

Circulating Pumps for Radiant Syngas Cooling (RSC) System

IGCC Plant Operates HTI Pumps for Critical Cooling Application

Commissioned in 2013, the Integrated Gasification Combined Cycle (IGCC) facility at Edwardsport, Indiana is one of the cleanest and most efficient coal-based power plants in the world. At 618 MWe, it is also one of the largest plants of its kind in the world.

The IGCC process is an advanced technology that converts coal to a synthesis gas (syngas) and removes pollutants from the syngas before it is combusted in a gas turbine to produce electricity. The gas cleaning units that remove the pollutants operate at much lower temperatures, and therefore the syngas needs to be cooled. As a function of the Radiant Syngas Cooler (RSC) system, hot syngas exiting the gasifier at temperatures up to 2,900 F (1,600 C) is passed through a radiant syngas cooling vessel to lower the gas temperature. The heat is also recovered. Inside the vessel, high pressure (~1,650 psi) steam is generated from circulating cooling water as the hot syngas transfers heat across a ring of tubes connected together in a configuration called a waterwall. The steam generated is then sent to a heat recovery steam generator (HRSG) system and is used to power steam turbines for additional electricity production and improving the overall plant efficiency.

Featuring high operating temperatures and pressures, the RSC system is one of the most critical and highly-loaded components of the IGCC, and the RSC circulating pump is a crucial part of that system. Hayward Tyler's high-performing circulating pumps were selected for this demanding application. Based on Hayward Tyler's long-proven boiler circulating pump, the RSC vertical, wet stator circulating pumps supplied by Hayward Tyler, Inc. have operated reliably since the commissioning of the Edwardsport IGCC.

BASIC DESIGN DETAILS

- Rated Flow: 16,577 gpm
- Design Pressure: 3,303 psi
- Design Temp: 653° F
- Rated Power: 550 hp
- Power Supply: 4160 V / 60 Hz / 3 ph
- Designed in accordance with ASME B & PV VIII DIV 1
- Designed and manufactured in Colchester, VT, USA

Project Summary

SITE / LOCATION:

Edwardsport, IN, USA
Integrated Gasification Combined Cycle (IGCC) Plant

SOLUTION AND FEATURES:

- Sealless, Vertical, Single Stage Centrifugal Pump with Wet Stator Unit (WSU)
- No seals, no oil-lubricated bearings
- "Hot neck" casing design limits the transfer of heat from the pump to the motor
- XLPE insulated and PVC protected motor stator windings for high protection
- Designed for serviceability with a stator assembly that is easily removed for maintenance



Integrated Gasification Combined Cycle (IGCC) Facility at Edwardsport, Indiana

Project Data Sheet

Name	Edwardsport, IN	
Product	Radiant Syngas Cooler (RSC) Circulating Pumps	
Quantity	Four (4)	
Codes and Standards		
Design	ASME B & PV VIII DIV 1	
Pump Test Standard	Hydraulic Institute Standards	
Flange Standard	ANSI B16.5	
Materials Standard	ASME / ASTM	
Welding Standard	ASME B & PV IX	
Electrical Standard	IEEE 252 / NEMA MG1	
Pump Details		
Pump Type	Centrifugal, Single Suction, Single Discharge	
Pump Size	24 x 24 x 20	
Fluid Pumped	Demineralized Water	
	Imperial	Metric
Rated Flow	16,577 gpm	3,765 m3/hr
Rated Differential Head	40.83 ft	12.45 m
Specific Gravity (@ Oper.Temp)	.6228	.6228
Design Pressure	2256 psig	155 bar(g)
Design Temperature	653° F	345° C
Hydrostatic Test Pressure	3303 psig	228 bar(g)
Motor Details		
Motor Rating	550 Hp (410 kW)	
Service Factor	1.15	
RPM	1750	
Power Supply	4160 V / 3 ph / 60 Hz	
Motor Full Load Current	78.2 Amps	
Heat Exchanger Details		
Design Code	ASME VIII, Division 1	
Cooling Water Flow	22 gpm	5 m3/hr
Cooling Water Temperature (max)	100° F	38° C
Weights (Approximate Wet)		
	Pounds (lbs.)	Kilograms (kg)
Pump Casing	11,436	5,187
Motor Casing	16,808	7,624
Rotating Assembly	638	289
Bolting & Residuals	1,527	693
Heat Exchanger Assembly	558	253
Total	30,967	14,046



Hayward Tyler Vertical Circulating Pump
with a Wet Stator Unit (WSU)



Radiant Syngas Cooling circulating pumps
installed in Edwardsport, IN



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