

	SYSTEM DESCRIPTION	FILE NO. 141643.43.0253
	FGD RECLAIM WATER SYSTEM (ZC)	AEP 031406-D

AMERICAN ELECTRIC POWER

Big Sandy Unit 2

FGD Reclaim Water System (ZC)

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1.0 Description of Process

1.1 General

The function of the Flue Gas Desulfurization (FGD) Reclaim Water System is to store and distribute reclaim water from the FGD Byproduct Dewatering System (ZD) for flushing, chloride blowdown, and makeup uses among the FGD area users.

1.2 System Design

Reclaim water is recovered from the light overflow of the FGD Byproduct Dewatering System (ZD) and diluted with makeup water drawn from the bottom ash pond. Additional makeup water from the FGD Service Water System (SW) is also supplied as required to maintain minimum level in the reclaim water tanks. The Reclaim Water System provides water to the FGD system for reagent preparation, absorber makeup, and pipe flushing via the reclaim water pumps.

Presently, only the AEP Big Sandy Unit 2 design scope is defined. However, select FGD systems - FGD Byproduct Dewatering System (ZD), FGD Reagent Preparation System (ZP), and FGD Reagent Feed System (ZF) - are sized to accommodate the possible future addition of the Unit 1 scope. Since the Reclaim Water System is intended to handle all the light effluent from the FGD Byproduct Dewatering System (ZD), it is also designed to accommodate both Unit 1 and Unit 2 reclaim water processing and distribution demands.

Reclaim water consists of hydrocyclone overflow and filtrate from the vacuum filters, which may contain 2 to 3 percent solids by weight and chlorides up to 12,000 ppm.

2.0 Description of Major Equipment

2.1 FGD Reclaim Water Tanks

2.1.1 Component Identification

Component Name: Reclaim Water Tanks A and B

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Component Identification No.: 02-ZC-TK-8001-01 and 02-ZC-TK-8001-02

2.1.2 Function

The reclaim water tanks provide storage of the reclaim water for use in the FGD area, as well as adequate net positive suction head (NPSH) for the reclaim water pumps.

2.1.3 Description

Two reclaim water tanks are provided. Light overflow from the FGD Dewatering System (ZD) chloride bleed tanks and filtrate receivers discharges into either tank.

Each reclaim water tank is an above grade, field-erected, cylindrical, open-top tank. Each tank is equipped with a structural assembly/walkway and designed to support the reclaim water tank agitator and to provide maintenance access. The tanks are provided with an overflow, a vent drain, one 30-inch manway, and an 8-inch by 16-inch removable panel. The tanks are equipped with wall-mounted antiswirl baffles. Each tank is supported on a concrete ringwall foundation with compacted backfill, covered by lean concrete that is crowned at the tank center.

2.1.4 Sizing Criteria

Presently, only the AEP Big Sandy Unit 2 design scope is defined. However, the FGD Byproduct Dewatering System (ZD), FGD Reagent Preparation System (ZP), and the FGD Reagent Feed System (ZF) are sized to accommodate the possible future addition of the Unit 1 scope. Since the FGD Reclaim Water System is essentially an extension of the FGD Byproduct Dewatering System (ZD), the reclaim water tanks are also designed to accommodate the scopes of Unit 1 and Unit 2. Each reclaim water tank is sized to provide 4 hours' storage of reclaim water for both Units 1 and 2 at design conditions without having to draw from the Service Water System (SW).. The approximate size of each tank is 50 feet in diameter by 53 feet in straight side height. The total useful capacity of each tank is 532,320 gallons. The tank's gross capacity is 765,700 gallons, which accounts for normal operation of the tank through its useful capacity while maintaining agitator submergence. Each tank's overflow piping is sized to

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evacuate the maximum anticipated total inflow from the FGD Dewatering System (ZD) hydrocyclones, dewatering filtrate, and makeup water to prevent the tanks from overflowing to grade.

2.1.5 Materials Selection

The reclaim water tanks are fabricated from ASTM A36 carbon steel. The tank interior is protected with a natural rubber lining and the tank exterior is protected with a primer and finish coating.

2.2 FGD Reclaim Water Tank Agitators

2.2.1 Component Identification

Component Name: FGD Reclaim Water Tank Agitators A and B
Component Identification No.: 02-ZC-AG-8001-01 and 02-ZC-AG-8001-02

2.2.2 Function

The reclaim water tank agitators provide mixing to keep the slurry solids contained in the reclaim water tank in suspension.

2.2.3 Description

Two reclaim water tank agitators are supplied, one for each reclaim water tank. Each reclaim water tank agitator is a top-entry, gear-driven, axial flow type agitator with a long, cantilevered shaft. Each agitator's electric motor drive, speed reducer, and shaft bearings are located on support steel at the top of the reclaim water tank.

Depending on the vendor and design selected, the agitator impeller may be either three- or four-bladed.

The agitation pattern is downward toward the reclaim water tank floor. The reclaim water tanks are fitted with two to four baffles designed to minimize the swirl effects caused by the agitator mixing dynamics.

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2.2.4 Sizing Criteria

Mixing in the reclaim water tank is sufficient to keep the tank bottom free of settled solids. The design conditions are 2 to 3 weight percent gypsum, with a mean particle diameter of 70 μm . The slurry specific gravity is 1.01 and the particle specific gravity is 2.32.

2.2.5 Materials Selection

The agitator shafts and blades are carbon steel covered with natural rubber.

2.3 FGD Reclaim Water Pumps

2.3.1 Component Identification

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

2.3.2 Function

The reclaim water pumps transfer FGD reclaim water to the ball mills for grind water, the classifier feed tank for dilution, the jet bubbling reactor (JBR) absorber for makeup, and to all slurry systems for pipe and pump flush.

2.3.3 Description

Two reclaim water pumps are provided, with each pump capable of drawing slurry from either reclaim water tank. Each reclaim water pump is a vertically split case, end suction, constant-speed, belt-driven, centrifugal slurry pump that handles abrasive slurry with up to 3 weight percent solids. The pumps are equipped with mechanical shaft seals.

2.3.4 Sizing Criteria

Presently, only the AEP Big Sandy Unit 2 design scope is defined. However, the FGD Byproduct Dewatering System (ZD), the FGD Reagent Preparation System (ZP), and the FGD Reagent Feed System (ZF) are sized to accommodate the possible future addition of the Unit 1 scope. Since the FGD Reclaim Water System is essentially an extension of the FGD Byproduct Dewatering System

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(ZD), the reclaim water pumps are also designed to accommodate Unit 1 and Unit 2 design requirements. Each reclaim water pump is sized to provide 100 percent of the design reclaim water requirements for the continuous reclaim water users of both Unit 1 and Unit 2 plus an allowance for instantaneous demand during pipe flushing. The average expected demand, including one slurry line flush, is 2,100 gpm. Both pumps are required to operate if the demand exceeds this amount.

2.3.5 Materials Selection

The reclaim water pumps are fabricated from materials suitable for the corrosive and erosive nature of the reclaim water. Each pump casing is hard metal or hard metal-line. The pump impellers are abrasion-resistant, high-chrome cast iron.

2.4 Piping and Valves

2.4.1 Component Identification

Component Name: Piping and Valves
Component Identification No.: Various

2.4.2 Function

The piping and valves convey reclaim water to the various users. The reclaim system piping transports reclaim water to the JBR, chloride bleed, and various slurry system flush connections.

2.4.3 Description

The piping and valves are in accordance with ANSI standards and are 125/150 psi rated with materials of construction specifically selected for the corrosive and erosive nature of the reclaim water. All of the piping is routed above ground.

2.4.4 Sizing Criteria

The piping and valves are sized for a maximum velocity of 10 ft/s in main piping headers.

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2.4.5 Materials Selection

Piping is fabricated of fiberglass reinforced plastic (FRP) without an internal abrasion-resistant lining. Valves 2-1/2 inches and larger are lug wafer rubber-lined carbon steel butterfly valves. Valves 2 inches and smaller valves are flanged FRP ball valves.

3.0 Description of Major Interlocks

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

4.0 Description of System Operation and Control

4.1 Instrumentation and Control

The FGD Reclaim 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 the FGD Reclaim 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. The protective interlocks remain in service during remote manual operation.

The DCS opens and closes the reclaim water tank fill valve to maintain the level of water in the tank.

During normal operation, one reclaim water pump operates continuously. If the pressure transmitter at the pump's discharge header senses low-low pressure, it prompts the DCS to start the second pump. The DCS controls the pump's recirculation valve based on discharge header pressure in order to maintain header pressure in the appropriate range.

An ultrasonic type level transmitter is provided on each reclaim water tank and is used by the DCS to initiate the opening and closing of the tank fill valve, as well as to provide low suction head protection for the reclaim water pumps.

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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 FGD Reclaim Water System is sized to provide sufficient water to supply reclaim water to the FGD unit for 8 hours with a loss of supply water from both the FGD Byproduct Dewatering System (ZD) and Makeup Water System (RW).

One reclaim water pump operates continuously.

The system capacity is based on supplying sufficient reclaim water to the following users:

- Constant JBR makeup flow.
- Constant reagent preparation flow.
- Constant chloride bleed.
- Largest single flush requirement flow.

4.3 Redundancy

Two 100 percent capacity reclaim water pumps are provided. Either of the two pumps can supply the full reclaim water requirements at design maximum continuous rate (MCR) conditions when the unit is burning the 7.5 lb SO₂/MMBtu coal. In the event of abnormally high reclaim water requirements, both pumps can be operated simultaneously.

The two reclaim water tanks are sized such that the total storage capacity of both tanks is 8 hours, based on the total reclaim water demand.

5.0 Description of Provisions for Flushing and Testing

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

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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 hazardous areas and materials will be completed during detail design.

8.0 References

8.1 Flow Diagrams

Black & Veatch Drawing No.	AEP Drawing No.
141643-02ZC-M2253A	02-5 1 8004-D

8.2 General Arrangements

Later.

8.3 Electrical One-Line Drawings

Later.

8.4 Descriptive Articles

Later.

8.5 Codes and Standards

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

- 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."
- Hydraulic Institute.
- National Electrical Manufacturers Association (NEMA).

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- Institute of Electrical and Electronics Engineers (IEEE).
- American National Standards Institute (ANSI).
- American Welding Society (AWS).
- American Gear Manufacturers Association (AGMA).

8.6 Regulatory Requirements

The FGD Reclaim 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.