

SALT WASTE PROCESSING FACILITY PROJECT

ALPHA FINISHING PROCESS

SYSTEM DESCRIPTION

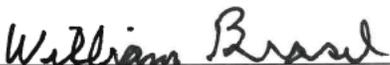
Prepared, reviewed, and accepted by:



Nicholas DesRocher
SWPF Cognizant Engineer

9/12/19

Date



William Brasel
SWPF Engineering Integration Manager

9/12/19

Date



Dr. Thomas D. Burns, Jr., P.E.
SWPF Director of Engineering

9/12/19

Date

SUMMARY OF CHANGES

Revision No.	Date	Description of Change
0	05/20/08	Issued for Approval
1	08/28/15	Revise per DCN-1475. This is a complete rewrite, therefore no revision bars shown.
2	09/12/19	Revise per DCN-2039, DCN-7015, and DCN-2101.

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ACRONYMS AND ABBREVIATIONS

%	Percent
°F	degrees Fahrenheit
AFDT	Alpha Finishing Drain Tank (TK-228)
AFF	Alpha Finishing Facility
AFP	Alpha Finishing Process
AMP	Ampere
ASDT	Alpha Sorption Drain Tank (TK-601)
AST-B	Alpha Sorption Tank-B (TK-221)
Ba	Barium
BDT	Barium-137 Decay Tank (TK-206)
BPCS	Basic Process Control System
CCA	Cold Chemicals Area
CDCSS	Cesium-depleted Clarified Salt Solution
CFF	Cross-flow Filter
CSDT-B	Cleaning Solution Dump Tank-B (TK-223)
CSSX	Caustic-side Solvent Extraction
DF	Decontamination Factor
dP	Differential Pressure
DSS	Decontaminated Salt Solution
DSSHT	Decontaminated Salt Solution Hold Tank (TK-207)
FFT-B	Filter Feed Tank-B (TK-222)
ft	Feet/Foot
g/L	Grams per Liter
gpm	Gallons per minute
HNO ₃	Nitric acid
hp	Horsepower
IST	Intermediate Storage Tank (TK-220)
M	Molar
MST	Monosodium Titanate
MSTT	MST/Sludge Transfer Tank (TK-224)
Na ⁺	Sodium ion
NaOH	Sodium Hydroxide
NTU	Nephelometric Turbidity Unit
P&ID	Piping and Instrumentation Diagram
PFD	Process Flow Diagram
psid	Pounds per square inch differential
psig	Pounds per square inch gauge
PVVS	Process Vessel Vent System
RPM	Revolutions per minute
s.g.	Specific Gravity
SAST	Spent Acid Storage Tank (TK-127)

ACRONYMS AND ABBREVIATIONS (cont.)

SPF	Saltstone Production Facility
SQL	Structured Query Language
Sr	Strontium
SSRT	Sludge Solids Receipt Tank (TK-104)
SWPF	Salt Waste Processing Facility
T/T	Tangent-Tangent (height)
TCV	Temperature Control Valve
TMP	Transmembrane Pressure
VFD	Variable Frequency Drive
WAC	Waste Acceptance Criteria
wt%	Weight percent

DEFINITIONS/GLOSSARY

There are no definitions or glossary items for this System Description.

1.0 SCOPE

The scope of this System Description is the Salt Waste Processing Facility (SWPF) Alpha Finishing Process (AFP) and related equipment.

The AFP can be divided into five Systems:

- Intermediate Storage Tank (IST) (TK-220) System – functions include collecting Decontaminated Salt Solution (DSS)/Cesium-depleted Clarified Salt Solution (CDCSS) for sampling and analysis and staging it for transfer to the DSS Hold Tank (DSSHT) (TK-207) in single-strike operation or the Alpha Sorption Tank-B (AST-B) (TK-221) in multi-strike operation;
- AST-B System – functions include receiving and storing DSS in single-strike operation; striking with Monosodium Titanate (MST) to allow actinide and strontium (Sr) sorption; and transferring the MST slurry to Filter Feed Tank-B (FFT-B) (TK-222) for filtration in multi-strike operation;
- FFT-B System – functions include receiving MST slurry for filtration and producing concentrated MST/sludge and DSS by filtering the MST slurry received from AST-B (TK-221), using cross-flow filters (CFFs) (FLT-222A/B/C);
- Cleaning Solution Dump Tank-B (CSDT-B) (TK-223) System – functions include receiving cleaning chemicals from the Cold Chemicals Area (CCA), and circulating cleaning solution through the filter for cleaning; and
- DSSHT System – primary function is to receive, store, and transfer the DSS to TK-50.

The AFP system interfaces with components in the following System Descriptions:

- [E-SD-J-00002](#), *SWPF Electrical System Description*¹;
- [J-SD-J-00002](#), *SWPF Instrumentation and Controls System Description*²;
- [M-SD-J-00005](#), *SWPF Utilities System Description*³;
- [X-SD-J-00001](#), *SWPF Alpha Strike Process System Description*⁴;
- [X-SD-J-00002](#), *SWPF Caustic-side Solvent Extraction System Description*⁵;
- [X-SD-J-00003](#), *SWPF Cold Chemicals Area System Description*⁶;
- [X-SD-J-00005](#), *SWPF Drains System Description*⁷;
- [X-SD-J-00006](#), *SWPF Sampling System Description*⁸, and
- [X-SD-J-00009](#), *SWPF Caustic-side Solvent Extraction with Next Generation Solvent (NGS) System Description*⁹.

The safety analysis requirements related to system functions for this system are documented in Chapter 4 of [S-SAR-J-00002](#), *SWPF Documented Safety Analysis*¹⁰.

The safety analysis requirements related to operability for this system are documented in Chapter 5 of [S-SAR-J-00002](#)¹⁰.

The discrete project design requirements for this system are documented in [P-DB-J-00002](#), *SWPF Design Criteria Database*¹¹.

As part of the maintenance of the SWPF Master Equipment List (see [PP-EN-5042](#)¹², *Master Equipment List*), all permanent plant equipment is assigned a unique tag number. Each component (equipment, instrumentation, specialty item, etc.) is assigned to one (and only one) CSE system code. Structured Query Language (SQL) reports are generated (real time) off the controlled Master Equipment List. These are filterable by CSE system. A complete listing of all components associated with this system can be found using the following reports, and filtering by AFP:

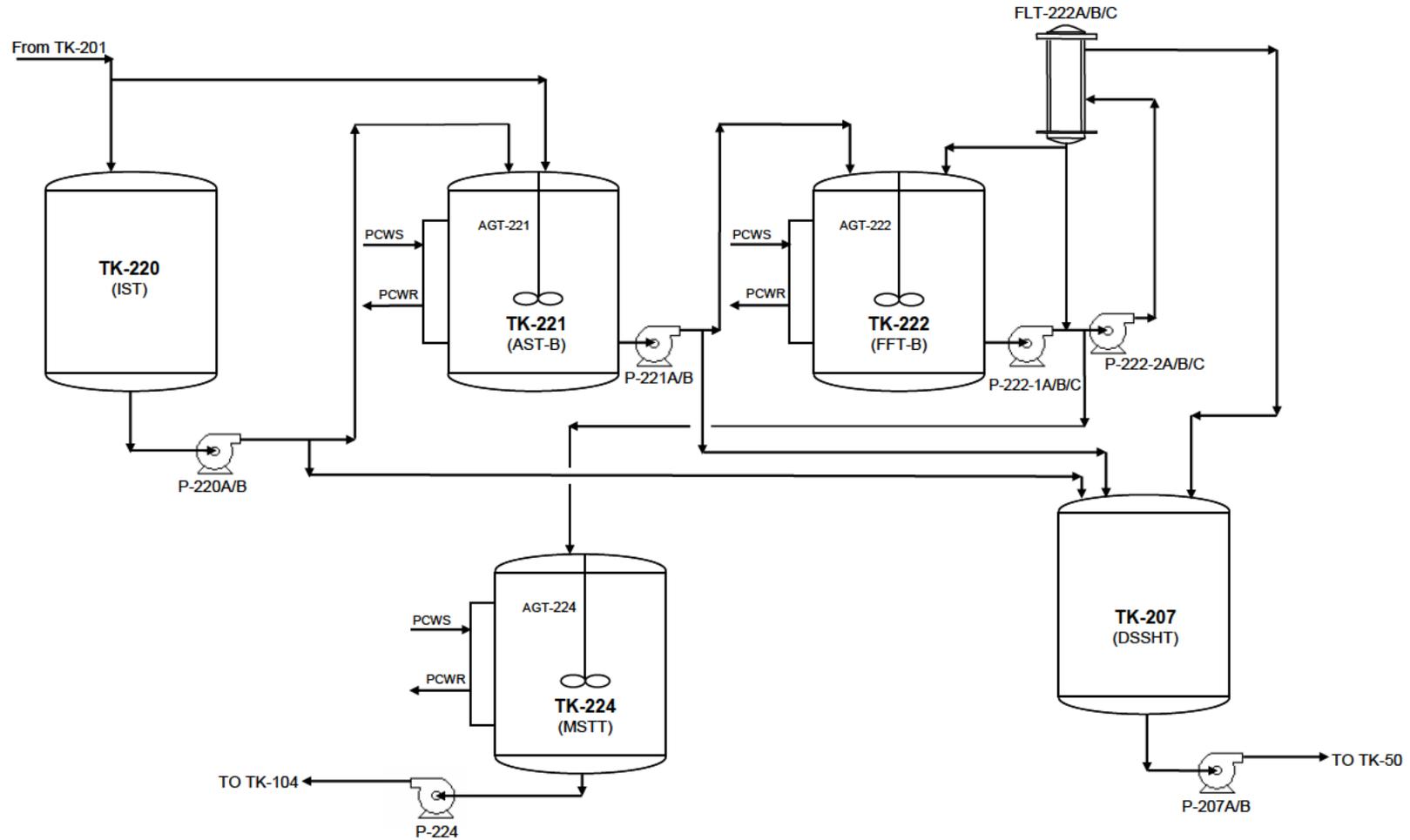
- [MEL Cables](#);
- [MEL Equipment](#);
- [MEL Instruments](#);
- [MEL Lines](#);
- [MEL Manual Valves](#); and
- [MEL Specialty Items](#).

Similarly, all essential and support drawings are coded to the appropriate CSE system code (with only one code allowed per drawing). Using the following link: [Drawing Category Status](#), a report may be generated for AFP and selecting the drawing type (Essential, Support). Reference drawings are not assigned System Codes and not required to be maintained current with facility modifications per [PP-EN-5001](#)¹², *Design Control* and [P-CDM-J-00001](#), *Configuration Management Plan*¹³.

2.0 GENERAL OVERVIEW

The AFP is the third SWPF processing stage. In single-strike mode, the AFP receives and stores DSS from Caustic-side Solvent Extraction (CSSX) before its subsequent transfer to TK-50. In multi-strike operation, an additional MST strike, followed by filtration, removes additional Sr and actinides from the CDCSS. An additional strike is performed only if the Sr/actinide content of the waste feed is sufficiently high that a single MST strike operation cannot reduce the concentration low enough for the CDCSS to meet the Saltstone Production Facility (SPF) Waste Acceptance Criteria (WAC) limits. Use of the multi-strike operation is expected to be an infrequent occurrence. The major Process Vessels in the AFP are the IST (TK-220), AST-B (TK-221), FFT-B (TK-222), MST/Sludge Transfer Tank (MSTT) (TK-224), and DSSHT (TK-207). The major process vessels, associated transfer pumps, and Alpha Sorption Filters (FLT-222A/B/C) are depicted in Figure 2-1.

Figure 2-1. Simplified Process Flow Schematic of the AFP



3.0 IST (TK-220)

3.1 System Functions

- Receives DSS/CDCSS from the DSS Coalescer (TK-201) (see [P-DB-J-00003](#), *SWPF Process Basis of Design*¹⁴).
- Isolates the DSS/CDCSS during sampling and analysis of the salt solution to verify the Sr/actinide concentrations (see [P-DB-J-00003](#)¹⁴).
- Transfers DSS/CDCSS to either the AST-B (TK-221) (multi-strike) or the DSSHT (TK-207) (single-strike) (see [P-DB-J-00003](#)¹⁴).
- Sufficiently agitates the contents to ensure a representative sample.

3.2 Operational Overview

During single-strike operations, the DSS in the BDT (TK-206) is pumped to the IST (TK-220) via the DSS Coalescer (TK-201). The IST (TK-220) receives DSS until it reaches a setpoint, and, once the IST (TK-220) is full, the DSS flow is diverted to AST-B (TK-221) while the IST (TK-220) undergoes sampling. A sample is taken in the IST (TK-220) to confirm that the DSS meets the SPF WAC (see [X-WCP-J-00001](#), *SWPF Waste Compliance Plan for Decontaminated Salt Solution Transfer to Tank 50*¹⁵). Upon confirmation that the salt solution meets the SPF WAC requirements, it is transferred to the DSSHT (TK-207).

During multi-strike operations, CDCSS from the DSS Coalescer (TK-201) is pumped to the IST (TK-220). From the IST (TK-220), the CDCSS is staged for processing through the Alpha Finishing Facility (AFF) MST strike and filtration steps.

3.3 Configuration Information

3.3.1 Description of System

Refer to Piping and Instrumentation Diagrams (P&IDs) and Process Flow Diagrams (PFDs) listed in Table 3-1.

Table 3-1. P&IDs and PFDs

Diagram Number	Diagram Title
M-M5-J-0001	<i>SWPF Simplified Process Flow Schematic (U)</i> ¹⁶
M-M5-J-0015	<i>SWPF Intermediate Storage Tank, Alpha Sorption Tank-B, Filter Feed Tank-B, and Cleaning Solution Dump Tank-B PFD (U)</i> ¹⁷
M-M6-J-0049 SH1	<i>SWPF Alpha Finishing Facility Intermediate Storage Tank TK-220 P&ID (U)</i> ¹⁸
M-M6-J-0049 SH2	<i>SWPF Alpha Finishing Facility Intermediate Storage Transfer Pumps P-220A/B P&ID (U)</i> ¹⁹

3.3.2 Major Components

See Table 3-2 for a list of major components.

Table 3-2. Major Components

Component	Description
IST (TK-220)	<p>Capacity: 37,700 gallons (see M-CLC-J-00050, <i>SWPF Intermediate Storage Tank Sizing Calculation, TK-220</i>²⁰)</p> <p>Dimensions: 19 feet/foot (ft) (diameter) x 16 ft 10 inch Tangent-Tangent (T/T) (see M-CLC-J-00050²⁰)</p> <p>Design Features:</p> <ul style="list-style-type: none"> ● Stainless Steel Pressure Vessel; ● Provided with active air purge; ● Mixing Capability; ● Dipped overflow; ● Connected to the AFF Process Vessel Vent System (PVVS); and ● In-tank flush ring to spray down tank walls.
Intermediate Storage Transfer Pumps (P-220A/B)	<p>Centrifugal pump used to transfer the CDCSS/DSS to either the DSSHT (TK-207) or AST-B (TK-221).</p> <p>Capacity: 400 gallons per minute (gpm) (see M-CLC-J-00037, <i>SWPF Intermediate Storage Transfer Pumps A & B Sizing Calculation, P-220A/B</i>²¹)</p> <p>Horsepower (hp): 25</p>

3.3.3 Stream Data

See Table 3-3 for a listing of streams.

Table 3-3. Streams

Stream	Description
CDCSS	<p>CDCSS is aqueous raffinate from the extraction stages of the CSSX process with Sr/actinide concentrations that are too high to send to TK-50. It is transferred to the AFP through the IST (TK-220) to the AST-B (TK-221), where it undergoes an additional MST strike.</p> <p>Properties 1.24 specific gravity (s.g.) (see M-CLC-J-00143, <i>SWPF Mass Balance Model Calculations as a Result of Nitric Acid Replacing Oxalic Acid</i>²²)</p> <p> 5.25 Molar (M) Sodium Ion (Na⁺) concentration (see M-CLC-J-00143²²)</p>
DSS	<p>DSS is an aqueous raffinate from the CSSX extraction stages with an Sr/actinide concentration that is within the SPF WAC. It is transferred to the AFP through the DSS Coalescer (TK-201).</p> <p>Properties 1.24 s.g. (see M-CLC-J-00143²²)</p> <p> 5.24M Na⁺ concentration (see M-CLC-J-00143²²)</p>

3.3.4 Physical Location and Layout

The IST System is housed in the western-most diked tank area of the AFF.

3.3.5 System Control Features

3.3.5.1 System Monitoring

- Redundant bubblers are installed to continuously monitor the IST (TK-220) level.
- Instrumentation is provided on the discharge line of the Intermediate Storage Transfer Pumps (P-220A/B) to monitor pressure and flow.
- Instrumentation is provided to measure and continuously monitor the IST (TK-220) temperature.

See Table 3-4 for a listing of System Monitoring Instrumentation.

Table 3-4. System Monitoring Instrumentation

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
LIT-7000	M-M6-J-0049 SH1 ¹⁸	J-JZ-J-0031 , <i>SWPF LI-7000 IST Level</i> ²³	IST (TK-220) Liquid Level	gallons
LIT-7019	M-M6-J-0049 SH1 ¹⁸	J-JZ-J-0032 , <i>SWPF LI-7019 IST Level</i> ²⁴	IST (TK-220) Liquid Level	gallons

Table 3-4. System Monitoring Instrumentation (cont.)

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
DIT-7000	M-M6-J-0049 SH1 ¹⁸	J-JZ-J-01161, SWPF DI-7000 IST Density ²⁵	IST (TK-220) Liquid Density	s.g.
DIT-7019	M-M6-J-0049 SH1 ¹⁸	J-JZ-J-00465, SWPF DI-7019 IST Density ²⁶	IST (TK-220) Liquid Density	s.g.
TE-7001	M-M6-J-0049 SH1 ¹⁸	J-JZ-J-00466, SWPF TI-7001 IST Temp ²⁷	IST (TK-220) Liquid Temperature	Degrees Fahrenheit (°F)
HV-7002	M-M6-J-0049 SH1 ¹⁸	N/A	Valve Position	Open/Closed
HV-7015	M-M6-J-0049 SH2 ¹⁹	N/A	Valve Position	Open/Closed
P-220A	M-M6-J-0049 SH2 ¹⁹	N/A	Pump Status	Run/Off
P-220B	M-M6-J-0049 SH2 ¹⁹	N/A	Pump Status	Run/Off
PIT-7012	M-M6-J-0049 SH2 ¹⁹	J-JZ-J-00468, SWPF PI-7012 IST Xfer Pump A/B Discharge Pressure ²⁸	P-220A/B Discharge Pressure	pounds per square inch gauge (psig)
FE-7017	M-M6-J-0049 SH2 ¹⁹	J-JZ-J-00467, FI-7017 IST Xfer Pump A/B Flow ²⁹	P-220A/B Discharge Flow Rate/Totalized Quantity	gpm/gallons
HV-7013	M-M6-J-0049 SH2 ¹⁹	N/A	Valve Position	Open/Closed
HV-7018	M-M6-J-0049 SH2 ¹⁹	N/A	Valve Position	C-A/C- B/Intermediate Off Position

3.3.5.2 Control Functions

There are no control functions for this system.

3.4 Operations

3.4.1 Initial Configuration

In single-strike operation, the IST (TK-220) will be initially empty and the pumps (P-220A/B) will not be in operation. In double-strike operation, the IST (TK-220) will contain a minimum level as the feed from CSSX does not stop.

3.4.2 System Startup

Initiation of the IST System is carried out in the Control Room by the Operator. The system is put in service by aligning flow from the DSS Coalescer (TK-201). Refer to [X-SD-J-00002](#)⁵ and [X-SD-J-00009](#)⁹ for details.

3.4.3 Normal Operations

Single-strike Operation

1. When the IST (TK-220) level reaches a pre-determined value, one of the pumps (P-220A/B) is started and the discharge is routed through the tank eductor, EDT-220. This provides mixing of tank contents prior to a sample being taken.
2. At a second higher pre-determined level in the IST (TK-220), diverted DSS is feed to the AST-B (TK-221).
3. When diversion of DSS is confirmed, the IST Sample Pump (SP-220) is started to circulate fluid through the laboratory. A sample is pulled from the recirculation line for analysis.
4. While the IST (TK-220) is being sampled and analyzed, DSS continues to be fed to AST-B (TK-221).
5. Once the sample has confirmed the DSS is within SPF WAC requirements, one of the two pumps (P-220A/B) is used to transfer the contents of the IST (TK-220) to the DSSHT (TK-207).
6. On completion of a transfer from the IST (TK-220) to the DSSHT (TK-207), the pump (P-220A/B) is shut off and the actuated valves in the transfer path are closed/realigned.

Multi-strike Operation

1. When the IST (TK-220) level reaches a predetermined value, one of the two pumps (P-220A/B) is started and the discharge is routed through the tank eductor, EDT-220. This provides mixing of the tank contents prior to transfer.
2. At a second higher predetermined level, the IST (TK-220) contents are transferred to AST-B (TK-221) using one of the two pumps (P-220A/B). During this transfer, CDCSS continues to flow into the IST (TK-220).
3. On completion of a transfer from the IST (TK-220) to AST-B (TK-221), the pump (P-220A/B) is shut off and the actuated valves in the transfer path are closed/realigned.

The process sequences for the IST system are included in Section 4.0 in [X-PCD-J-00003](#), *SWPF Automation Functional Control Sequence for: Alpha Finishing Process*³⁰.

3.4.4 Off-Normal and Recovery Operation

To prevent accumulation of solvent in the AFP, the IST (TK-220) is pumped down periodically using the IST Sample Pump (SP-220). The tank is first pumped down to a minimum level using

one of the pumps (P-220A/B). The IST Sample Pump (SP-220) is then used to transfer the solvent remnant in the heel of the vessel that will be directed back into the CSSX process via the Solvent Drain Tank (TK-208). The contents of the IST (TK-220) will be directed through a series of filters (FLT-240, FLT-241, and FLT-242) to ensure that solids do not enter the Solvent Drain Tank (TK-208) (see [M-M6-J-0149](#), *SWPF Alpha Finishing Facility Recovered Solvent Filters P&ID (U)*³¹).

See Table 3-5 for a listing of equipment and component failure.

Table 3-5. Equipment and Component Failure

Condition	Detection	Immediate Action	Recovery
IST (TK-220) High Level	Level Indicators (LI-7000 and LI-7019)	Stop all transfers into the tank. Performs Aborting Logic for Running Sequence.	Use P-220A/B to reduce the level
Intermediate Storage Transfer Pumps (P-220A/B) Failure	Failure alarm in Basic Process Control System (BPCS)	Performs Aborting Logic for Running Sequence.	The alternate duty pump can be used until repairs are completed. The failed pump and associated piping will be flushed and drained prior to maintenance/ replacement.
Valve Failure	Failure alarm in BPCS	Shut down P-220A/B. Performs Aborting Logic for Running Sequence.	Flush out piping and investigate failure prior to maintenance/replacement.
Low Plant Air Header Pressure	Pressure Indicator (PI-4435)	Perform Aborting/Stopping Logic for Running Sequence.	Operator to investigate cause of problem.
Low Process Building Exhaust Fan dP	Differential Pressure (dP) Indicator (PDI-4077)	Perform Aborting/Stopping Logic for Running Sequence.	Operator to investigate cause of problem.

Other postulated off-normal events include pump failure and/or valve failure. Immediate action and recovery from the off-normal events are provided in Table 3-5. Each scenario starts with isolating the system and then flushing the piping and components from the suction side. The transfer line and transfer pump (P-220A/B) are flushed prior to maintenance or replacement.

3.4.5 System Shutdown

On completion of a transfer from the IST (TK-220) to either AST-B (TK-221) or the DSSHT (TK-207), the pumps (P-220A/B) are shut off and the pump suction valve is closed shortly after stopping the pumps. Mixing stops on low level in the IST (TK-220). The transfer pump and suction valve shut down on low-low level.

4.0 AST-B (TK-221)

4.1 System Functions

Single-Strike Operations:

- Receives DSS from the DSS Coalescer(TK-201) (see [P-DB-J-00003¹⁴](#));
- Isolates the DSS during sampling and analysis of the salt solution to verify Sr/actinide concentrations;
- Transfers DSS to the DSSHT (TK-207) (see [P-DB-J-00003¹⁴](#));
- Cools and maintains AST-B (TK-221) contents at 77°F ($\pm 5^\circ\text{F}$); and
- Sufficiently agitates the contents to ensure a representative sample.

Multi-Strike Operations:

- Receives CDCSS from the IST (TK-220) (see [P-DB-J-00003¹⁴](#));
- Strikes the CDCSS with MST to achieve an MST concentration of 0.4 grams per Liter (g/L) (see [P-SPC-J-00002](#), *SWPF Functional Specification³²*);
- Sufficiently agitates the contents to maintain solids in suspension and ensure efficient adsorption by MST (see [P-DB-J-00003¹⁴](#));
- Transfers the contacted MST/sludge to FFT-B (TK-222), following the prescribed reaction duration (see [P-DB-J-00003¹⁴](#)); and
- Cools and maintains the AST-B (TK-221) contents at 77°F ($\pm 5^\circ\text{F}$) for optimum MST performance (see [P-DB-J-00003¹⁴](#)).

4.2 Operational Overview

AST-B (TK-221) operates in both single- and multi-strike modes. When operating during single-strike mode, the AST-B System serves essentially the same function as the IST System. Salt solution is pumped from the BDT (TK-206) via the DSS Coalescer (TK-201). Upon filling the AST-B (TK-221), the DSS flow is redirected to the now empty IST (TK-220) and the AST-B (TK-221) is isolated. The contents are then sampled and analyzed in accordance with [X-WCP-J-00001¹⁵](#). If the salt solution is confirmed to be within the SPF WAC, it is transferred to the DSSHT (TK-207) before being discharged to TK-50.

When operating in multi-strike mode, an additional MST strike is performed in AST-B (TK-221). CDCSS is pumped from the IST (TK-220). MST is added to strike the salt solution to adsorb Sr and actinides. After striking, the contents are transferred to FFT-B (TK-222) using one of the pumps (P-221A/B).

4.3 Configuration Information

4.3.1 Description of System

Refer to P&IDs and PFDs listed in Table 4-1.

Table 4-1. P&IDs and PFDs

Diagram Number	Diagram Title
M-M5-J-0001	SWPF Simplified Process Flow Schematic (U) ¹⁶
M-M5-J-0015	SWPF Intermediate Storage Tank, Alpha Sorption Tank-B, Filter Feed Tank-B, and Cleaning Solution Dump Tank-B PFD (U) ¹⁷
M-M6-J-0050 SH1	SWPF Alpha Finishing Facility Alpha Sorption Tank-B TK-221 P&ID (U) ³³
M-M6-J-0050 SH2	SWPF Alpha Finishing Facility Alpha Sorption Tank-B Transfer Pumps P-221A/B P&ID (U) ³⁴

4.3.2 Major Components

See Table 4-2 Table 4-2for a list of major components.

Table 4-2. Major Components

Component	Description
AST-B (TK-221)	Capacity: 37,700 gallons (see M-CLC-J-00051, SWPF Alpha Sorption Tank-B Sizing Calculation, TK-221 ³⁵) Size: 19 ft (diameter) x 16 ft-10 inches (T/T) (see M-CLC-J-00051 ³⁵) Design Features: <ul style="list-style-type: none"> Stainless Steel Pressure Vessel; Provided with active air purge; Mixing capability; Dipped overflow; Connected to the AFF PVVS; In-tank flush ring to spray down tank walls; and Equipped with an external cooling jacket for temperature control of tank.
AST-B Transfer Pumps (P-221A/B)	Centrifugal pumps used to transfer DSS from AST-B (TK-221) to DSSHT (TK-207) in single-strike mode. In double-strike mode, the pumps transfer MST slurry from AST-B (TK-221) to FFT-B (TK-222). Capacity: 300 gpm (see M-CLC-J-00038, SWPF Alpha Sorption Tank-B Transfer Pumps Sizing Calculation P-221A/B ³⁶) hp: 25 Design Features: <ul style="list-style-type: none"> Low shear to minimize particle attrition.
AST-B Agitator (AGT-221)	Mechanical agitator used to mix the contents of AST-B (TK-221). hp: 30 Design Feature: Speed controlled.

Table 4-2. Major Components (cont.)

Component	Description
AST-B Siphon Break (SB-221)	Siphon Break used to provide a positive break between CCA and the AFF.

4.3.3 Stream Data

See Table 4-3 for a listing of Streams.

Table 4-3. Streams

Stream	Description
CDCSS	<p>CDCSS is aqueous raffinate from the extraction stages of the CSSX process having Sr/actinide concentrations too high to TK-50. It is transferred to the AFP through the IST (TK-220) to AST-B (TK-221), where it undergoes an additional MST strike.</p> <p>Properties 1.24 s.g. (see M-CLC-J-00143²²) 5.25M Na⁺ concentration (see M-CLC-J-00143²²)</p>
DSS	<p>DSS is an aqueous raffinate from the CSSX extraction stages with a Sr/actinide concentration that is within the SPF WAC. It is transferred to the AFP through the IST (TK-220), AST-B (TK-221), or DSSHT (TK-207). DSS is also a contact-handled solution because most of the Cesium has been removed.</p> <p>Properties 1.24 s.g. (see M-CLC-J-00143²²) 5.24M Na⁺ concentration (see M-CLC-J-00143²²)</p>
MST	<p>MST provides a medium for adsorption of Sr and actinides from the CDCSS. MST is added to AST-B (TK-221) to achieve a concentration of 0.4 g/L.</p> <p>Properties 1.06 s.g. (see M-CLC-J-00143²²) 15 weight percent (wt%) solids (see M-CLC-J-00143²²) Particle Size: 98 percent (%) of particles between 1 and 35.5 microns (see X-SPC-J-00009, SWPF Monosodium Titanate (MST)³⁷)</p>
MST slurry	<p>MST slurry is produced after adding MST to the CDCSS. The MST slurry will be transferred to FFT-B (TK-222), where it is staged for filtration.</p> <p>Properties 1.25 s.g. (see M-CLC-J-00143²²) 5.24M Na⁺ concentration (see M-CLC-J-00143²²)</p>

4.3.4 Physical Location and Layout

The AST-B System is housed in the western-most diked tank area of the AFF.

4.3.5 System Control Features

4.3.5.1 System Monitoring

- Redundant bubblers are installed to continuously monitor the AST-B (TK-221) level.
- Instrumentation is installed on the discharge line of the AST-B Transfer Pumps (P-221A/B) to monitor pressure and flow.
- Instrumentation is installed inside the AST-B (TK-221) to measure and continuously monitor temperature.

See Table 4-4 for a listing of System Monitoring Instrumentation.

Table 4-4. System Monitoring Instrumentation

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
LIT-7031	M-M6-J-0050 SH1 ³³	J-JZ-J-0033, SWPF LI-7031 AST-B Level ³⁸	AST-B (TK-221) Liquid Level	gallons
LIT-7033	M-M6-J-0050 SH1 ³³	J-JZ-J-0034, SWPF LI-7033 AST-B Level ³⁹	AST-B (TK-221) Liquid Level	gallons
DIT-7031	M-M6-J-0050 SH1 ³³	J-JZ-J-00469, SWPF DI-7031 AST-B Density ⁴⁰	AST-B (TK-221) Liquid Density	s.g.
DIT-7033	M-M6-J-0050 SH1 ³³	J-JZ-J-01162, SWPF DI-7033 AST-B Density ⁴¹	AST-B (TK-221) Liquid Density	s.g.
TE-7050	M-M6-J-0050 SH1 ³³	J-JZ-J-00471, SWPF TIC-7050 AST-B Temp ⁴²	AST-B (TK-221) Liquid Temperature	°F
TV-7050	M-M6-J-0050 SH1 ³³	N/A	Valve Position	0-100% Open
HV-7039	M-M6-J-0050 SH1 ³³	N/A	Valve Position	Open/Closed
AGT-221	M-M6-J-0050 SH1 ³³	N/A	Agitator Status	Run/Off
JA-7038	M-M6-J-0050 SH1 ³³	N/A	Agitator Current	Ampere (AMP)
SC-7038	M-M6-J-0050 SH1 ³³	J-JZ-J-00470, SWPF SIC-7038 AST-B Agitator Speed ⁴³	Agitator Speed	Revolutions per minute (RPM)
VE-9277A/B/C	M-M6-J-0050 SH1 ³³	N/A	AGT-221 Vibration	Cycles/second Inches/second
HV-7040	M-M6-J-0050 SH2 ³⁴	N/A	Valve Position	C-A/C-B/A-B Position
P-221A	M-M6-J-0050 SH2 ³⁴	N/A	Pump Status	Run/Off
P-221B	M-M6-J-0050 SH2 ³⁴	N/A	Pump Status	Run/Off
PIT-7055	M-M6-J-0050 SH2 ³⁴	J-JZ-J-00473, SWPF PI-7055 AST-B Xfer Pump A/B Discharge Pressure ⁴⁴	P-221A/B Discharge Pressure	psig
FE-7052	M-M6-J-0050 SH2 ³⁴	J-JZ-J-00472, SWPF FI-7052 AST-B Xfer Pump A/B Flow ⁴⁵	P-221A/B Discharge Flow Rate/Totalized Quantity	gpm/gallons

Table 4-4. System Monitoring Instrumentation (cont.)

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
HV-7041	M-M6-J-0050 SH2 ³⁴	N/A	Valve Position	C-A/C-B Position

4.3.5.2 Control Functions

The AST-B System is remotely controlled by an automatic sequence in the Control Room. The Operator has the ability to terminate the automatic sequence and manually control the operation.

See Table 4-5 for a listing of Control Loops.

Table 4-5. Control Loops

Loop Number	P&ID	Scale Sheet	Controlled Variable	Set Point
TIC-7050	M-M6-J-0050 SH1 ³³	J-JZ-J-00471 ⁴²	AST-B (TK-221) temperature	77°F (see M-M5-J- 0015 ¹⁷)

4.4 Operations

Decontamination Factors (DFs) used in developing the Mass Balance Model (P-DB-J-00003¹⁴) for the AFP are summarized in Table 4-6.

Table 4-6. Decontamination Factors

Radionuclide	Single-Strike (12-hour DF Values)	Multi-Strike	
		First-Strike (6-hour DF Values)	Subsequent-Strike (6-hour DF Values)
Uranium	1.35	1.3	1.3
Plutonium	5.5	4.7	3.9
Sr*	20	17	17
Americium**	4.6	3.4	1.5
Curium***	1	1	1
Neptunium	2.4	2.14	1.13

Notes:

* Per guidance from SRT-LWP-2004-00076, *Decontamination Factors for Strontium, Plutonium, Neptunium, and Uranium upon Contact of Concentrated Alkaline Waste Solutions with Monosodium Titanate*⁴⁶ and WSRC-TR-2004-00145, *Monosodium Titanate Multi-Strike Testing*⁴⁷

** Value from simulant testing. All other values are from real waste testing.

*** Curium: No data available for 6-hour or 12-hour strike operation.

4.4.1 Initial Configuration

Initially, the AST-B (TK-221) will be empty and the pumps (P-221A/B) will not be in operation.

4.4.2 System Startup

When operating in single-strike mode, the AST-B System is placed in service by aligning and opening valves to allow salt solution from the DSS Coalescer (TK-201) to flow to the AST-B (TK-221) while the IST (TK-220) is being sampled. When operating in multi-strike mode, the AST-B System operation begins by receiving CDCSS from the IST (TK-220).

4.4.3 Normal Operations

Single-strike Mode

1. When the AST-B (TK-221) reaches a predetermined level, the AST-B agitator (AGT-221) is started to provide mixing of the tank contents.
2. At a second higher pre-determined level in the AST-B (TK-221), the DSS feed is diverted to the IST (TK-220).
3. After the DSS flow to AST-B (TK-221) has been stopped for a pre-determined time, the tank contents are sampled and analyzed.
4. Once the sample is confirmed to be within the SPF WAC requirements, the contents of AST-B (TK-221) are transferred to the DSSHT (TK-207), using one of the two pumps (P-221A/B).
5. Agitation is stopped at the minimum level for mixing.
6. On completion of a transfer to the DSSHT (TK-207), the pumps (P-221A/B) are shut off and the actuated valves in the transfer path are closed/realigned.

Multi-strike Mode

1. When the IST (TK-220) has reached a pre-determined level, one of the IST Transfer Pump (P-220A/B) discharge valves are aligned to the AST-B (TK-221).
 2. Start either P-220A or P-220B to transfer the CDCSS from the IST (TK-220) to the AST-B (TK-221).
 3. At a pre-determined level in the AST-B (TK-221), the AST-B agitator (AGT-221) is started. The tank contents are mechanically agitated for the entire reaction period.
 4. After the IST (TK-220) transfer to the AST-B (TK-221) is complete, MST is added from the MST Storage Tank (TK-311). Sodium hydroxide (NaOH) solution from the Caustic Dilution Feed Tank (TK-108) is used to flush the line after MST addition.
 5. After the required adsorption period, the contents of AST-B (TK-221) are sampled and analyzed.
-

6. If the sample results predict an acceptable concentration of actinides and Sr, the working volume of AST-B (TK-221) is transferred to the FFT-B (TK-222) via one of the pumps (P-221A/B).
7. Agitation is stopped at the minimum level for AST-B (TK-221) mixing.
8. On completion of a transfer to FFT-B (TK-222), the pumps (P-221A/B) are shut down and the actuated valves in the transfer path are closed/realigned. The transfer lines and pumps are flushed with DSS.

The process sequences for the AST-B system are included in Section 5.0 in [X-PCD-J-00003](#)³⁰.

4.4.4 Off-Normal and Recovery Operation

To prevent the accumulation of solvent in the AFP, the AST-B (TK-221) will be pumped down periodically, using AST-B Sample Pump (SP-221). Refer to Section 3.4.4 for details on solvent recovery.

See Table 4-7 for a listing of equipment and component failure.

Table 4-7. Equipment and Component Failure

Condition	Detection	Immediate Action	Recovery
AST-B Transfer Pump (P-221A/B) failure	Failure alarm in BPCS.	Performs Aborting Logic for Running Sequence.	The alternate duty pump can be used until repairs are completed. The failed pump and associated piping will be flushed and drained prior to maintenance /replacement.
AST-B Agitator motor failure (AGT-221)	Equipment fault.	None.	Replace the motor.
AST-B Temperature Control Valve (TCV) failure (TV-7050)	High or Low Temperature Alarm	None.	Tank cooling can be operated in manual, using the TCV bypass valve until repairs are completed.
Valve Failure	Failure alarm in BPCS	Stop P-221A/B. Performs Aborting Logic for Running Sequence.	Flush out piping and pumps and investigate failure prior to maintenance/replacement.
Low Plant Air Header Pressure	Pressure Indicator (PI-4435)	Perform Aborting/Stopping Logic for Running Sequence.	Operator to investigate cause of problem.
Low Process Building Exhaust Fan dP	dP Indicator (PDI-4077)	Perform Aborting/Stopping Logic for Running Sequence.	Operator to investigate cause of problem.

Other postulated off-normal events include pump failure, valve failure, and/or agitator failure. Immediate action and recovery from the off-normal events are provided in Table 4-7. Each scenario starts with isolating the system and then flushing the piping, components, and equipment prior to maintenance or replacement. The transfer line can be flushed back to the AST-B (TK-221) and also downstream of the pumps (P-221A/B).

4.4.5 System Shutdown

On a shutdown of the AST-B System, the pumps (P-221A/B) are stopped and the valves are closed. The AST-B (TK-221), pumps, and process lines are drained and flushed as necessary.

5.0 FFT-B (TK-222)

5.1 System Functions

- Receives MST slurry from the AST-B (TK-221).
- Concentrates the MST slurry to 5 wt% MST/sludge by circulating the slurry through the Alpha Sorption Filter (FLT-222A/B/C) (see [P-DB-J-00003¹⁴](#)).
- Transfers filtrate to the DSSHT (TK-207) (see [P-DB-J-00003¹⁴](#)).
- Collects and subsequently transfers multiple batches of MST/sludge to the Sludge Solids Receipt Tank (SSRT) (TK-104) (see [P-DB-J-00003¹⁴](#)).
- Cools and maintains the contents of the FFT-B (TK-222) and filter loops at 77°F (±5°F) (see [M-M5-J-0015¹⁷](#)).

5.2 Operational Overview

The FFT-B System only operates in multi-strike mode. FFT-B (TK-222) receives multiple batches of MST slurry from the AST-B (TK-221). Each batch of MST slurry will be concentrated to a level that facilitates mixing and monitoring. The last (seventh) batch of MST slurry is filtered and concentrated to the target concentration of 5 wt% (see [P-DB-J-00003¹⁴](#)). The slurry is circulated until the targeted concentration is achieved. The concentrated batches from FFT-B (TK-222) are then transferred to the MSTT (TK-224), prior to being transferred to the SSRT (TK-104) for washing. The filtrate is transferred to the DSSHT (TK-207) for staging before being transferred to TK-50.

5.3 Configuration Information

5.3.1 Description of System

Refer to P&IDs and PFDs listed in Table 5-1.

Table 5-1. P&IDs and PFDs

Diagram Number	Diagram Title
M-M5-J-0001	<i>SWPF Simplified Process Flow Schematic (U)¹⁶</i>
M-M5-J-0015	<i>SWPF Intermediate Storage Tank, Alpha Sorption Tank-B, Filter Feed Tank-B, and Cleaning Solution Dump Tank-B PFD (U)¹⁷</i>
M-M5-J-0016	<i>SWPF Alpha Sorption Filters FLT-222A/B/C PFD (U)⁴⁸</i>
M-M6-J-0051 SH1	<i>SWPF Alpha Finishing Facility Filter Feed Tank-B TK-222 P&ID (U)⁴⁹</i>
M-M6-J-0051 SH2	<i>SWPF Alpha Finishing Facility Filter Feed/Solids Transfer Pump P-222-1A and Filter Recirculation Pump P-222-2A P&ID (U)⁵⁰</i>
M-M6-J-0051 SH3	<i>SWPF Alpha Finishing Facility Filter Feed/Solids Transfer Pump P-222-1B and Filter Recirculation Pump P-222-2B P&ID (U)⁵¹</i>
M-M6-J-0051 SH4	<i>SWPF Alpha Finishing Facility Filter Feed/Solids Transfer Pump P-222-1C and Filter Recirculation Pump P-222-2C P&ID (U)⁵²</i>
M-M6-J-0052	<i>SWPF Alpha Finishing Facility Alpha Sorption Filter FLT-222A P&ID (U)⁵³</i>
M-M6-J-0053	<i>SWPF Alpha Finishing Facility Alpha Sorption Filter FLT-222B P&ID (U)⁵⁴</i>
M-M6-J-0054	<i>SWPF Alpha Finishing Facility Alpha Sorption Filter FLT-222C P&ID (U)⁵⁵</i>
M-M6-J-0055 SH1	<i>SWPF Alpha Finishing Facility Back Pulse Charge Tank-B TK-233 P&ID (U)⁵⁶</i>
M-M6-J-0056 SH1	<i>SWPF Alpha Finishing Facility MST/Sludge Transfer Tank TK-224 P&ID (U)⁵⁷</i>
M-M6-J-0056 SH2	<i>SWPF Alpha Finishing Facility MST/Sludge Transfer Pump P-224 P&ID (U)⁵⁸</i>
M-M6-J-0175	<i>SWPF Alpha Finishing Facility Filter Recirculation Coolers HX-222A/B P&ID (U)⁵⁹</i>
M-M6-J-0176	<i>SWPF Alpha Finishing Facility Filter Recirculation Cooler HX-222C P&ID (U)⁶⁰</i>

5.3.2 Major Components

See Table 5-2 for a list of major components.

Table 5-2. Major Components

Component	Description
FFT-B (TK-222)	<p>Capacity: 37,700 gallons (see M-CLC-J-00052, <i>SWPF Filter Feed Tank-B Sizing Calculation, TK-222</i>⁶¹)</p> <p>Dimensions: 19 ft (diameter) × 16 ft-10 inches (T/T) (see M-CLC-J-00052⁶¹)</p> <p>Design Features:</p> <ul style="list-style-type: none"> ● Stainless Steel Pressure Vessel; ● Active air purge; ● Mixing capability; ● Dipped overflow; ● Connected to the AFF PVVS; ● In-tank flush ring to spray down tank walls; and ● Equipped with external cooling jacket for temperature control of tank.
FFT-B Agitator (AGT-222)	<p>Mechanical agitator used to mix the contents of FFT-B (TK-222)</p> <p>hp: 30</p> <p>Design Feature: Speed controlled.</p>
Filter Feed/Solids Transfer Pumps (P-222-1A/1B/1C)	<p>Centrifugal pumps with variable frequency drives (VFDs) that provide a controlled pressurized feed to the AFP filter loops</p> <p>Capacity: 60 gpm (see M-CLC-J-00039, <i>SWPF Filter Feed/Solids Transfer Pumps A, B, and C Sizing Calculation, P-222-1A/B/C</i>⁶²).</p> <p>hp: 30</p> <p>Design Features:</p> <ul style="list-style-type: none"> ● Low shear to minimize particle attrition.
Filter Recirculation Pumps (P-222-2A/2B/2C)	<p>Centrifugal pumps with VFDs that provide a controlled feed to the filters (FLT-222A/B/C)</p> <p>Capacity: 1,300 gpm (see M-CLC-J-00040, <i>SWPF Filter Recirculation Pumps A, B, and C Sizing Calculation, P-222-2A/B/C</i>⁶³)</p> <p>hp: 150</p> <p>Design Features:</p> <ul style="list-style-type: none"> ● Low shear to minimize particle attrition.
Filter Recirculation Coolers (HX-222A/B/C)	<p>In-line heat exchangers used to cool the filtration system</p> <p>Rating: 300,000 British thermal units per hour (see M-M6-J-0175⁵⁹ and M-M6-J-0176⁶⁰)</p>
Alpha Sorption Filters (FLT-222A/B/C)	<p>CFF used to produce permeate and concentrated MST slurry in FFT-B (TK-222)</p> <p>Rating: 0.1 micron</p> <p>Size: 216 square ft (see M-CLC-J-00023: <i>SWPF Alpha Sorption Filter and Washing Filter Sizing Calculation, FLT-102A/B/C, FLT-222A/B/C, and FLT-104</i>⁶⁴)</p> <p>Tube Details: Sintered metal design</p>
Finishing Area Backpulse Tanks (TK-225A/B/C)	<p>Stainless steel pressure vessel designed to provide pressurized air in short durations to reverse flow to clean the filter pores.</p>

Table 5-2. Major Components (cont.)

Component	Description
Backpulse Charge Tank-B (TK-233)	Stainless steel pressure vessel designed to backpulse the filters with filtrate during normal operations to dislodge debris from the filter pores. Capacity: 30 gallons Dimension: 1.5 ft (diameter) × 2.25 ft (T/T) Design Features: <ul style="list-style-type: none"> ● Stainless Steel Pressure Vessel
MSTT (TK-224)	Capacity: 2,000 gallons (see M-CLC-J-00055 , <i>SWPF MST/Sludge Transfer Tank Sizing Calculation, TK-224⁶⁵</i>) Dimension: 6 ft (diameter) × 9 ft-9 inch (T/T) (see M-CLC-J-00055⁶⁵) Design Features: <ul style="list-style-type: none"> ● Stainless Steel Pressure Vessel; ● Active air purge; ● Mixing capability; ● Dipped overflow; ● Connected to the AFF PVVS; ● In-tank flush ring to spray down tank walls; and ● Equipped with external cooling coils for temperature control of tank.
MST/Sludge Transfer Pump (P-224)	Centrifugal pump used to transfer MST sludge from the MSTT (TK-224) to the SSRT (TK-104). Capacity: 60 gpm (see M-CLC-J-00066 , <i>SWPF MST/Sludge Transfer Pump Sizing Calculation, P-224⁶⁶</i>) hp: 20 Design Features: <ul style="list-style-type: none"> ● Low shear to minimize particle attrition.
MSTT Agitator (AGT-224)	Mechanical agitator used to mix the contents of the MSTT (TK-224) hp: 1 Design Feature: Speed controlled.
AFP Filter Loop Drain Pump (P-229)	Positive displacement pump used to pump out the AFP filter loops Capacity: 30 gpm hp: 5

5.3.3 Stream Data

See Table 5-3 for a listing of Streams.

Table 5-3. Streams

Stream	Description
MST slurry	Treated CDCSS transferred to FFT-B (TK-222) for filtering Properties 1.25 s.g. (M-CLC-J-00143 ²²) 5.24M Na ⁺ concentration (M-CLC-J-00143 ²²)
MST sludge	MST sludge produced after concentrating the MST slurry through the filtration process. MST sludge will be transferred to the SSRT (TK-104) for washing, prior to being transferred to Defense Waste Processing Facility. Properties 1.25 s.g. (M-CLC-J-00143 ²²) Up to 5 wt% solids (M-CLC-J-00143 ²²) 5.24M Na ⁺ concentration (M-CLC-J-00143 ²²)
DSS	Description DSS is the permeate that is produced from the filters (FLT-222A/B/C). Properties 1.24 s.g. (M-CLC-J-00143 ²²) 5.24M Na ⁺ concentration (M-CLC-J-00143 ²²)

5.3.4 Physical Location and Layout

The FFT-B System is housed in the DSSHT/FFT-B diked tank area in the AFF.

5.3.5 System Control Features

5.3.5.1 System Monitoring

The FFT-B System normally operates with minimal Operator intervention. Instrumentation is provided to monitor the status of the system and initiate corrective actions, if necessary. Remote alarm indications are provided to the BPCS.

- Redundant bubblers are installed to continuously monitor FFT-B (TK-222) level. Instrumentation is provided to continuously monitor and control FFT-B (TK-222) temperature.
- Bubblers are installed to continuously monitor MSTT (TK-224) level and density. Instrumentation is provided to continuously monitor and control MSTT (TK-224) temperature.
- Instrumentation is provided on discharge of the Filter Feed/Solids Transfer Pumps (P-222-1A/1B/1C) to monitor and control the flow rate and pressure.
- Instrumentation is provided on the discharge of the Filter Recirculation Pumps (P-222-2A/2B/2C) to measure pressure, flow rate, and fluid density. The instrumentation controls chilled water to HX-222A/B/C.
- Instrumentation is provided on agitators AGT-222 and AGT-224 to control agitator speed.

- Instrumentation is included to measure dP through the filter (FLT-222A/B/C) and transmembrane pressure (TMP) between the filter tubes and shell.
- Instrumentation is provided on the filtrate lines to measure turbidity, flow rate, and pressure.
- Instrumentation is provided on the discharge of the MST/Sludge Transfer Pump (P-224) to measure flow rate and pressure.
- Instrumentation is provided on the discharge of the AFP Filter Loop Drain Pump (P-229) to measure flow rate and pressure.

See Table 5-4 for a listing of System Monitoring Instrumentation.

Table 5-4. System Monitoring Instrumentation

FFT-B (TK-222) Instrumentation

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
LIT-7064	M-M6-J-0051 SH1 ⁴⁹	J-JZ-J-0036, SWPF LI-7064 FFT-B Level ⁶⁷	FFT-B (TK-222) Liquid level	gallons
LIT-7072	M-M6-J-0051 SH1 ⁴⁹	J-JZ-J-0037, SWPF LI-7072 FFT-B Level ⁶⁸	FFT-B (TK-222) Liquid Level	gallons
DIT-7064	M-M6-J-0051 SH1 ⁴⁹	J-JZ-J-01163, SWPF DI- 7064 FFT-B Density ⁶⁹	FFT-B (TK-222) Liquid Density	s.g.
DIT-7072	M-M6-J-0051 SH1 ⁴⁹	J-JZ-J-00474, SWPF DI- 7072 FFT-B Density ⁷⁰	FFT-B (TK-222) Liquid Density	s.g.
TE-7060	M-M6-J-0051 SH1 ⁴⁹	J-JZ-J-00476, SWPF TIC- 7060 FFT-B Temp ⁷¹	FFT-B (TK-222) Liquid Temperature	°F
TV-7060	M-M6-J-0051 SH1 ⁴⁹	N/A	Valve Position	0-100% Open
AGT-222	M-M6-J-0051 SH1 ⁴⁹	N/A	Agitator Status	Run/Off
SC-7063	M-M6-J-0051 SH1 ⁴⁹	J-JZ-J-00475, SWPF SIC- 7063 FFT-B Agitator Speed ⁷²	Agitator Speed	RPM
JA-7063	M-M6-J-0051 SH1 ⁴⁹	N/A	Agitator Current	AMP
VE- 9278A/B/C	M-M6-J-0051 SH1 ⁴⁹	N/A	AGT-222 Vibration	Cycles/second Inches/second

Table 5-4. System Monitoring Instrumentation (cont.)

Filter Feed/Solids Transfer Pump (P-222-1A) and Filter Recirculation Pump (P-222-2A) Instrumentation

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
HV-7069	M-M6-J-0051 SH2 ⁵⁰	N/A	Valve Position	C-A/C- B/Intermediate Off Position
HV-7066	M-M6-J-0051 SH2 ⁵⁰	N/A	Valve Position	C-A/C-B/A-B position
P-222-1A	M-M6-J-0051 SH2 ⁵⁰	N/A	Pump Status	Run/Off
SC-7081	M-M6-J-0051 SH2 ⁵⁰	J-JZ-J-01214, SWPF SIC- 7081 AFF Filter Feed/Solids Xfer Pump 1A Speed ⁷³	P-222-1A Speed	RPM
PIT-7078	M-M6-J-0051 SH2 ⁵⁰	J-JZ-J-00486, SWPF PI-7078 AFF Filter Feed/Solids Xfer Pump 1A Discharge Pressure ⁷⁴	P-222-1A Discharge Pressure	psig
FE-7081	M-M6-J-0051 SH2 ⁵⁰	J-JZ-J-00480, SWPF FIC- 7081 AFF Filter Feed/Solids Xfer Pump 1A Flow Control ⁷⁵	P-222-1A Discharge Flow	gpm
HV-7084	M-M6-J-0051 SH2 ⁵⁰	N/A	Valve Position	C-A/C- B/Intermediate Off Position
P-222-2A	M-M6-J-0051 SH2 ⁵⁰	N/A	Pump Status	Run/Off
SC-7101	M-M6-J-0051 SH2 ⁵⁰	J-JZ-J-01217, SWPF SIC- 7101 AFF Filter Recirc Pump 2A Speed ⁷⁶	P-222-2A Speed	RPM
FE-7101	M-M6-J-0051 SH2 ⁵⁰	J-JZ-J-00483, SWPF FIC- 7101 AFF Filter Recirc Pump 2A Flow Control ⁷⁷ J-JZ-J-00477, SWPF DI- 7101 AFF Filter A Recirc Loop Density ⁷⁸ J-JZ-J-00492, SWPF TIC- 7101 AFF Filter Recirc Pump 2A Temperature Control ⁷⁹	P-222-2A Discharge Flow / Density / Temperature	gpm / s.g. / °F
PIT-7106A	M-M6-J-0051 SH2 ⁵⁰	J-JZ-J-00489, SWPF PI- 7106A AFF Filter Recirc Pump 2A Discharge ⁸⁰	P-222-2A Discharge Pressure / FLT-222A Inlet Pressure	psig
TE-7100A	M-M6-J-0051 SH2 ⁵⁰	J-JZ-J-01002, SWPF TI- 7100A FLT-222A Loop Temperature ⁸¹	P-222-2A Discharge Temperature	°F
TE-7100B	M-M6-J-0051 SH2 ⁵⁰	J-JZ-J-01003, SWPF TI- 7100B FLT-222A Loop Temperature ⁸²	P-222-2A Discharge Temperature	°F

Table 5-4. System Monitoring Instrumentation (cont.)

Filter Feed/Solids Transfer Pump (P-222-1B) and Filter Recirculation Pump (P-222-2B) Instrumentation

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
HV-7070	M-M6-J-0051 SH3 ⁵¹	N/A	Valve Position	C-A/C- B/Intermediate Off Position
HV-7067	M-M6-J-0051 SH351	N/A	Valve Position	C-A/C-B/A-B position
P-222-1B	M-M6-J-0051 SH351	N/A	Pump Status	Run/Off
SC-7082	M-M6-J-0051 SH351	J-JZ-J-01215, SWPF SIC- 7082 AFF Filter Feed/Solids Xfer Pump 1B Speed ⁸³	P-222-1B Speed	RPM
PIT-7079	M-M6-J-0051 SH351	J-JZ-J-00487, SWPF PI-7079 AFF Filter Feed/Solids Xfer Pump 1B Discharge Pressure ⁸⁴	P-222-1B Discharge Pressure	psig
FE-7082	M-M6-J-0051 SH351	J-JZ-J-00481, SWPF FIC- 7082 AFF Filter Feed/Solids Xfer Pump 1B Flow Control ⁸⁵	P-222-1B Discharge Flow	gpm
HV-7085	M-M6-J-0051 SH351	N/A	Valve Position	C-A/C- B/Intermediate Off Position
P-222-2B	M-M6-J-0051 SH3 ⁵¹	N/A	Pump Status	Run/Off
SC-7121	M-M6-J-0051 SH3 ⁵¹	J-JZ-J-01219, SWPF SIC- 7121 AFF Filter Recirc Pump 2B Speed ⁸⁶	P-222-2B Speed	RPM
FE-7121	M-M6-J-0051 SH3 ⁵¹	J-JZ-J-00484, SWPF FIC- 7121 AFF Filter Recirc Pump 2B Flow Control ⁸⁷ J-JZ-J-00478, SWPF DI- 7121 AFF Filter B Recirc Loop Density ⁸⁸ J-JZ-J-00493, SWPF TIC- 7121 AFF Filter Recirc Pump 2B Temperature Control ⁸⁹	P-222-2B Discharge Flow / Density / Temperature	gpm / s.g. / °F
PIT-7126A	M-M6-J-0051 SH3 ⁵¹	J-JZ-J-00490, SWPF PI- 7126A AFF Filter Recirc Pump 2B Discharge Pressure ⁹⁰	P-222-2B Discharge Pressure / FLT-222B Inlet Pressure	psig
TE-7099A	M-M6-J-0051 SH3 ⁵¹	J-JZ-J-01004, SWPF TI- 7099A FLT-222B Loop Temperature ⁹¹	P-222-2B Discharge Temperature	°F
TE-7099B	M-M6-J-0051 SH3 ⁵¹	J-JZ-J-01005, SWPF TI- 7099B FLT-222B Loop Temperature ⁹²	P-222-2B Discharge Temperature	°F

Table 5-4. System Monitoring Instrumentation (cont.)

Filter Feed/Solids Transfer Pump (P-222-1C) and Filter Recirculation Pump (P-222-2C) Instrumentation

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
HV-7071	M-M6-J-0051 SH4 ⁵²	N/A	Valve Position	C-A/C-B/Intermediate Off Position
HV-7068	M-M6-J-0051 SH4 ⁵²	N/A	Valve Position	C-A/C-B/A-B position
P-222-1C	M-M6-J-0051 SH4 ⁵²	N/A	Pump Status	Run/Off
SC-7083	M-M6-J-0051 SH4 ⁵²	J-JZ-J-01216, SWPF SIC-7083 AFF Filter Feed/Solids Xfer Pump 1C Speed ⁹³	P-222-1C Speed	RPM
PIT-7080	M-M6-J-0051 SH4 ⁵²	J-JZ-J-00488, SWPF PI-7080 AFF Filter Feed/Solids Xfer Pump 1C Discharge Pressure ⁹⁴	P-222-1C Discharge Pressure	psig
FE-7083	M-M6-J-0051 SH4 ⁵²	J-JZ-J-00482, SWPF FIC-7083 AFF Filter Feed/Solids Xfer Pump 1C Flow Control ⁹⁵	P-222-1C Discharge Flow	gpm
HV-7086	M-M6-J-0051 SH4 ⁵²	N/A	Valve Position	C-A/C-B/Intermediate Off Position
P-222-2C	M-M6-J-0051 SH4 ⁵²	N/A	Pump Status	Run/Off
SC-7141	M-M6-J-0051 SH4 ⁵²	J-JZ-J-01220, SWPF SIC-7141 AFF Filter Recirc Pump 2C Speed ⁹⁶	P-222-2C Speed	RPM
FE-7141	M-M6-J-0051 SH4 ⁵²	J-JZ-J-00485, SWPF FIC-7141 AFF Filter Recirc Pump 2C Flow Control ⁹⁷ J-JZ-J-00479, SWPF DI-7141 AFF Filter C Recirc Loop Density ⁹⁸ J-JZ-J-00494, SWPF TIC-7141 AFF Filter Recirc Pump 2C Temperature ⁹⁹	P-222-2C Discharge Flow / Density / Temperature	gpm / s.g. / °F
PIT-7146A	M-M6-J-0051 SH4 ⁵²	J-JZ-J-00491, SWPF PI-7146A AFF Filter Recirc Pump 2C Discharge Pressure ¹⁰⁰	P-222-2C Discharge Pressure / FLT-222C Inlet Pressure	psig
TE-7098A	M-M6-J-0051 SH4 ⁵²	J-JZ-J-01137, SWPF TI-7098A FLT-222C Loop Temperature ¹⁰¹	P-222-2C Discharge Temperature	°F
TE-7098B	M-M6-J-0051 SH4 ⁵²	J-JZ-J-01138, SWPF TI-7098B FLT-222C Loop Temperature ¹⁰²	P-222-2C Discharge Temperature	°F
HV-7089	M-M6-J-0051 SH4 ⁵²	N/A	Valve Position	C-A/C-B position
HV-7087	M-M6-J-0051 SH4 ⁵²	N/A	Valve Position	C-A/C-B position
HV-7088	M-M6-J-0051 SH4 ⁵²	N/A	Valve Position	C-A/C-B position

Table 5-4. System Monitoring Instrumentation (cont.)

Alpha Sorption Filter (FLT-222A) Instrumentation

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
HV-7107	M-M6-J-0052 ⁵³	N/A	Valve Position	C-A/C- B/Intermediate Off Position
PV-7106	M-M6-J-0052 ⁵³	N/A	Valve Position	0-100% Open
PIT-7106B	M-M6-J-0052 ⁵³	J-JZ-J-00513, SWPF PIC- 7106 AFF Filter A Retentate Outlet Pressure Control ¹⁰³	FLT-222A Outlet Pressure	psig
PDI-7106	M-M6-J-0052 ⁵³	J-JZ-J-00507, SWPF PDI- 7106 AFF Filter A Retentate dP ¹⁰⁴	FLT-222A dP	Pounds per square inch differential (psid)
PDI-7110	M-M6-J-0052 ⁵³	J-JZ-J-00504, SWPF PDI- 7110 AFF Filter A Transmembrane Pressure ¹⁰⁵	FLT-222A TMP	psid
HV-7102	M-M6-J-0052 ⁵³	N/A	Valve Position	Open/Closed
HV-7103	M-M6-J-0052 ⁵³	N/A	Valve Position	Open/Closed
PIT-7110	M-M6-J-0052 ⁵³	N/A	FLT-222A Filtrate Pressure	psig
FE-7105	M-M6-J-0052 ⁵³	J-JZ-J-00498, SWPF FIC- 7105 AFF Filter A DSS Filtrate Flow Control ¹⁰⁶ J-JZ-J-00501, SWPF FQI- 7105 AFF Filter A DSS Filtrate Flow Totalizer ¹⁰⁷	FLT-222A Filtrate Flow Rate / Totalized Quantity	gpm / gallons
AE-7109	M-M6-J-0052 ⁵³	J-JZ-J-00495, SWPF AI-7109 AFF Filter A DSS Filtrate Turbidity ¹⁰⁸	FLT-222A Filtrate Turbidity	Nephelometric Turbidity Unit (NTU)
FV-7105	M-M6-J-0052 ⁵³	N/A	Valve Position	0-100% Open
HV-7111	M-M6-J-0052 ⁵³	N/A	Valve Position	C-A/C- B/Intermediate Off Position
HV-7114	M-M6-J-0052 ⁵³	N/A	Valve Position	C-A/C-B position
TV-7101	M-M6-J-0175 ⁵⁹	N/A	Valve Position	0-100% open
HV-7104	M-M6-J-0175 ⁵⁹	N/A	Valve Position	Open/Closed
HV-7108	M-M6-J-0175 ⁵⁹	N/A	Valve Position	C-A/C-B position

Table 5-4. System Monitoring Instrumentation (cont.)

Alpha Sorption Filter (FLT-222B) Instrumentation

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
HV-7127	M-M6-J-0053 ⁵⁴	N/A	Valve Position	C-A/C- B/Intermediate Off Position
PV-7126	M-M6-J-0053 ⁵⁴	N/A	Valve Position	0-100% Open
PIT-7126B	M-M6-J-0053 ⁵⁴	J-JZ-J-00514, SWPF PIC- 7126 AFF Filter B Retentate Outlet Pressure Control ¹⁰⁹	FLT-222B Outlet Pressure	psig
PDI-7126	M-M6-J-0053 ⁵⁴	J-JZ-J-00508, SWPF PDI- 7126 AFF Filter B Retentate dP ¹¹⁰	FLT-222B dP	psid
PI-7130	M-M6-J-0053 ⁵⁴	N/A	FLT-222B TMP	psid
HV-7122	M-M6-J-0053 ⁵⁴	N/A	Valve Position	Open/Closed
HV-7123	M-M6-J-0053 ⁵⁴	N/A	Valve Position	Open/Closed
PIT-7130	M-M6-J-0053 ⁵⁴	J-JZ-J-00505, SWPF PDI- 7130 AFF Filter B Transmembrane Pressure ¹¹¹	FLT-222B Filtrate Pressure	psig
FE-7125	M-M6-J-0053 ⁵⁴	J-JZ-J-00499, SWPF FIC- 7125 AFF Filter B DSS Filtrate Flow Control ¹¹² J-JZ-J-00502, SWPF FQI- 7125 AFF Filter B DSS Filtrate Flow Totalizer ¹¹³	FLT-222B Filtrate Flow Rate / Totalized Quantity	gpm / gallons
AE-7129	M-M6-J-0053 ⁵⁴	J-JZ-J-00496, SWPF AI-7129 AFF Filter B DSS Filtrate Turbidity ¹¹⁴	FLT-222B Filtrate Turbidity	NTU
FV-7125	M-M6-J-0053 ⁵⁴	N/A	Valve Position	0-100% Open
HV-7131	M-M6-J-0053 ⁵⁴	N/A	Valve Position	C-A/C- B/Intermediate Off Position
HV-7132	M-M6-J-0053 ⁵⁴	N/A	Valve Position	C-A/C-B position
TV-7121	M-M6-J-0175 ⁵⁹	N/A	Valve Position	0-100% Open
HV-7112	M-M6-J-0175 ⁵⁹	N/A	Valve Position	Open/Closed
HV-7113	M-M6-J-0175 ⁵⁹	N/A	Valve Position	C-A/C-B position

Table 5-4. System Monitoring Instrumentation (cont.)

Alpha Sorption Filter (FLT-222C) Instrumentation

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
HV-7147	M-M6-J-0054 ⁵⁵	N/A	Valve Position	C-A/C- B/Intermediate Off Position
PV-7146	M-M6-J-0054 ⁵⁵	N/A	Valve Position	0-100% Open
PIT-7146B	M-M6-J-0054 ⁵⁵	J-JZ-J-00515, SWPF PIC- 7146 AFF Filter C Retentate Outlet Pressure Control ¹¹⁵	FLT-222C Outlet Pressure	psig
PDI-7146	M-M6-J-0054 ⁵⁵	J-JZ-J-00509, SWPF PDI- 7146 AFF Filter C Retentate dP ¹¹⁶	FLT-222C dP	psid
PDI-7150	M-M6-J-0054 ⁵⁵	J-JZ-J-00506, SWPF PDI- 7150 AFF Filter C Transmembrane Pressure ¹¹⁷	FLT-222C TMP	psid
HV-7142	M-M6-J-0054 ⁵⁵	N/A	Valve Position	Open/Closed
HV-7143	M-M6-J-0054 ⁵⁵	N/A	Valve Position	Open/Closed
PIT-7150	M-M6-J-0054 ⁵⁵	N/A	FLT-222C Filtrate Pressure	psig
FE-7145	M-M6-J-0054 ⁵⁵	J-JZ-J-00500, SWPF FIC- 7145 AFF Filter C DSS Filtrate Flow Control ¹¹⁸ J-JZ-J-00503, SWPF FQI- 7145 AFF Filter C DSS Filtrate Flow Totalizer ¹¹⁹	FLT-222C Filtrate Flow Rate / Totalized Quantity	gpm / gallons
AE-7149	M-M6-J-0054 ⁵⁵	J-JZ-J-00497, SWPF AI-7149 AFF Filter C DSS Filtrate Turbidity ¹²⁰	FLT-222C Filtrate Turbidity	NTU
FV-7145	M-M6-J-0054 ⁵⁵	N/A	Valve Position	0-100% Open
HV-7151	M-M6-J-0054 ⁵⁵	N/A	Valve Position	C-A/C- B/Intermediate Off Position
HV-7152	M-M6-J-0054 ⁵⁵	N/A	Valve Position	C-A/C-B position
TV-7141	M-M6-J-0176 ⁶⁰	N/A	Valve Position	0-100% Open
HV-7115	M-M6-J-0176 ⁶⁰	N/A	Valve Position	Open/Closed
HV-7116	M-M6-J-0176 ⁶⁰	N/A	Valve Position	C-A/C-B position
P-229	M-M6-J-0176 ⁶⁰	N/A	Pump Status	On/Off
SC-7117	M-M6-J-0176 ⁶⁰	J-JZ-J-01218, SWPF SIC- 7117 AFF Filter Loop Drain Pump Speed ¹²¹	P-229 Speed	RPM
PIT-2015	M-M6-J-0176 ⁶⁰	J-JZ-J-01181, SWPF PI-2015 AFF Filter Loop Drain Pump Disch Pressure ¹²²	P-229 Discharge Pressure	psig
FE-7119	M-M6-J-0176 ⁶⁰	J-JZ-J-00809, SWPF FI-7119 AFF Filter Loop Drain Flowrate ¹²³	P-229 Discharge Flow	gpm

Table 5-4. System Monitoring Instrumentation (cont.)

HV-7120	M-M6-J-017660	N/A	Valve Position	C-A/C-B/Intermediate Off Position
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Backpulse Charge Tank-B (TK-233) Instrumentation

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
PIT-5191	M-M6-J-0055 SH1 ⁵⁶	J-JZ-J-00516, SWPF PI-5191 AFF Back Pulse Charge Tank-B Pressure ¹²⁴	Backpulse Charge Tank-B (TK-233) Pressure	psig
YS-7178	M-M6-J-0055 SH1 ⁵⁶	N/A	PSE-7178 Burst Indication	Yes/No
KV-7175	M-M6-J-0055 SH1 ⁵⁶	N/A	Valve Position	Open/Closed
YS-7179	M-M6-J-0055 SH1 ⁵⁶	N/A	PSE-7179 Burst Indication	Yes/No
KV-7176	M-M6-J-0055 SH1 ⁵⁶	N/A	Valve Position	Open/Closed
YS-7180	M-M6-J-0055 SH1 ⁵⁶	N/A	PSE-7180 Burst Indication	Yes/No
KV-7177	M-M6-J-0055 SH1 ⁵⁶	N/A	Valve Position	Open/Closed

MSTT (TK-224) Instrumentation

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
HV-7195	M-M6-J-0056 SH1 ⁵⁷	N/A	Valve Position	C-A/C-B position
HV-7196	M-M6-J-0056 SH1 ⁵⁷	N/A	Valve Position	Open/Closed
LIT-7190	M-M6-J-0056 SH1 ⁵⁷	J-JZ-J-00067, SWPF LI-7190 MSTT Level ¹²⁵	MSTT (TK-224) Liquid Level	gallons
LIT-7206	M-M6-J-0056 SH1 ⁵⁷	J-JZ-J-00066, SWPF LI-7206 MSTT Level ¹²⁶	MSTT (TK-224) Liquid Level	gallons
DIT-7206	M-M6-J-0056 SH1 ⁵⁷	J-JZ-J-00519, SWPF DI- 7206 MSTT Density ¹²⁷	MSTT (TK-224) Liquid Density	s.g.
AGT-224	M-M6-J-0056 SH1 ⁵⁷	N/A	Agitator Status	Run/Off
SC-7189	M-M6-J-0056 SH1 ⁵⁷	J-JZ-J-00521, SWPF SIC- 7189 MSTT Agitator Speed ¹²⁸	Agitator Speed	RPM
JA-7189	M-M6-J-0056 SH1 ⁵⁷	N/A	Agitator Current	AMPs
TE-7193	M-M6-J-0056 SH1 ⁵⁷	J-JZ-J-00522, SWPF TIC- 7193 MSTT Temp ¹²⁹	MSTT (TK-224) Liquid Temperature	°F
TV-7193	M-M6-J-0056 SH1 ⁵⁷	N/A	Valve Position	0-100% Open

Table 5-4. System Monitoring Instrumentation (cont.)

MSTT Pump (P-224) Instrumentation

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
HV-7192	M-M6-J-0056 SH2 ⁵⁸	N/A	Valve Position	C-A/C-B/A-B position
P-224	M-M6-J-0056 SH2 ⁵⁸	N/A	Pump Status	Run/Off
PI-7208	M-M6-J-0056 SH2 ⁵⁸	J-JZ-J-01164, SWPF PI-7208 MST/Sludge Xfer Pump Discharge Pressure ¹³⁰	P-224 Discharge Pressure	psig
FE-7209	M-M6-J-0056 SH2 ⁵⁸	J-JZ-J-00523, SWPF FI-7209 MST/Sludge Xfer Pump Flow ¹³¹	P-224 Discharge Flow/Flow Totalized Quantity	gpm/gallons
HV-7204	M-M6-J-0056 SH2 ⁵⁸	N/A	Valve Position	C-A/C- B/Intermediate Off Position

5.3.5.2 Control Functions

See Table 5-5 for a listing of Control Loops.

Table 5-5. Control Loops

FFT-B (TK-222)

Loop Number	P&ID	Scale Sheet	Controlled Variable	Set Point
TIC-7060	M-M6-J-0051 SH1 ⁴⁹	J-JZ-J-00476 ⁷¹	FFT-B (TK-222) temperature	77°F

Alpha Sorption Filter (FLT-222A) Circuit

Loop Number	P&ID	Scale Sheet	Controlled Variable	Set Point
FIC-7081	M-M6-J-0051 SH2 ⁵⁰	J-JZ-J-00480 ⁷⁵	P-222-1A Pump flow rate	60 gpm
FIC-7101	M-M6-J-0051 SH2 ⁵⁰	J-JZ-J-00483 ⁷⁷	P-222-2A Pump flow rate	1,300 gpm
TIC-7101	M-M6-J-0051 SH2 ⁵⁰	J-JZ-J-00492 ⁷⁹	FLT-222A Loop Temperature	77°F
PDIC-7110	M-M6-J-0052 ⁵³	J-JZ-J-00504 ¹⁰⁵	FLT-222A TMP	Dependent on control method
FIC-7105	M-M6-J-0052 ⁵³	J-JZ-J-00498 ¹⁰⁶	FLT-222A Filtrate flow rate	Dependent on control method

Table 5-5. Control Loops (cont.)

Alpha Sorption Filter (FLT-222B) Circuit

Loop Number	P&ID	Scale Sheet	Controlled Variable	Set Point
FIC-7082	M-M6-J-0051 SH3 ⁵¹	J-JZ-J-00481 ⁸⁵	P-222-1B Pump flow rate	60 gpm
FIC-7121	M-M6-J-0051 SH3 ⁵¹	J-JZ-J-00484 ⁸⁷	P-222-2B Pump speed/Pump flow rate	1,300 gpm
TIC-7121	M-M6-J-0051 SH3 ⁵¹	J-JZ-J-00493 ⁸⁹	FLT-222B Loop Temperature	77°F
PDIC-7130	M-M6-J-0053 ⁵⁴	J-JZ-J-00505 ¹¹¹	FLT-222B TMP	Dependent on control method
FIC-7125	M-M6-J-0053 ⁵⁴	J-JZ-J-00499 ¹¹²	FLT-222B Filtrate flow rate	Dependent on control method

Alpha Sorption Filter (FLT-222C) Circuit

Loop Number	P&ID	Scale Sheet	Controlled Variable	Set Point
FIC-7083	M-M6-J-0051 SH4 ⁵²	J-JZ-J-00482 ⁹⁵	P-222-1C Pump flow rate	60 gpm
FIC-7141	M-M6-J-0051 SH4 ⁵²	J-JZ-J-00485 ⁹⁷	P-222-2C Pump flow rate	1,300 gpm
TIC-7141	M-M6-J-0051 SH4 ⁵²	J-JZ-J-00494 ⁹⁹	FLT-222C Loop Temperature	77°F
PDIC-7150	M-M6-J-0054 ⁵⁵	J-JZ-J-00506 ¹¹⁷	FLT-222C TMP	Dependent on control method
FIC-7145	M-M6-J-0054 ⁵⁵	J-JZ-J-00500 ¹¹⁸	FLT-102C Filtrate flow rate	Dependent on control method

MSTT (TK-224)

Loop Number	P&ID	Scale Sheet	Controlled Variable	Set Point
TIC-7193	M-M6-J-0056 SH1 ⁵⁷	J-JZ-J-00522 ¹²⁹	MSTT (TK-224) temperature	77°F

5.4 Operations

5.4.1 Initial Configuration

The FFT-B System is not used when operating in single-strike mode. When operating multi-strike mode, the FFT-B (TK-222) will be maintained at a minimal heel, and neither the Filter Feed/Solids Transfer Pump (P-222-1A/1B/1C) nor the Filter Recirculation Pump (P-222-2A/2B/2C) will be operating. The FFT-B System operation begins by aligning valves and pumping MST slurry from AST-B (TK-221) to FFT-B (TK-222). The FFT-B (TK-222) sequence will be initiated on completion of the transfer.

5.4.2 System Startup

Filtration may begin after the transfer from AST-B (TK-221) is complete. Agitator AGT-222 is started to mix the FFT-B (TK-222) contents and ensure that the solids are suspended. The Operator selects the two filters (FLT-222A/B/C) to be used and the mode of operation (either TMP or Filtrate Flow Control), and the circuit is switched into fully automatic control.

Initially, the filtrate is routed back to FFT-B (TK-222). When the filtrate discharge is within required turbidity parameters, filtrate discharge is re-routed from the FFT-B (TK-222) to the DSSHT (TK-207).

The two selected filters are then filled with MST slurry by operating the respective Filter Feed/Solids Transfer Pumps (P-222-1A/1B/1C) for a set time period before starting the Filter Recirculation Pumps (P-222-2A/2B/2C). The filtrate control valve is open during filling to permit circuit venting.

The Filter Recirculation Pumps (P-222-2A/2B/2C) for the two selected filters are started at low speed to establish recirculation before ramping up to full speed. The filtrate and slurry return valves are throttled to establish the pressure or flow set points. Chilled water is available to the filter recirculation coolers (HX-222A/B/C) to start removing pump heat from the system, if needed.

5.4.3 Normal Operations

1. Recirculation is maintained through two CFFs at a specific rate by controlling the speed of the Filter Recirculation Pump (P-222-2A/2B/2C) to maintain a tube velocity of 9 to 13 ft per second within the CFF bundle.
 2. During the TMP Control method of operation, the slurry return control valve and the Filter Feed/Solids Transfer Pump (P-222-1A/1B/1C) are operated to maintain the desired TMP and maintain flow into the filter loop. The Filter Recirculation Pump (P-222-2A/2B/2C) is controlled to maintain a constant flow rate (velocity) of feed through the filter tubes. No throttling is performed on the filtrate line, and the filtrate flow rate produced is variable.
 3. In the Filtrate Flow Control method of operation, the filter TMP varies as the circuit conditions change during MST slurry concentration. The filtrate flow control valve modulates its position to maintain a constant filtrate flow rate. The slurry return line control valve modulates during this mode, but should not completely close off the recirculation.
 4. During normal operation, each operating CFF can be backpulsed via the Finishing Area Backpulse Tank (TK-225A/B/C) to dislodge debris from the filter pores. When backpulsing is initiated, the filtrate flow is momentarily reversed back through the filter by opening an air valve connected to the pressurized Finishing Area Backpulse Tank (TK-225A/B/C). The filtrate control valve is closed for the duration of the backpulse. The pulse then takes place, after which the control valve reopens to its normal operating position.
 5. Backpulse cleaning is initiated as needed by the Operator.
-

6. When backpulsing fails to restore the filtrate flux rate, the filter must be chemically cleaned. The standby filter is placed into service and the affected filter loop is drained and pumped into FFT-B (TK-222), if the level permits, and isolated. The fouled filter is cleaned by the circulation of cleaning solutions through the filter, as described in Section 6.4.3.
7. As the MST slurry is concentrated, the level in FFT-B (TK-222) falls. At a predetermined level in the FFT-B (TK-222), dewatering is stopped by placing the filtration circuits on hold. This entails continuing to transfer slurry into and out of the filter loop, and recirculate MST slurry around the filter circuits, but with the filtrate control valves positioned so that no further concentration of the slurry can take place.
8. The next batch of MST slurry is transferred into FFT-B (TK-222) from AST-B (TK-221), complete with line flush. This is transferred on top of the batch already concentrated. The filter circuit is placed back on-line by positioning the filtrate control valves so that concentrating can continue. Dewatering then takes place until the level has fallen to the same level identified in Step 7 above. Although the final level in FFT-B (TK-222) is the same, the average concentration of wt% solids is now greater.
9. Upon receipt of the seventh batch to the FFT-B (TK-222), a sample is taken in order to determine the final dewatering endpoint.
10. When the MST slurry concentration approaches the pre-determined level for operation of a single filter, the BPCS places the filter circuit with the lowest filtrate flow rate on hold (the main circuit contents continue to recirculate, but with the filtrate discharge line isolated) and then shut down. The shutdown loop is allowed to drain back to the FFT-B (TK-222), and the volume that will not drain is pumped back to the FFT-B (TK-222) via AFP Filter Loop Drain Pump (P-229). When the FFT-B (TK-222) concentration endpoint is reached, the filter circuit is placed on hold and the dewatering is ceased. The circuit is then shut down and the contents are allowed to drain back to the FFT-B (TK-222). The remaining circuit volume is pumped back to the FFT-B (TK-222) via AFP Filter Loop Drain Pump (P-229).
11. The concentrated MST/sludge is then transferred from the FFT-B (TK-222) to the MSTT (TK-224), and then eventually to the SSRT (TK-104). One of three Filter Feed/Solids Transfer Pumps (P-222-1A/1B/1C) is used for transfer out of the FFT-B (TK-222).
12. During the FFT-B (TK-222) to MSTT (TK-224) transfer, the AST-B (TK-221) contents cannot be transferred to the FFT-B (TK-222).
13. On completion of the MST sludge transfer to the MSTT (TK-224), the line is flushed with DSS supplied from the DSSHT (TK-207).
14. After the line flush is complete, the next batch of MST slurry is transferred into the FFT-B (TK-222) and the seven-batch processing cycle is repeated.

The process sequences for the FFT-B system are included in Section 6.0 in [X-PCD-J-00003](#)³⁰. The process sequences for the MSTT system are included in Section 8.0 in [X-PCD-J-00003](#)³⁰.

5.4.4 Off-Normal and Recovery Operation

To prevent accumulation of solvent in the AFP, the FFT-B (TK-222) will be pumped down periodically, using the FFT-B Sample Pump (SP-222). Refer to Section 3.4.4 for details on solvent recovery.

See Table 5-6 for a listing of equipment and component failure.

Table 5-6. Equipment and Component Failure

FFT-B (TK-222) and Filter Circuit (FLT-222A/B/C) Failures

Condition	Detection	Immediate Action	Recovery
FFT-B (TK-222) TCV failure (TV-7060)	High Temperature Alarm or Low Temperature Notification	None	Tank cooling can be manually operated, using the TCV bypass valve until repairs are completed.
FFT-B Agitator motor failure (AGT-222)	Equipment fault.	None.	Replace the motor.
Filter Feed/Solids Transfer Pump failure (P-222-1A/1B/1C)	Low flow (FIC-7081/7082/7083)	Shut down filter circuit. Performs Aborting Logic for Running Sequence.	The alternate filter train can be used until repairs are completed. The failed pump and associated piping will be flushed and drained prior to maintenance/ replacement.
Filter Recirculation Pump failure (P-222-2A/2B/2C)	Low flow (FIC-7101/7121/7141)	Shut down filter circuit. Performs Aborting Logic for Running Sequence.	The alternate filter train can be used until repairs are completed. The failed pump and associated piping will be flushed and drained prior to maintenance/ replacement.
Filter Tube Plugged (FLT-222A/B/C)	High dP	None.	The alternate filter train can be used until repairs are completed. The filter train can be flushed/cleaned in an attempt to clear the clogged tubes.
Filter Tube Breakthrough (FLT-222A/B/C)	High turbidity (AE-7109 / 7129 / 7149)	Filter circuit aligns for hold processing	The alternate filter train can be used until repairs are completed. The filter train is flushed prior to removal.
Clogged filter tubes (FLT-222A/B/C)	Low Flow (FIC-7105/7125/7145)	None	Operator can initiate backpulse. If backpulsing fails, drain out/pump out filter loop when level in FFT-B (TK-222) allows, and initiate filter cleaning.
AFP Filter Loop Drain Pump Failure (P-229)	Low Flow (FI-7119)	None	Isolate filter circuit. Flush out piping and pump prior to maintenance/replacement.

Table 5-6. Equipment and Component Failure (cont.)

Condition	Detection	Immediate Action	Recovery
Valve Failure	Failure alarm in BPCS	Stop transfer, isolate system. Perform Aborting/ Stopping Logic for Running Sequence.	Flush out piping and pumps and investigate failure, prior to maintenance/replacement.
Low Plant Air Header Pressure	Pressure Indicator (PI-4435)	Perform Aborting/ Stopping Logic for Running Sequence.	Operator to investigate cause of problem.
Low Process Building Exhaust Fan dP	dP Indicator (PDI-4077)	Perform Aborting/ Stopping Logic for Running Sequence.	Operator to investigate cause of problem.

MSTT (TK-224) Failures

Condition	Detection	Immediate Action	Recovery
MSTT Agitator motor failure	Equipment fault.	None.	Replace the motor.
MST/Sludge Transfer Pump Failure (P-224)	Failure alarm in BPCS.	None	Flush and drain the pump and lines before repairing/replacing the pump.
Valve Failure	Failure alarm in BPCS	Stop transfer, isolate system. Performs Aborting Logic for Running Sequence.	Flush out piping and pumps and investigate failure prior to maintenance/replacement.
Low Plant Air Header Pressure	Pressure Indicator (PI-4435)	Perform Aborting/ Stopping Logic for Running Sequence.	Operator to investigate cause of problem.
Low Process Building Exhaust Fan dP	dP Indicator (PDI-4077)	Perform Aborting/ Stopping Logic for Running Sequence.	Operator to investigate cause of problem.

Other postulated off-normal events include pump failure, valve failure, agitator failure, and/or filter failure. Immediate action and recovery from the off-normal events are provided in Table 5-6. Each scenario starts with isolating the system and then flushing the piping, components, and equipment prior to maintenance or replacement. The transfer line can be flushed back to the tank (FFT-B [TK-222] or MSTT [TK-224]) and also downstream of the pump.

5.4.5 System Shutdown

Shutdown of the FFT-B System includes stopping pumps and closing valves. The tank (FFT-B [TK-222] or MSTT [TK-224]), pumps, and process lines are drained and flushed.

6.0 CSDT-B (TK-223)

6.1 System Functions

The function of the CSDT-B System is to isolate, clean, and restore normal operation of the AFP Alpha Sorption Filters (FLT-222A/B/C).

6.2 Operational Overview

The CSDT-B (TK-223) receives and store filter cleaning chemicals from the CCA. The cleaning solution is circulated through the filters, using the same two pumps (the Filter Feed/Solids Transfer Pumps [P-222-1A/1B/1C] and the Filter Recirculation Pumps [P-222-2A/2B/2C]) used for filtration. Spent cleaning solution is transferred out, using the Filter Feed/Solids Transfer Pumps (P-222-1A/1B/1C). Spent caustic is transferred to either the Alpha Sorption Drain Tank (ASDT) (TK-601) or the Spent Acid Storage Tank (SAST) (TK-127), and spent acid is transferred to the SAST (TK-127). Filter cleaning is expected to occur on the order of once every 28 batches (see [P-DB-J-00003](#)¹⁴).

6.3 Configuration Information

6.3.1 Description of System

Refer to P&IDs and PFDs listed in Table 6-1.

Table 6-1. P&IDs and PFDs

Diagram Number	Diagram Title
M-M5-J-0015	<i>SWPF Intermediate Storage Tank, Alpha Sorption Tank-B, Filter Feed Tank-B, and Cleaning Solution Dump Tank-B PFD (U)</i> ¹⁷
M-M6-J-0055 SH2	<i>SWPF Alpha Finishing Facility Cleaning Solution Dump Tank-B TK-223 P&ID (U)</i> ¹³²

6.3.2 Major Components

See Table 6-2 for a list of major components.

Table 6-2. Major Components

Component	Description
CSDT-B (TK-223)	Capacity: 1,000 gallons (see M-CLC-J-00054, SWPF Cleaning Solution Dump Tank B Sizing Calculation, TK-223 ¹³³) Dimensions: 5 ft (diameter) × 7 ft-3 inch (T/T) (see M-CLC-J-00054 ¹³³) Design Features: <ul style="list-style-type: none"> • Stainless Steel Pressure Vessel; • Active air purge; • Dipped overflow; • Connected to the AFF PVVS; and • In-tank flush ring to spray down tank walls.
CSDT-B Siphon Break (SB-223)	Siphon Break used to provide a positive break between CCA and the AFF.

6.3.3 Stream Data

See Table 6-3 for a listing of Streams.

Table 6-3. Streams

Stream	Description
Filter Cleaning Caustic	Description Dilute caustic used to rinse out filter loops Properties 1.00 s.g. (M-CLC-J-00143 ²²) 1.0M NaOH (M-CLC-J-00143 ²²)
Filter Cleaning Acid	Description Nitric acid (HNO ₃) used to clean the filter circuits Properties 1.12 s.g. 20 wt% HNO ₃

6.3.4 Physical Location and Layout

The CSDT-B (TK-223) and associated equipment are located in the DSSHT/FFT-B Diked Area in the AFF.

6.3.5 System Control Features

6.3.5.1 System Monitoring

The CSDT-B System has instrumentation to monitor the status of the system and initiate corrective actions, if necessary.

- The CSDT-B (TK-223) level will be continuously monitored with the use of a bubbler and radio frequency instrument.

- Instrumentation is provided inside the CSDT-B (TK-223) to measure and continuously monitor temperature.

See Table 6-4 for a listing of System Monitoring Instrumentation.

Table 6-4. System Monitoring Instrumentation

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
LIT-7165	M-M6-J-0055 SH2 ¹³²	J-JZ-J-00065, SWPF LI-7165 CSDT-B Level ¹³⁴	CSDT-B (TK-223) Liquid Level	gallons
LIT-7164	M-M6-J-0055 SH2 ¹³²	J-JZ-J-00064, SWPF LI-7164 CSDT-B Level ¹³⁵	CSDT-B (TK-223) Liquid Level	gallons
DIT-7164	M-M6-J-0055 SH2 ¹³²	J-JZ-J-00517, SWPF DI-7164 CSDT-B Density ¹³⁶	CSDT-B (TK-223) Liquid Density	s.g.
TE-7166	M-M6-J-0055 SH2 ¹³²	J-JZ-J-00518, SWPF TI-7166 CSDT-B Temp ¹³⁷	CSDT-B (TK-223) Liquid Temperature	°F
HV-7167	M-M6-J-0055 SH2 ¹³²	N/A	Valve Position	Open/Closed
HV-7169	M-M6-J-0055 SH2 ¹³²	N/A	Valve Position	Open/Closed
HV-7171	M-M6-J-0055 SH2 ¹³²	N/A	Valve Position	Open/Closed

6.3.5.2 Control Functions

There are no control functions for this system.

6.4 Operations

6.4.1 Initial Configuration

Initially, the CSDT-B (TK-223) will be empty or contain a minimal heel, and the transfer pumps (P-222-1A/1B/1C) will not be operating. Filter cleaning startup begins by changing the position of valves and transferring cleaning chemicals from the CCA.

6.4.2 System Startup

The appropriate chemical is transferred to the CSDT-B (TK-223) by opening the appropriate supply valve and starting the chemical supply pump (P-106 or P-107).

The Alpha Sorption Filters (FLT-222A/B/C) shell and the Finishing Area Backpulse Tanks (TK-225A/B/C) contents are drained to the Alpha Finishing Drain Tank (AFDT) (TK-228). The appropriate chemical is transferred to CSDT-B (TK-223) by opening the appropriate supply valve and starting the chemical supply pump (P-106 or P-107). After the CSDT-B (TK-223) has been filled, the CSDT-B (TK-223) is lined up to the filter circuit to be cleaned.

6.4.3 Normal Operations

1. When the quantity of cleaning chemical has been transferred to the CSDT-B (TK-223), the chemical supply pump (P-106 or P-107) is stopped and the respective supply valve is closed.
2. After the CSDT-B (TK-223) has been filled, the tank is lined up to the filter circuit to be cleaned.
3. The filter circuit is filled by aligning the pump suction and discharge valves for recirculation and operating the respective Filter Feed/Solids Transfer Pump (P-222-1A/1B/1C). The pump is operated for a set time period before starting the Filter Recirculation Pump (P-222-2A/2B/2C). The filtrate control valve is open during filling to permit circuit venting.
4. Once the filter circuit is filled, the respective Filter Recirculation Pump (P-222-2A/2B/2C) is started and ramped up to a pre-determined speed to achieve the required circulating flow. The chemical is recirculated for a set period of time.
5. Filtrate (chemical reagent) discharge from the Finishing Area Backpulse Tanks (TK-225A/B/C) is recirculated to the CSDT-B (TK-223) by appropriate alignment of valves.
6. Backpulsing of the CFF undergoing cleaning is controlled by the Operator.
7. The CSDT-B (TK-223) is equipped with level control to ensure the level in the tank stays at a minimum level during cleaning. If the level drops below a pre-set point, additional cleaning chemicals are added from the CCA.

When the chemical cleaning period is complete, the pumps (P-222-1A/1B/1C and P-222-2A/2B/2C) are stopped and the filter circuit is pumped back to the CSDT-B (TK-223) via pump P-229. The Finishing Area Backpulse Tanks (TK-225A/B/C) and filter shell are drained to the CSDT-B (TK-223). The CSDT-B (TK-223) contents are pumped to either the ASDT (TK-601) (pre-acid caustic rinse) or SAST (TK-127) (acid and post-wash caustic).

The process sequences for the CSDT-B system are included in Section 7.0 in [X-PCD-J-00003](#)³⁰.

6.4.4 Off-Normal and Recovery Operation

See Table 5-6-5 for a listing of equipment and component failure.

Table 6-5. Failures/Malfunctions

Condition	Detection	Immediate Action	Recovery
CSDT-B (TK-223) High Level	Level Indicators (LI-7164 and LI-7165)	Stop all inputs into CSDT-B (TK-223). Performs Aborting Logic for Running Sequence.	Use P-222-1A/B/C to reduce level.
Low Plant Air Header Pressure	Pressure Indicator (PI-4435)	Perform Aborting/Stopping Logic for Running Sequence.	Operator to investigate cause of problem.
Low Process Building Exhaust Fan dP	dP Indicator (PDI-4077)	Perform Aborting/Stopping Logic for Running Sequence.	Operator to investigate cause of problem.

6.4.5 System Shutdown

Shutdown of the CSDT-B system includes stopping pumps and operating equipment. The CSDT-B (TK-223), pumps, and process lines are drained and flushed and isolation valves are closed.

7.0 DSSHT (TK-207)

7.1 System Functions

The DSSHT System:

- Receives and stores DSS,
- Transfers DSS to TK-50, and
- Sufficiently mix contents (see [P-SPC-J-00002](#)³²).

7.2 Operational Overview

The DSSHT (TK-207) collects and stores DSS solution from both the Alpha Strike Process and the AFP. Pumps P-207A/B transfer DSS from the DSSHT (TK-207) to TK-50 at a controlled rate and pressure. If sampling analysis shows the contents of DSSHT (TK-207) to be outside acceptable limits, the DSS can be recycled to the Salt Solution Feed Tank (TK-109) for reprocessing. Other flow paths of the pumps (P-207A/B) include recirculation for mixing via the mixing eductors, to pump P-109A/B for contactor startup, to the IST (TK-220) and/or AST-B (TK-221) for further processing, and to the AFF Flush Header to decontaminate equipment in the AFP.

7.3 Configuration Information

7.3.1 Description of System

Refer to P&IDs and PFDs listed in Table 7-1.

Table 7-1. P&IDs and PFDs

Diagram Number	Diagram Title
M-M5-J-0009	<i>SWPF DSS Coalescer, DSS Hold Tank and Transfer Pumps PFD (U)</i> ¹³⁸
M-M6-J-0004	<i>SWPF LLW Transfer System Process Facility To DSS Tie-in Valve Enclosure P&ID (U)</i> ¹³⁹
M-M6-J-0048 SH1	<i>SWPF Alpha Finishing Facility DSS Hold Tank TK-207 P&ID (U)</i> ¹⁴⁰
M-M6-J-0048 SH2	<i>SWPF Alpha Finishing Facility DSS Hold Tank Transfer Pumps P-207A/B P&ID (U)</i> ¹⁴¹

7.3.2 Major Components

See Table 7-2 for a list of major components.

Table 7-2. Major Components

Component	Description
DSSHT (TK-207)	<p>Capacity: 43, 600 gallons (see M-CLC-J-00025, <i>SWPF DSS Hold Tank Sizing Calculation, TK-207¹⁴²</i>)</p> <p>Dimensions: 19 ft (diameter) x 19 ft-8 inch (T/T) (see M-CLC-J-00025¹⁴²)</p> <p>Design Features:</p> <ul style="list-style-type: none"> • Stainless Steel Pressure Vessel; • Active air purge; • Mixing capability; • Dipped overflow; • Connected to the AFF PVVS; and • In-tank flush ring to spray down tank walls.
DSSHT Transfer Pumps (P-207A/B)	<p>Centrifugal pumps with VFDs used to transfer DSS to TK-50.</p> <p>Capacity: 400 gpm (see M-CLC-J-00014, <i>SWPF DSS Hold Tank Transfer Pumps Sizing Calculation, P-207A/B¹⁴³</i>).</p> <p>hp: 40</p>

7.3.3 Stream Data

See Table 7-3 for a listing of Streams.

Table 7-3. Streams

Stream	Description
DSS	<p>In single strike mode, DSS is the aqueous raffinate from the CSSX extraction stages with an Sr/actinide concentration that is within the SPF WAC. It is transferred to the DSSHT (TK-207) through the IST (TK-220) or AST-B (TK-221).</p> <p>In multi-strike mode, DSS is the filtrate produced from the Alpha Sorption Filters (FLT-222A/B/C). The DSS is transferred from the filters to the DSSHT (TK-207)</p> <p>Properties 1.24 s.g. (M-CLC-J-00143²²) 5.24M Na⁺ concentration (M-CLC-J-00143²²)</p>

7.3.4 Physical Location and Layout

The DSSHT System is housed in the FFT-B/DSSHT Diked Area in the AFF.

7.3.5 System Control Features

7.3.5.1 System Monitoring

The DSSHT System normally operates with minimal Operator intervention. Instrumentation is provided to monitor the status of the system and initiate corrective actions, if necessary. Remote alarm indications are provided to the BPCS.

- Redundant bubblers are installed to continuously monitor the DSSHT (TK-207) level.
- Instrumentation is provided on the discharge of the DSSHT Transfer Pumps (P-207A/B) to measure and control pump flow rate and pressure.
- Instrumentation is provided to measure and continuously monitor the DSSHT (TK-207) temperature.

See Table 7-4 for a listing of System Monitoring Instrumentation.

Table 7-4. System Monitoring Instrumentation

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
LIT-2203	M-M6-J-0048 SH1 ¹⁴⁰	J-JZ-J-0027, SWPF LI-2203 DSSHT Level ¹⁴⁴	DSSHT (TK-207) Liquid Level	gallons
LIT-2206	M-M6-J-0048 SH1 ¹⁴⁰	J-JZ-J-0028, SWPF LI-2206 DSSHT Level ¹⁴⁵	DSSHT (TK-207) Liquid Level	gallons
DIT-2203	M-M6-J-0048 SH1 ¹⁴⁰	J-JZ-J-00461, SWPF DI-2203 DSSHT Density ¹⁴⁶	DSSHT (TK-207) Liquid Density	s.g.
DIT-2206	M-M6-J-0048 SH1 ¹⁴⁰	J-JZ-J-01160, SWPF DI-2206 DSSHT Density ¹⁴⁷	DSSHT (TK-207) Liquid Density	s.g.
TE-2207	M-M6-J-0048 SH1 ¹⁴⁰	J-JZ-J-00462, SWPF TI-2207 DSSHT Temp ¹⁴⁸	DSSHT (TK-207) Liquid Temperature	°F
HV-2198	M-M6-J-0048 SH1 ¹⁴⁰	N/A	Valve Position	Open/Closed
HV-2225	M-M6-J-0048 SH2 ¹⁴¹	N/A	Valve Position	Open/Closed
P-207A	M-M6-J-0048 SH2 ¹⁴¹	N/A	Pump Status	Run/Off
P-207B	M-M6-J-0048 SH2 ¹⁴¹	N/A	Pump Status	Run/Off
SC-2227A	M-M6-J-0048 SH2 ¹⁴¹	J-JZ-J-01123, SWPF SIC-2227A DSSHT Xfer Pump A Speed ¹⁴⁹	P-207A Speed	RPM
SC-2227B	M-M6-J-0048 SH2 ¹⁴¹	J-JZ-J-01124, SWPF SIC-2227B DSSHT Xfer Pump B Speed ¹⁵⁰	P-207B Speed	RPM
PIT-2219	M-M6-J-0048 SH2 ¹⁴¹	J-JZ-J-00464, SWPF PI-2219 DSSHT Xfer Pump A/B Discharge Pressure ¹⁵¹	P-207A/B Discharge Pressure	psig

Table 7-4. System Monitoring Instrumentation (cont.)

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
FE-2227	M-M6-J-0048 SH2 ¹⁴¹	J-JZ-J-00463, SWPF FI-2227 DSSHT Xfer Pump A/B Flow ¹⁵²	P-207A/B Discharge Flow Rate/ Totalized Quantity	gpm/gallons
HV-2231	M-M6-J-0048 SH2 ¹⁴¹	N/A	Valve Position	Open/Closed
HV-2228	M-M6-J-0048 SH2 ¹⁴¹	N/A	Valve Position	C-A/ C-B/Intermediate Off Position
FV-2229	M-M6-J-0048 SH2 ¹⁴¹	N/A	Valve Position	Open/Closed
PV-1002	M-M6-J-0004 ¹³⁹	N/A	Valve Position	0-100% Open
HV-1001	M-M6-J-0004 ¹³⁹	N/A	Valve Position	Open/Closed
PIT-1002	M-M6-J-0004 ¹³⁹	J-JZ-J-00103, SWPF PIC-1002 DSS Xfer Line Pressure to Saltstone ¹⁵³	Discharge to TK-50 Pressure	psig

7.3.5.2 Control Functions

See Table 7-5 for a listing of Control Loops.

Table 7-5. Control Loops

Loop Number	P&ID	Scale Sheet	Controlled Variable	Set Point
PIC-1002	M-M6-J-0004 ¹³⁹	J-JZ-J-00103 ¹⁵³	Pressure to TK-50	150 psig maximum
FIC-2227A	M-M6-J-0048 SH2 ¹⁴¹	J-JZ-J-00463 ¹⁵²	P-207A pump flow rate	Dependent on destination
FIC-2227B	M-M6-J-0048 SH2 ¹⁴¹	J-JZ-J-00463 ¹⁵²	P-207B pump flow rate	Dependent on destination

7.4 Operations

7.4.1 Initial Configuration

The DSSHT (TK-207) is initially empty with the transfer pumps (P-207A/B) shut down.

7.4.2 System Startup

The DSSHT system begins by aligning and/or opening valves to allow DSS to flow to into the DSSHT (TK-207).

7.4.3 Normal Operations

1. For single-strike mode, either pumps P-220A/B or pumps P-221A/B are aligned to pump to the DSSHT (TK-207). In multi-strike mode, the system is started by changing position of valves, allowing DSS filtrate to flow from filter FLT-222A/B/C to the DSSHT (TK-207).
2. At a pre-determined level in the DSSHT (TK-207), pump P-207A or P-207B is started to recirculate back to eductor EDT-207 inside the DSSHT (TK-207) to provide mixing of the tank contents. If required, the DSSHT (TK-207) contents can be sampled and analyzed.
3. When the DSSHT (TK-207) reaches a preset level, the Operator requests to transfer the tank contents to TK-50.
4. When the transfer is authorized, the transfer route valves are aligned and the pump (P-207A/B) is started. The pumps are variable speed and are controlled at 100 to 150 gpm to transfer to TK-50.
5. After the predetermined volume has been transferred, or the predetermined level has been reached in DSSHT (TK-207), the operating pump (P-207A/B) is shut down.

The process sequences for the DSSHT system are included in Section 9.0 in [X-PCD-J-00003](#)³⁰.

7.4.4 Off-Normal and Recovery Operation

To prevent the accumulation of solvent in the AFP, the DSSHT (TK-207) will be periodically pumped down using the DSSHT Sample Pump (SP-207). See Section 3.4.4 for details on solvent recovery.

See Table 7-6 for a listing of equipment and component failure.

Table 7-6. Equipment and Component Failure

Condition	Detection	Immediate Action	Recovery
DSSHT Transfer Pump failure (P-207A/B)	Failure alarm in BPCS.	Performs Aborting Logic for Running Sequence.	The alternate duty pump can be used until repairs are completed. The failed pump and associated piping will be flushed and drained prior to maintenance/ replacement.
Valve Failure	Failure Alarm in BPCS	Shut down P-207A/B. Performs Aborting Logic for Running Sequence.	Flush out piping and pumps and investigate failure prior to maintenance/replacement.
Low Plant Air Header Pressure	Pressure Indicator (PI-4435)	Perform Aborting/Stopping Logic for Running Sequence.	Operator to investigate cause of problem.
Low Process Building Exhaust Fan dP	dP Indicator (PDI-4077)	Perform Aborting/Stopping Logic for Running Sequence.	Operator to investigate cause of problem.

Other postulated off-normal events include pump failure and/or valve failure. Immediate action and recovery from the off-normal events are provided in Table 7-6. Each scenario starts with isolating the system and then flushing the piping, components, and equipment prior to maintenance or replacement. The transfer line can be flushed back to the DSSHT (TK-207) and also downstream of the pump (P-207A/B).

7.4.5 System Shutdown

Shutdown of the DSSHT system includes stopping pumps and closing valves. The DSSHT (TK-207), pumps, and process lines are drained and flushed.

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