Solids Handling & Belt Filter Press Upgrades 2020 - 2023

This document is meant to inform and educate Plant Operators & Operations Supervisors on the wide range of changes, upgrades, & repairs made by the Controls and Data Comm section here at Water Reclamation. Going forward, the primary focus of this content is based on the SCADA screens that are located in the SDB/SH Operator office on the 5th floor of the SDB Building and the local SCADA screens associated with each Belt Filter Press that was re-built mechanically by Alfa Laval in 2021-22.

These changes & upgrades began with the SDB 3rd floor polymer delivery system, primarily with the automated filling of the belt filter press day tank. These upgrades and improvements continue to the present, with a focus on completing the automation of sludge & polymer to Belt Filter Presses 2, 4, & 6.

This is an open document. Additions, changes, and corrections are encouraged.

In detail, the following items, processes, & systems have been accomplished:

SDB 3rd floor polymer delivery system – BFP polymer day tank automation, BFP polymer storage tank level & volume indications.

New PLCs, SCADA computers & screens, Wonderware InTouch upgrade, data communications, network cameras, and distributed data throughput to other SCADA applications for the newly re-built Belt Filter Presses 2, 4, & 6

SCADA application improvements to various screens in the Solids Handling application.

Upgraded / replaced antiquated DC variable speed drives on belt filter press Sludge Pumps 1, 2, 4, & 6. Did the same for the obsolete belt filter press Polymer Pumps 4 & 6 (Polymer Drive #2 is pending). Also, the old Reliance DC belt drives were replaced with new Allen-Bradley PowerFlex AC drives. This is important because viable DC drive electronics are no longer being manufactured. This upgrade from older DC drives to newer AC drives was long overdue.

Note: Going forward, we realize that there are still some legacy issues with these changes and improvements. We are having minor issues getting the new PLCs in the Belt Filter Press control panels on the 5th floor to communicate without error to the old & antiquated PLC 5s that control start & stop functions for the Belt Filter Press sludge pumps & polymer pumps.... This issues will be resolved.



BELT FILTER PRESS 6 OVERVIEW - BFP 6 LOCAL CONTROL PANEL 5th FLOOR

This is the main Operator screen at the Belt Filter Press control panel. All readings, settings, and status are viewable on this screen. New SCADA computers, software & panel screens were provided on the Belt Filter Press upgrade project (2021 to 2022).

We took the original SCADA screens from Wonderware InTouch application that ran under Windows 3.1 / 95 and added several upgrades and enhancements to improve operational procedures.

There are discrete indications for various "**running**" conditions. **Hand / Remote** indications are shown in both graphic and text format. There are discrete indications for various "**alarms**". Most of these alarms appear in the upper left-hand corner. They include:

B Conveyor Not Running | B Conveyor Fault | B Conveyor Alarm

E-Stop | Belt Mis-Alignment | Cake Fault | Belt Broken | Sludge Feedbox Hi Level

The graphic pushbuttons for "Primary Sequential" will start the Washwater Booster Pump, Hydraulic Pump and Filter Press Belt Drive (assuming that there are no active alarms). The "Secondary Sequential" pushbutton will start the associated sludge & polymer pumps on the 3rd Floor of SDB.

Overview screens for Belt Filter Presses 2 & 4 are similar.



BELT FILTER PRESS 4 OVERVIEW - BFP 4 LOCAL CONTROL PANEL 5th FLOOR

This is the main Operator screen at the Belt Filter Press control panel number 4. All readings, settings, and status are viewable on this screen. A new SCADA computer, software & panel screen were provided on the Belt Filter Press upgrade project (2021 to 2022).

Again, there are discrete indications for various "**running**" conditions. **Hand / Remote** indications are shown in both graphic and text format. There are discrete indications for various "**alarms**". Most of these alarms appear in the upper left-hand corner. They include:

	B Conveyor Not Running B Conveyor Fault B Conveyor Alarm							or Alarm
E-Stop	Ι	Belt Mis-Alignment	Ι	Cake Fault	Ι	Belt Broken	I	Sludge Feedbox Hi Level



SDB Page 17, BELT FILTER PRESS 6 OVERVIEW - 5th FLOOR

Modeled to resemble the main Operator screen at the Belt Filter Press control panel, this page carries a wide assorted of data related to the belt filter press dewatering process.

There are discrete indications for various "running" conditions. Hand / Remote indications are shown in both graphic and text format. There are discrete indications for various "alarms". Most of these alarms appear in the upper left-hand corner. They include:

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B Conveyor Not Running | B Conveyor Fault | B Conveyor Alarm
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E-Stop | Belt Mis-Alignment | Cake Fault | Belt Broken | Sludge Feedbox Hi Level

Currently, there is no plan in place for control from this SCADA page. However, this could change as the process expands.

Pages dedicated to Belt Filter Presses 2 & 4 are similar. They are listed in the SCADA as:

SDB Page 15, BELT FILTER PRESS 2 OVERVIEW - 5th FLOOR

SDB Page 16, BELT FILTER PRESS 4 OVERVIEW - 5th FLOOR



SDB Page 9, Polymer System Overview

Real-time status of the Belt Filter Press Polymer System on the third floor. This includes:

24 hour real-time trend chart that tracks the polymer transfer & mixing pump and the level of the polymer day tank.

Graphics of the six polymer pumps and the level of the BFP polymer storage tank.

Alarm banners will appear for various issues with the polymer system on the third floor, including:

"High Level" and "Low Level" in the BFP polymer day tank; "Low Water Pressure" for the mixing pump

And, an indication for "Level System Loss of Echo" which signifies an issue with the ultrasonic level system.

History: We replaced the original capacitance level probes in the BFP polymer day tank a few years back because of several successive control failures that left the third floor of the SDB covered with polymer. After several failures and the lack of any progress in solving this issue, we stepped in to take over and implement a permanent solution. The expanded SCADA status that was accomplished was an added plus.



SDB Page 9, Polymer System Overview – ALL STATUS SHOWN

Alarm banners for various issues with the polymer system on the third floor:

"High Level" and "Low Level" in the BFP polymer day tank;

"Low Water Pressure" for the mixing pump

"Level System Loss of Echo" which signifies an issue with the ultrasonic level system.

In addition to the SCADA mentioned above, we also added the "RUNNING" status of the BFP polymer solution & mixing pump. This had never been included in the SCADA system for some unknown reason.



SDB Page 10, SDB BUILDING 3RD FLOOR

Indications for all belt filter press operational equipment on the 3rd floor of the SDB Building.

Discrete indications for "pumps running". Hand / Remote banner tags for process related equipment.

Analog indications for various speed settings, well levels, tank levels, and flows. Also has a 12 hour realtime trend for "Storage Tank 7 Level"

	PROGRAM BFP SPEED REPORT								
	ON Actual Speed / Reference Values in the Field OFF (Not PLC Speed Setpoints) NOTE: 0 to 60 Hz equates to 0 to 100% speed								
E	3ELT FILTER PRESS #1 Belt Speed 25 % Sludge Pump Speed 60 Hz Polymer Pump Speed 0 % Sludge Pump RPMs 640								
E	3ELT FILTER PRESS #2 Belt Speed 0 Hz Sludge Pump Speed 0 Hz Polymer Pump Speed 0 % Washwater System Pressure 0 PSI Sludge Pump RPMs 0								
E	Sludge Pump Speed 0 % Polymer Pump Speed 0 % Polymer Pump Speed 0 %								
E	BELT FILTER PRESS #4 Belt Speed 43 Hz Sludge Pump Speed 0 Hz Polymer Pump Speed 13 Hz Washwater System Pressure 0 PSI Sludge Pump RPMs 0 Polymer Pump RPMs 248								
E	Sludge Pump Speed 18 % Polymer Pump Speed 0 %								
E	3ELT FILTER PRESS # 6 Belt Speed 60 Hz Sludge Pump Speed 45 Hz Polymer Pump Speed 9 Hz Washwater System Pressure								
	DIGESTER 7 LEVEL 10.63 ft. BFP WELL LEVELS 4.51 ft. 4.84 ft. POLYMER DAY TANK LEVEL 26 IN								
Page Back	Page Select Page A 04/25 16:17:05 ACK DIGESTER WATER RECIRCULATION PUMP SHDI_WATERRECIR ON Forward Return Page V 04/25 16:17:05 ACK DIGESTER TANK 3 MIXER 3C HIGH TORQUE SHDI_MIXR3CFALT ON 04/25 16:17:05 ACK DIGESTER TANK 3 MIXER 3C HIGH TORQUE SHDI_MIXR3CFALT ON								

SDB Page 8, Belt Filter Press Speed Report

Indication boxes display actual speed values from the various process equipment. These include:

Belt Filter Press Drive Belt speed in hertz for rebuilt presses 2, 4, 6. Values for the older presses do not work.

BFP Sludge Pump speed in hertz for the converted VFD & Seepex pump combinations on the third floor. Pumps 1, 2, 4, & 6. Also included is a reading for approx. RPMs. Values for Sludge Pumps 3 and 5 are in percentage of current (these are still the old DC drives).

The newly converted BFP Polymer Pumps 4 & 6 speed in hertz. These too include a reading for RPMs.

The "GREEN" and "WHITE" indications are for running / not running status.



SDB Page 11, BELT FILTER PRESS OVERVIEW

Pop-up banner indications for **CONVEYOR FAULTS** are now more pronounced. The intent is to grab the Operator's immediate attention. Previously, these alarms were only visible on SCADA page #18.





SH Page 9, STORAGE AND EQUALIZATION TANKS (DIGESTERS 7 & 8)

First off, the real-time trend levels for each tank (Storage Tank 7 - Equalize Tank 8) were added several years ago. More recently, which of the "in service" digesters is being fed was added (highlighted above in yellow). Just above that indication, WAIT TIME and WAIT TIME SELECTED indications were included.

Also of note: full length indications were implemented for Auto, Man, & Hand - instead of the A, M, & H designations that had been used for many years. This full length indication was completed for the entire Solids Handling / SDB SCADA application.



SH Page 16, DIGESTERS #5 AND #6

Indication for **FEEDING** status to the digester was added to all (Digesters 2, 3, 4, 5, & 6). Operator selected **FEED TIME SETTING** and **FEED TIME ACCUM** indications were also included on all digester SCADA pages. *See screenshot above – items are highlighted in yellow*.

Here too, you'll see full length indications for Auto, Man, & Hand.



SH Page 14, PLANT FLOW OVERVIEW

This customized page was added recently. It is tailored towards the various processes in the Solids Handing & SDB areas of the Bay View Wastewater Treatment Plant.

This SCADA page is based on similar pages found in the other Wonderware InTouch applications in use at this Division. It is for reference only, no control is enabled from this page.



The new Belt Filter Press Control Cabinets for BFPs 2, 4, & 6 - 5th Floor of SDB New Allen-Bradley MicroLogix PLCs, SCADA Computers, & AC VFDs for BFP Belt Drives New Hoffman Mouse & Keyboard enclosure New Overhead Conduits & Control Wiring.



The new BFP Sludge Pump (one of four) - 3rd Floor of SDB

New AC inverter duty motor | New Allen-Bradley PowerFlex 525 AC variable speed drive Belt Filter Press Sludge Pumps 1, 2, 4, & 6 New Seepex Pump



The new Polymer Pump #4 - 3rd Floor of SDB

New AC inverter duty motor | New Allen-Bradley PowerFlex 525 AC variable speed drive Similar to the new Polymer Pump #6