

	SYSTEM DESCRIPTION	FILE NO. 141643.43.0205
	FGD SERVICE WATER SYSTEM (SW)	AEP 031406-D

AMERICAN ELECTRIC POWER

Big Sandy Unit 2

FGD Service Water System (SW)

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SYSTEM DESCRIPTION

ISSUE DATE AND REVISION NO.
031406-D

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1.0 Description of Process

1.1 General

The function of the FGD Service Water System is to store and distribute service water to the Flue Gas Desulfurization (FGD) Absorber System (ZA), the reclaim water tank in the FGD Reclaim Water System (ZC), and the FGD Gypsum Dewatering System). There are two units (1 & 2) that are candidates for FGD retrofit. Presently, however, the scope of the overall OEM design includes only Unit 2. Explicit exceptions to this include the FGD Reagent Preparation System (ZP), FGD Reagent Feed System (ZF), and the FGD Byproduct Dewatering System (ZD), where capacity is included for both units in the eventuality of the Unit 1 scope inclusion. As a result, the support systems, such as FGD Reclaim Water System (ZC) and the FGD Service Water System, will include Unit 1 capacity as well.

1.2 System Design

The Service Water System provides water to the following components of the jet bubbling reactor (JBR) absorber: the gas cooler, the first- and second-stage mist eliminator wash, the upper deck wash, and the inlet plenum wash. This system also serves as a reserve water supply to the reclaim water tank.

Water for the FGD Service Water System is supplied from the Muskingum River via the raw water transfer equipment to the FGD Service Water Tank.

From the FGD Service Water Tank, service water is pumped by the service water pumps from the storage tank to the various users via a piping distribution system. In addition to the normal gas prequench, the Service Water System also supplies water to the FGD Emergency Quench Water System (ZQ), which acts to quench the flue gas upon station power failure. The service water and emergency quench water supplies are crosstied in the JBR Absorber (ZA) system so that emergency quench may be delivered from the FGD Service Water Pumps during an air heater failure.

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2.0 Description of Major Equipment

2.1 FGD Service Water Tank

2.1.1 Component Identification

Component Name: FGD Service Water Tank

Component Identification No.: Later

2.1.2 Function

The service water tank is used to provide storage for the Service Water System, as well as adequate net positive suction head (NPSH) for the service water pumps.

2.1.3 Description

One service water tank is provided, which is an above grade, field erected, cylindrical, open-top tank. The tank is supported on a concrete ringwall foundation with compacted backfill covered by lean concrete that is crowned at the tank center. The tank is provided with an overflow, a drain, one 30 inch manway, and a 8 inch by 16 inch removable panel.

2.1.4 Sizing Criteria

The service water tank is sized to provide 1 hour of service water storage at design conditions for two units with the tank fill valve closed. The sizing basis also takes into consideration the transient (emergency quench) conditions mentioned in Subsection 4.1.16 of the Performance Specification for Limestone Wet Flue Gas Desulfurization (WFGD) System (BS-123-AEEE-101303), as mutually agreed upon by AEP and Black & Veatch. The tank's overflow piping is sized to evacuate the maximum anticipated total inflow from the absorber bleed, JBR sump, and dewatering sump pumps to prevent the tanks from overflowing to grade.

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2.1.5 Material Selection

The service water tank is fabricated from ASTM A36 carbon steel and is coated with an epoxy interior coating.

2.2 FGD Service Water Pumps

2.2.1 Component Identification

Component Name: FGD Service Water Pumps A and B
Component Identification No.: 02-SW-PP-8001-01 and 02-SW-PP-8001-02

2.2.2 Function

The service water pumps supply service water to the FGD absorber gas cooler, JBR upper deck and inlet plenum washes, first- and second-stage mist eliminator wash, and FGD area service water stations. They also serve as a backup water supply to the reclaim water tank.

2.2.3 Description

Two pumps are provided. Each service water pump is a vertically split case, end suction, constant-speed, belt-driven, centrifugal pump furnished with mechanical seals.

2.2.4 Sizing Criteria

Each service water pump is sized to provide 100 percent of the design service water requirements for the continuous service water. Presently, only Unit 2 scope is required. However, Unit 1 capacity is added to support the additional capacity built into the limestone preparation/feed and gypsum dewatering systems. The average expected demand for both units is 1775 gpm. Two pumps are required to operate if the demand exceeds this amount.

2.2.5 Material Selection

The service water pumps have cast iron casings with stainless steel impellers.

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2.3 Piping and Valves

2.3.1 Component Identification

Component Name: Service Water Piping and Valves

Component Identification No.: Various

2.3.2 Function

The piping and valves regulate and distribute service water to the FGD absorber gas cooler, FGD upper and inlet deck washes, first- and second-stage mist eliminator wash, and FGD area service water stations.

2.3.3 Description

The piping and valves are in accordance with ANSI standards and are 125/150 psi rated with materials of construction typical for clean water systems.

2.3.4 Sizing Criteria

The piping and valves are sized for a maximum velocity of 10 ft/s in main piping headers. Hose stations within the FGD areas and associated support systems are standardized at 1 inch.

2.3.5 Material Selection

Piping material is carbon steel. Valves 2-1/2 inches and larger are lug wafer, rubber-lined carbon steel butterfly valves. Valves 2 inches and smaller are threaded or socket-welded ball valves.

3.0 Description of Major Interlocks

Specific interlocks, trips, and alarms will be determined during detail design.

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4.0 Description of System Operation and Control

4.1 Instrumentation and Control

The Service Water System equipment is controlled by the distributed control system (DCS), which allows control of the individual components in the remote automatic and remote manual modes.

In remote automatic control mode, the DCS opens/closes or starts/stops Service Water System components according to the programmed sequences and interlocks as directed by the control logic. In the remote manual control mode, individual pumps and valves can be opened/closed or started/stopped by the operator. Protective interlocks remain in service during remote manual operation.

During normal operation, one service water pump operates continuously. A pressure transmitter in the pump discharge header that senses low-low pressure prompts the DCS to start the second pump.

A pressure type level transmitter is provided on the service water tank and is used by the DCS to monitor the tank and initiate the opening and closing of the tank fill valve, as well as to provide low suction head protection for the system pumps.

4.2 System Operation

Specific information on system pre-startup, initial system fill, system startup, normal operation, and shutdown will be completed during detail design.

At design conditions, the service water tank is sized to provide sufficient water storage capacity to provide 1 hour of full flow at design conditions for two units upon a loss of water supply. The tank also supplies water to the FGD Emergency Quench Water System (ZQ), which acts to quench the flue gas upon station power failure.

One service water pump operates continuously.

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4.3 Redundancy

Two 100 percent capacity FGD service water pumps and one service water tank are provided. Either of the two pumps can supply the full service water requirement at design conditions. In the event of abnormally high service water requirements, both pumps can be operated simultaneously.

5.0 Description of Provisions for Flushing and Testing

The description of the provisions for flushing and testing will be completed during detail design.

6.0 Description of Provisions for Maintenance

The description of the provisions for maintenance will be completed during detail design.

7.0 Description of Hazardous Area / Materials

The description of the hazardous area/materials will be completed during detail design.

8.0 References

8.1 Flow Diagrams

Black & Veatch Drawing No.	AEP Drawing No.
141643-02RW-M2205A	02-5 1 8002-D

8.2 General Arrangements

Later.

8.3 Electrical One-Line Drawings

Later.

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8.4 Descriptive Articles

Later.

8.5 Codes and Standards

The Service Water System is designed in accordance with the following codes and standards:

- American Gear Manufacturers Association (AGMA).
- American National Standards Institute (ANSI).
- American Society for Testing and Materials (ASTM).
- American Society of Mechanical Engineers (ASME).
- American Petroleum Institute (API) Standard 650, "Welded Steel Tanks for Oil Storage."
- American Welding Society (AWS).
- Hydraulic Institute.
- National Electrical Manufacturers Association (NEMA).
- Institute of Electrical and Electronics Engineers (IEEE).

8.6 Regulatory Requirements

The Service Water System complies with all applicable state laws, local ordinances, and requirements of the Federal Occupational Safety and Health Standards, 29 CFR 1910, General Industry and 29 CFR 1926, Construction Industry.