximately 2000 US gal.
- The horizontal design allows the vessel to be elevated to provide sufficient suction head for the condensate return pumps.

Economizer:

- Manufacturer: Eco Inc
- Code: ASME Section I
- Tubes: 2" OD x 0.105" MW, SA178A tubes
- Fins: Serrated CS fins, 4.5/inch x 0.06" THK x 0.875 HI
- Headers: 4" Sch 40, SA106GrB
- Structure A-36 Carbon Steel
- Design Pressure: 935 psig @ 700°F
- Hydrostatic Test Pressure: 1403 psig
- Effective Heating Service: 6,670 SqFt
- Estimated Weight:
 - Dry: 16,000lb
 - Wet: 17,500lb

Steam Piping:

- Gryphon a CHA Company design (AECON fabricate)
- Reference Drawing- NA59-F1E-73110-003
- Design Pressure:
 - 78 psig (150 psig steam and steam to sample panel)
 - 75 psig (60 psig steam)
- Design Temperature: 379°F

Feedwater Piping System:

- Gryphon a CHA Company design (AECON fabricate)
- Reference Drawings: NA59-F1E-73110-0002
- Design Pressure: 325 psig
- Design Temperature: 275°F

Boiler Feed Pumps:

- Both Boilers are serviced by 2 x 100% Boiler Feedwater Pumps supplied by M-K Process.
- Each pump is initially capable of supplying the full 206,000 lb/hr at the boiler required pressure.

Burner:

- The Boilers are equipped with dual gas/oil fired Coen Variflame combustion burners.
 - Model #: SV5901G0TXX
 - Fuel: NG or #2 Oil
 - Capacity: 96 mm BTU/Hr

Safety Valves:

- All Boiler and Pressure Vessel Safety Valves associated with the Auxiliary Boiler and Auxiliary equipment were serviced in the fall of 2013. All Boiler Safety valves were lift assist tested in the summer of 2014.

Photos

Original photos available upon request. Additional photos are also available.



