



NAVIGATING SCADA FROM DESIGN TO STARTUP CASE STUDY OF THE METROPOLITAN DISTRICT WET WEATHER EXPANSION PROJECT SCADA IMPLEMENTATION

RYAN KOWALSKI, PE, ARCADIS SCOTT LAROSE, MDC

NEWEA Conference

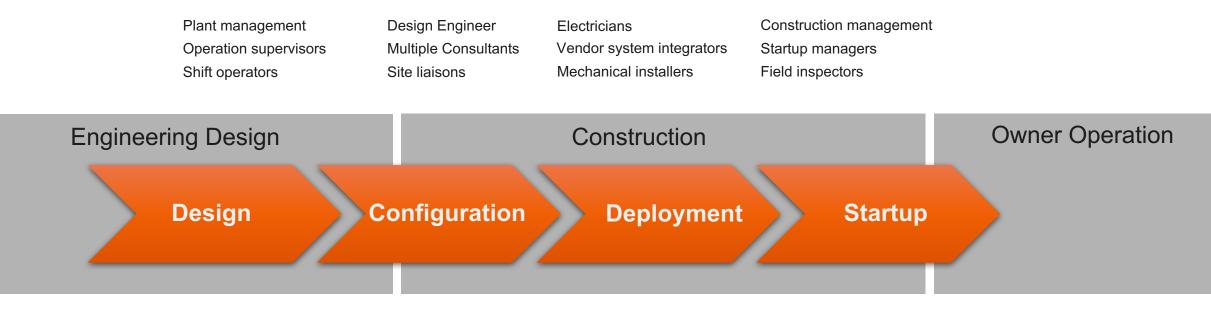
January 24, 2018





SCADA Continuum

Life-cycle of project process control system/SCADA implementation



Planning for successful startup begins during design.

Agenda

- 1. Overview of Project
- 2. SCADA Design Standardization
- 3. SCADA Configuration & Deployment
- 4. SCADA Startup and Commissioning
- 5. Conclusions



Project Overview

3 10004

A DESIGN

3 million

0.0-

100



Hartford Water Pollution Control Facility

Wet Weather Expansion Project - Overview

Contract 20

Preliminary Treatment

- Coarse and fine screens
- 210 mgd Influent pump station
- Screenings handling facilities
- Grit dewatering facilities
- Septage receiving station
- Biofilters for odor control
- Standby generators



Hartford Water Pollution Control Facility

Wet Weather Expansion Project - Overview

Clarifiers, wet weather facilities, effluent pump station

- Dual-use primary clarifiers
- Chemically Enhanced Primary Treatment (CEPT)
- Wet weather disinfection tank
- New effluent pump station

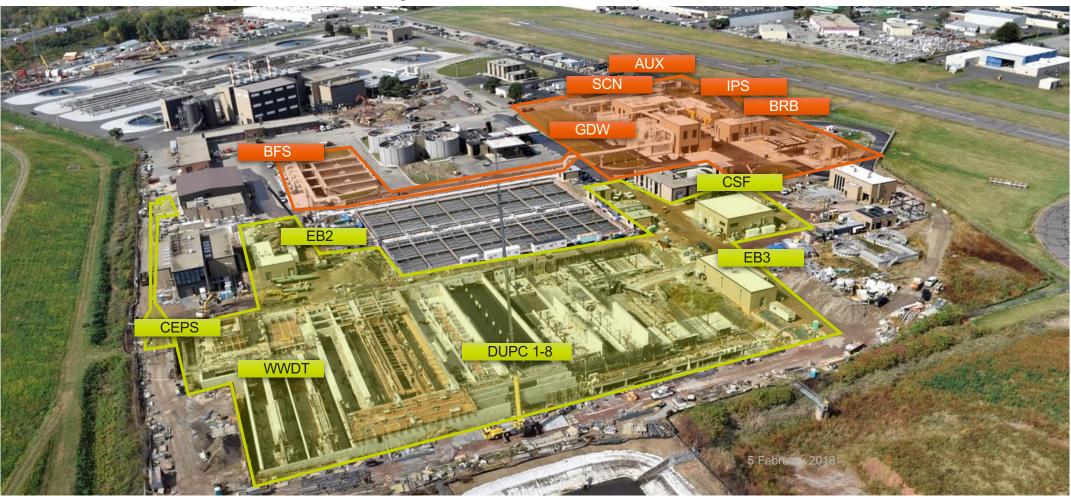
Contract 21

© Arcadis 2017



SCADA Overview

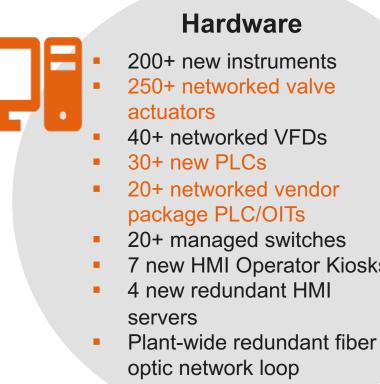
Wet Weather Expansion Project - SCADA Implementation Overview





SCADA Assets – By the Numbers

Wet Weather Expansion Project - SCADA Implementation Overview



- 7 new HMI Operator Kiosks
- Plant-wide redundant fiber



Digital / Software

- 100+ packaged vendor **OIT** screens
- 300+ of new HMI Screens configured
- 1000s++ of lines of new PLC code configured





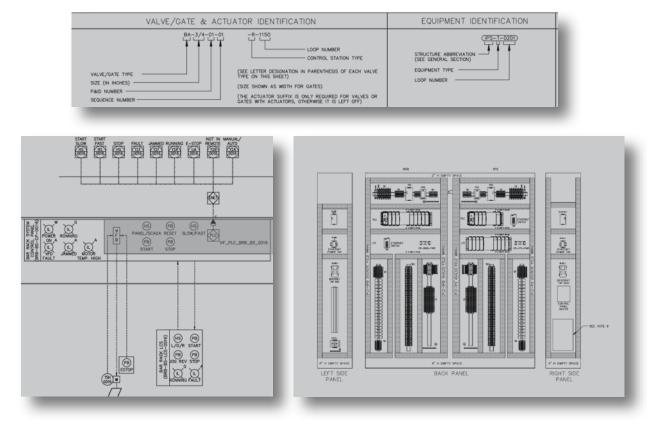
<u>anninn a</u>g



Standardization – I&C Design

Across all design contracts:

- Asset Tagging/ Nomenclature
- Control Hierarchy / Local and Remote controls
- P&ID Symbols/ Lead Sheets
- Control Panel Layouts
- Standard Specifications

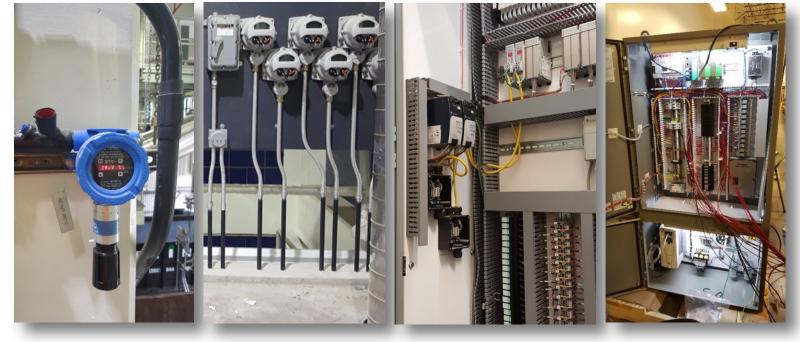


Common philosophy standardized final SCADA / operational schemes.



Standardization – Hardware Components

- Instrumentation / Actuators
- PLCs, including:
 - Process Control
 - Vendor Packages
 - HVAC Systems
- Vendor Packages
- Panel components
- Operator interfaces
- Process cameras

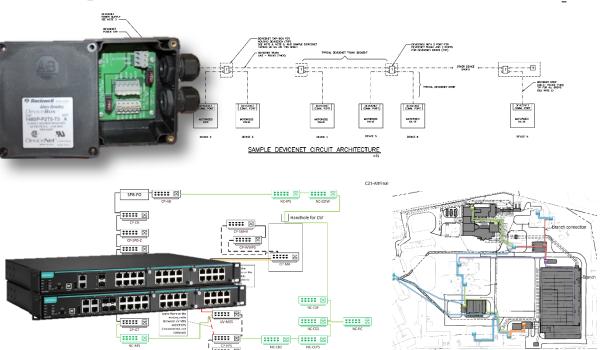


Parts standardization supports post-construction SCADA asset maintenance.



Standardization – Networking

- Network protocols / enclosures
- Architecture Fiber/ Ethernet network/ bus network
 - Managed switch implementation
 - Fieldbus (Devicenet) topology/ failure analysis/ segmentation
 - VFD networking architecture
- Staging and continuity between construction

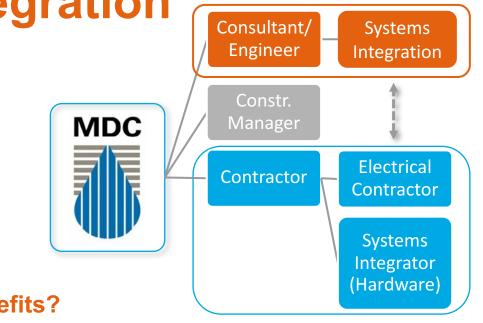


Ensuring network compatibility removes hours of troubleshooting at startup.



Standardization – Systems Integration

- Common systems integration approach specified / both process & HVAC systems
- **AESS Application engineering** • software supplier (HMI/PLC configuration)
 - Engineer (Arcadis)
 - Systems Integrator (NIC Systems) **Corporation**)



Benefits?

Engineer has in-depth knowledge of process / design

Integrator brings years of configuration expertise/ Owner preference knowledge

Owner has direct control over software engineering

Owner has direct control over system commissioning and optimization

Systems integration approach allows for greater Owner control of end product.

SCADA Configuration – Stakeholder Workshops



Stakeholder Engagement

- Bi-weekly operations (AESS) workshops
- Started prior to construction. Started in design. Then, after NTP from May 2014, continues uninterrupted to date (except during Contract Startup)
- Over 40+ workshops held
- Milestones in Configuration: Demonstration sessions with full scenario simulation

| Plant Supervisors | Sy |
|--------------------------------|-----|
| Operation Supervisors | Со |
| Project Managers | Ele |
| I&C/ SCADA Managers / Techs | Sh |

Systems Integrator Consultant Electrical Techs Shift Operators



Engagement early and often by MDC Operations drove understanding and planning for startup needs.



SCADA Workshops

- Process Control/ Operation Strategies
- Alarm Management/ Rationalization
- Navigation
- Trending/ Historian
- Information Management Systems



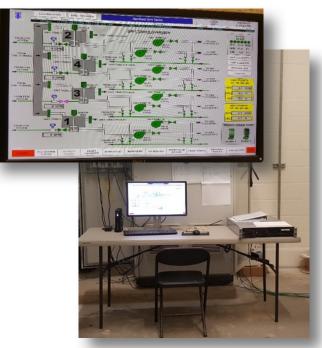
SCADA Configuration – Software Simulation



SCADA Simulations – Wet Weather Scenarios

(3) Witnessed software demonstrations held prior to startup

- All project SCADA servers and PLC CPUs brought into workshop
- Live simulator HMI developed by NIC and used to simulate all field I/O and strategy conditions
- Initial equipment set ups prior to testing (valves, lead/lag, OOS) essentially walkthrough of precommissioning setup



Scenario simulation was the foundation for Functional Demonstration Testing procedures during startup and commissioning.



SCADA Simulations – Initial Values

Stepped through flow events

- Scenario Matrix 8 scenarios from nominal flow to 210 mgd (wet weather event)
- All modes of control simulated

Operator input/ active review

- Initial operator settings inputted into SCADA O&M (setpoints, alarm limits, etc.)
- Early "offline" deployment of new project SCADA Servers for use by all shift operators

| - | | | | Legend; | | | | erate w/ Se ss Waste 1 | | | | | | noite | | | | | | | | | | | | |
|--|--|---|--------------------------|-------------------------------|----------------------------------|--------------------------------------|-------------------|---|---|------------------------------|-------------------|--|--|--|---|------------------------------|-----------|---------------|-----------------------------------|-------------------|-----------------------------------|--|-------|------------|------------|---|
| | | | | | | | | - simulate | | | | | | | | | | | | | | | | | | |
| | | | | | PLC-BRB | PLOBRE | PLC-BRB | PLC-IPS PL | 0.888 110 | 888 M.C-SC | F PLC-SOF | PLC-SCF | PLO-SCF | NO-6DW | NC-SDN | HC-GDW | PLC-BFS | Misc. | PLC-AUX | EDSCAP | PLC-MSS | ROAD | Misc | Misc. | Misc. | ÷ |
| No. | Scenario Description to Test | Headworks Flow (Simulated) | Headworks Flow (Real) | Scenario Test Duration | Influence Junicol ce Chambler | Influence Constant | Bur Rados | Influence Purrys (S) | Sample System | Fire Screets | Stutes Troughs | Screenings GrindeoWather/Co mpactors | Screenings Minobieg Belt: Conserver | Grit Renoad | Grit Pluoting Bick Conveyor | Primary Flow Distribution | Biofibers | Gas Detection | Facility Effluces Water System | Power Monitoring. | Main Sachdgreer PLC Conversion | Now of Restart Sequencing Strategy | NVK | Fire Alarm | Stellphing | |
| | | | | | 5.81 | 2.82 | 2.8.2 | 5.254 | 2.85 | 1 8 | 18.2 | 2.23 | 2.2.10 | 2.201 | 2.8.1 | 2.2.1 | 2.2.1 | 5.2.15 | 2.2.15 | 2.2010 | 2.2.1 | 2.2.1 | 2 2 2 | 522 | 2.8.2 | I |
| eliminar | ry Testing | | | | - | - | - | - | | | | - | - | - | - | - | - | - | - | - | | | - | | | t |
| | Check Completed for CS-20 # (specific to PLC/System) | | | | | | | | | | | | | | | | | | | | _ | | | | | 1 |
| | for Mechanical/Electrical Testing Complete for System (specific to piece of equipment) | | | | | | | | | | | | | | | | | | _ | | | | | _ | _ | đ |
| | Alarm List Complete for CS-20-# | | | | | | | | | | | | | | | _ | | _ | _ | | | | | | | f |
| | Vendor List Complete for CS-20-# | | | | | | | | | | | | | | | | | | _ | | | | | - | | ŝ |
| ALSS | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | i |
| ESS FD bial yala | leg for Performance Tassing (specific to piece of equipment) IT Headworks - Screenings Facility Operational Scenarios (with Service Water) is to test motes of operation for screency froughy/ GWC/ belt conveyor in auto. | IPS operatio | n/ flow simu | ilated. | | | | | | | | | | | | | | | | | | | | _ | | |
| ess FD urpose Islat value an nomini alive off imulate | Be Der Mertmanns Testing (specific to preco of equipment) Ti Hoadworks - Screenings Facility Operational Scenarios (with Service Water) is to test modes of operation for screened y tough(s) (WCC) belt conveyor in auto. www.mc. 20140.11 arXiv: 1 hrvn 2 screening/screening/conversion: Informer game, screening in auto. A screening tough(s) (WCC) belt conveyor in auto. www.mc. 20140.11 arXiv: 1 hrvn 2 screening/screening/conversion: Informer game, screening in a screening to scr | d the headbox | | ilated. | | | | | | | | | | | | | | | | | | | | | | |
| ess FD arpose loar nominate off mulate | be for Performance Stating (specific to piece of equipment) for Deformance Stating (specific to piece and equipment) is to test modes of operation for screency troughs/ GWC/ belt conveyor in auto. and these MDD 1 Bell Rats. 1 Privo 1 screency troughs/ GWC/ belt conveyor in auto. | d the headbox | | ilated. | S-Open | 5-Opm | A-1 | 30mgd | S-on o | r A-1 | A-1 | A-1 | Ass | S-Ox/ | S-On/ Auto | 10 | | | Aas | | | | | | | |
| SS FD arpose bial walk r nomini live off mulate rT-1 | Ne constraints and the second | d the headbox | | | 5-Open S-Open | | A-1 A-1 | 5- 5 30mpd 5-72 5 50mpd | 5-on 0 | - | A-1 | A-1 A-1 | A-00 | | | 8 8 | | | A-31 A-34 | | | | | | | |
| SS FD rpose sal value roomin two off nulate T-1 T-2 T-3 | Not the contraction of the contract of the contract of the contraction of the contraction of the contraction. Contracting Topological Contract Info Contractions (Section 2014) Contractions of the contraction (Topological Contract Info Contractions contractions of the contractions of the contraction (Topological Contractions) (Section 2014) Contractions of the contraction (Topological Contractions of the contraction (Topological Contractions) (Section 2014) Contractions of the contraction (Topological Contractions) (Section 2014) Contractions of the contraction (Section 2014) Contractions of the contraction (Section 2014) (Section 2014) Contractions of the contraction of the contraction (Section 2014) Contractions of the contraction (Section 2014) Contraction (Section 2014) Contractions of the contraction (Section 2014) Contraction (S | d the headbox | | 13 min. | | S-Open | | 5- 5 30mgd 5-72 5 50mgd 5 5.72 5 5.72 5 80mgd 5 | -0#/ | r A-2 | - | | | Auto 5-01/ | Aato 5-04/ | | | | | | | | | | | |
| Vand Vand SS FD arpose dal valu r nomia live off nulate r7-1 r7-2 r7-3 r7-4 | Not the devices of the second second second second second second second the sharehows in the second second second second second second second the sharehows is a second second second second second second second the second sec | d the headbox 30 MGD 50 MGD 80 MGD | | 15 min. 15 min. | S-Open | S-Open | A.1 | 5- 5 30mpd 5-72 5 5-72 5 5-72 5 8-72 5 8-73 5 84mpd | -Os/ Aato 0 | r A-2 r A-3 | A1 | A-1 | Ace | Aato S-Os/ Aato S-Os/ | Auto 5-Os/ Auto 5-Os/ | off | | | Aa | | | | | | | |
| Vend Vend ISS FD III pose fold value off mulate IT-1 IT-2 IT-3 IT-3 IT-5 | Not experimente foreira paramiter la prima d'activament : Il facilitaria con l'estare paramiter la prima d'activament : Il facilitaria con la construcción paramiter de la construcción a la c | d the headbox 30 MGD 50 MGD 80 MGD 84 MGD | | 15 min. 15 min. 15 min. | S-Open | S-Open S-Open S-Open | A-1 A-1 | 5- 33 330mpd 5-72 5-73 5-7 | i-Os/ Asto 0 i-Os/ 0 Asto 0 | r A2 r A3 r A3 | A-1 A-2 | A-1 A-2 | A.00 | Aato S-Os/ Aato S-Os/ Aato | Auto S-Os/ Auto S-Os/ Auto S-Os/ | off off | | | A-01 A-01 | | | | | | | |
| Vend Vend SSS FD III value fold value fold value fold value fold value for forming for forming | Not an experimental effect of present of experiments of the service to the service of the service to the service of the servic | d the headbox 30 MGD 50 MGD 80 MGD 84 MGD | | 15 min. 15 min. 15 min. | S-Open S-Open S-Open | S-Open S-Open S-Open S-Open | A-1 A-1 A-2 | 5- 339mgd 5-72 5 5-72 5 5-72 5 5-73 5 5-75 5 | i-Oe/ 0 i-Oe/ 0 i-Oe/ 0 i-Oe/ 0 i-Oe/ 0 | H A2 H A3 H A3 H A3 | A-1 A-2 A-2 | A-1 A-2 A-1 | A-00 A-00 A-00 | Auto S-Os/ Auto S-Os/ Auto S-Os/ Auto S-Os/ | Auto S-On/ Auto S-On/ Auto S-On/ Auto | off off | | | A-01 A-01 A-01 | | | | | | | |

Initializing and stepping through simulated scenarios forced the team to review key operational settings, paving the way for these to be included in draft O&M.





Facility Testing – Pre-WW Introduction

- (10) days of "offline" testing, followed Scenario Matrix developed
- Functional demonstration of all equipment using effluent water or in the dry as applicable



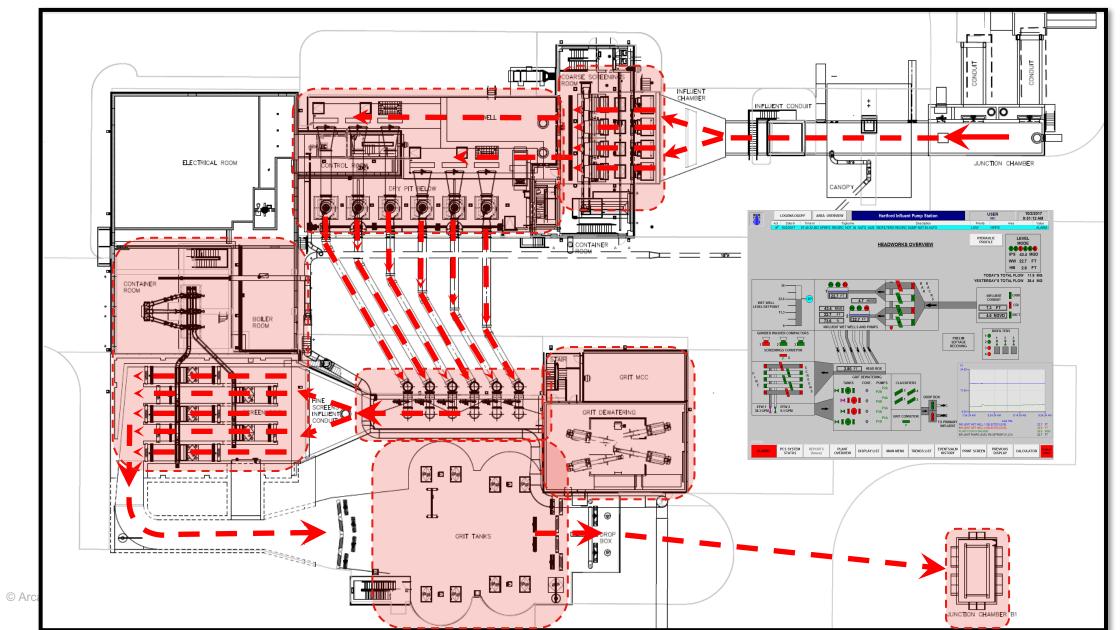






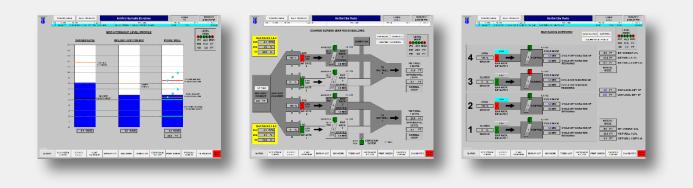
Process Flow Stream

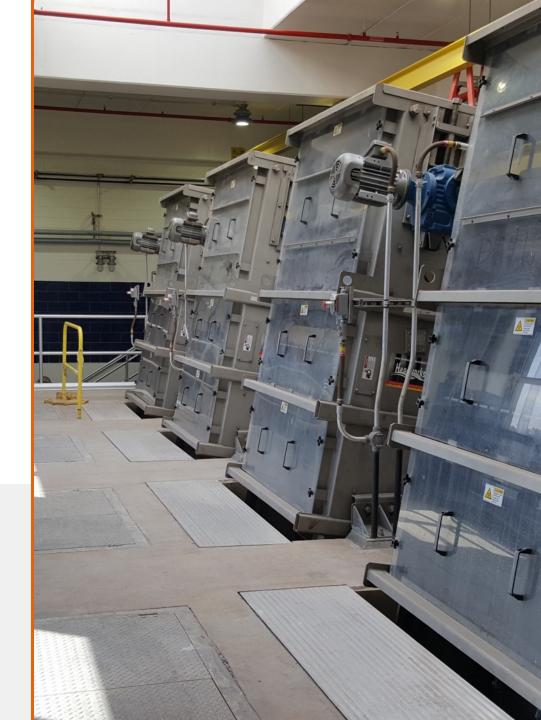




Bar Rack Facility

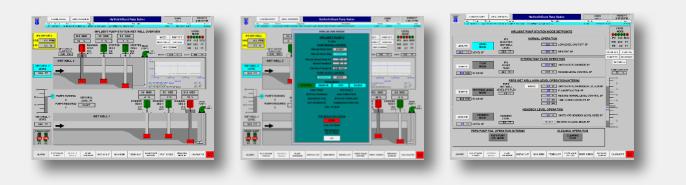
- (4) Coarse screens, vendor package systems with VFDs / PLC
- Integration of hydraulic profile ahead of bar racks for Operations review
- Optimize flow distribution to the IPS wet wells
- Automatic cycling and interlocking with wet well cleaning cycle





Influent Pump Station

- (6) submersible type pumps, 42 MGD capacity each
- Level control / multiple modes of operation to handle peak wet weather flows
- Integration of pump protection/ monitoring systems (vibration/ temperature/ diagnostics VFDs)
- Wet weather restart on power failure





Fine Screens

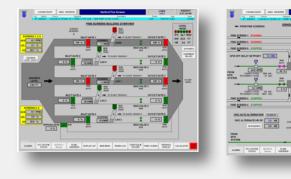
- (5) packaged fine screen systems, integrated into SCADA
- Integration of vendor VFDs/ status events/ trips/ vendor counters
- Level control for high flow events
- Global operational settings for wet weather events

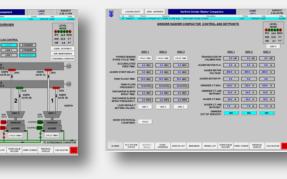




Screenings Handling

- (3) Grinder / Washer / Compactor Packaged System
- Automatically integrated with fine screen and effluent water operation
- Networked integration/ equipment status/ counters
- All vendor commissioning and timer settings available within SCADA
- Pivoting Belt Conveyor for managing screenings disposal

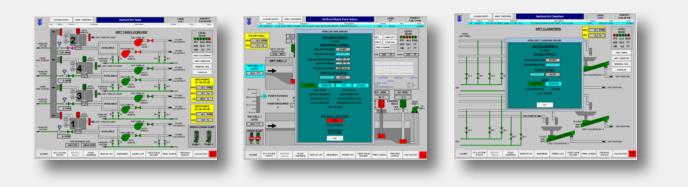






Grit Removal

- (4) 24-foot-diameter centrifugal vortex type grit chambers, 70 MGD rating / (2) 500 GPM pumps/ chamber
- Grit pumps automatically run on a timer sequence to extract grit deposited in the vortex hoppers
- Monitoring of runtimes/ equipment failures

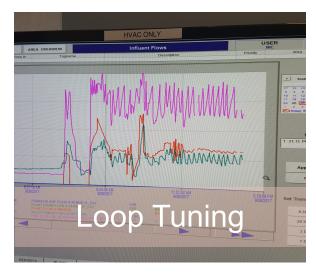


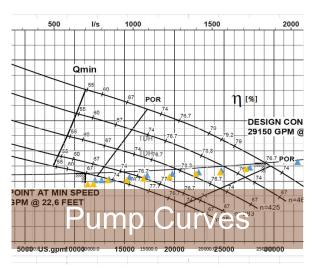


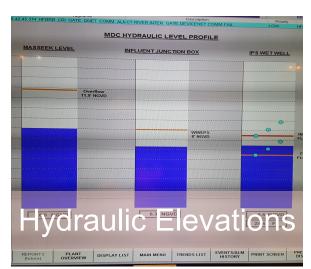


Facility Testing – WW Introduction

- Loop tuning for the major pump control loops/ modes of control
- Development of pump curves and review of hydraulic conditions
- Demonstration of vendor equipment operation
- Troubleshooting individual settings/ optimization









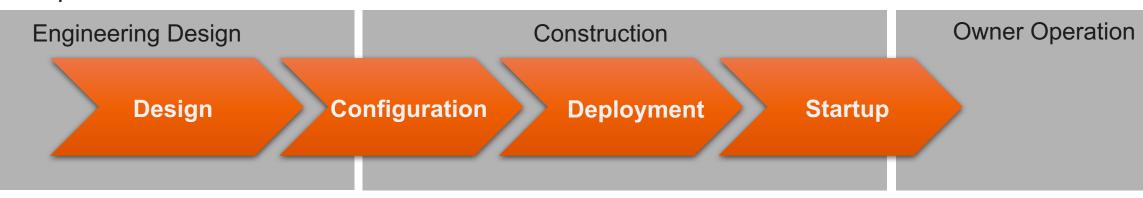




Conclusion – Success Factors

- Standardization of design elements (specifications, asset components, network topologies)
- Continued engagement through regular SCADA stakeholder workshops, with operations, management and technical staff input

 Scenario development and simulation demonstration prior to deployment, as a "dry-run" of pre-commissioning activities

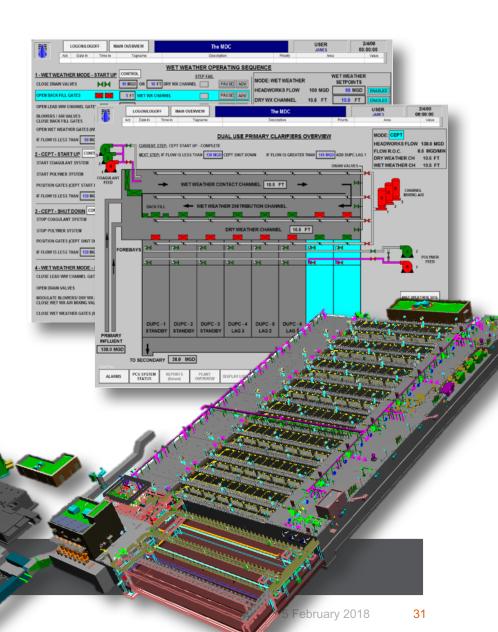


Planning for successful startup begins during design.



Looking Ahead...

- Currently involved in Contract 21 configuration and workshops, including Plant Master Wet Weather Strategy
- Approximately 2x the amount of I/O
- Just-in-time development of the logic coding for processors occurring now.
- Following similar SCADA implementation approach



Startup this summer....

Acknowledgements









GENERAL CONTRACTORS





Questions?

Speaker contact info:



Ryan J. Kowalski, P.E. ARCADIS U.S. White Plains, NY 914-310-5421 ryan.kowalski@arcadis.com



Scott W. LaRose The MDC Hartford, CT 860-278-7850 Ext 3569 slarose@themdc.com

Alarm Management

- Workshops held to rationalize Alarm Master Database
 - Initial pre-deployment, based on initial philosophy, designated priorities (2 workshops, larger groups)
 - During commissioning, prior to introduction of process flow, to reconfirm and go back through rationalization (2 workshops, smaller groups)
- Equipment failure/ performance/ trips
- Focused on:
 - Areas / Priority (Critical/ Audible)
 - Distribution (Process/ Maintenance)

| 721 | | FINE SCREEN SPAIL TO RUN | HF | HFIPS | |
|---|--|---|--|--|---|
| 722 | HFSCF_FS9_FTR_ALH | FINE SCREENS HIGH TEMP | HF | HFIPS | HF_ALM1 |
| 725 | HPSCP_PSS_HL_TEMP | FINE SCREENS HIGH TENP | HP | HFIPS | |
| | HFSCF_FSS_IH_GATE_DHET_ALH | | | | |
| 724 | HPSCP_PSS_IH_GATE_PTC | FINE SCREENS INLET GATE FAIL TO CLOSE | HP | HPIPS | HF_ALH1 |
| 725 | HPSCP_PSS_IH_GATE_PTO | FINE SCREENS INLET GATE FAIL TO OPEN | HP | HPIPS | HI_ALM1 |
| 725 | HPSCP_PSS_IN_GATE_JAM | FINE SCREEN SINLET GATE JAM | HF | HFIPS | |
| 727 | HPSCP_PSS_IH_GATE_LO_PAT_ALM | FINE SCREENS INLET GATE LOW PATTERY | HF | HFIPS | |
| 728 | HPSCP_PSS_IN_GATE_ODS | FINE SCREENS INLET GATE OPSTRUCTION | HF | HPIPS | |
| 725 | HPSCP_PSS_IN_GATE_TSH | FINE SCREENS INLET GATE HIGH TEMP | HP | HFIPS | |
| 738 | HFSCF_FSS_JAH | PINE SCREENS JAM | HP | HFIPS | HF_ALH1 |
| 731 | HFSCF_FS3_HAIHT_ALH | FIRE SCREEN'S MAINTENANCE MODE ALARM | Hr | HPIPS | |
| 792 | | FINE SCREEN S MOTION SENSOR ALARM | Hr | HPIPS | |
| | HPSCP_PSS_HOTIOH_ALH | | | | |
| 755 | HPSCP_PSS_HUD_VLV_DHET_ALH | FINE SCREEN 3 MUD VALVE DHET COMM FAIL | HF | HPIPS | |
| 754 | HPSCP_PS9_HUD_VLV_PTC | FINE SCREEKS MUD VALVE FAIL TO CLOSE | HP | HPIPS | HI_ALH1 |
| 755 | HPSCP_PSS_HUD_VLV_PTO | FINE SCREENS MUD VALVE FAIL TO OPEN | HP | HPIPS | |
| 735 | HPSCP_PS9_HUD_VLV_JAH | FINE SCREENS MUD VALVE JAM | HP | HPIPS | |
| 737 | HPSCP_PSS_HUD_VLV_LO_DAT_ALH | FINE SCREENS MUD VALVE LOW PATTERY | HF | HFIPS | |
| 738 | HPSCP_PSS_HUD_VLV_ODS | FINE SCREENS MUD VALVE OPSTRUCTION | HF | HFIPS | |
| 755 | HPSCP_PSS_HUD_VLV_TSH | FINE SCREEN S MUD VALVE HIGH TEMP | HP | HPIPS | |
| 748 | HFSCF_FSS_OL_ALH | FINE SCREENS MOTOR OVERLOAD | HP | HPIPS | HP_ALH: common from alarm 1 |
| 741 | HISCITIST OF COME AND AND | | Ĥ | HPIPS | |
| | HFSCF_FSS_OUT_GATE_DHET_ALH | FINE SCREEKS OUTLET GATE DHETCOMM FAIL | | | |
| 742 | HPSCP_PSS_OUT_GATE_PTC | FINE SCREEN SOUTLET GATE FAIL TO CLOSE | HP | HPIPS | |
| 745 | HPSCP_PSS_OUT_GATE_PTO | FINE SCREENS OUTLET GATE FAIL TO OPEN | HF | HPIPS | |
| 744 | HISCI_ISS_OUT_GATE_JAM | FINE SCREENS OUTLET GATE JAM | HF | HFIPS | |
| 745 | HPSCP_PSS_OUT_GATE_LO_DAT_ALM | FINE SCREEKS OUTLET GATE LOW PATTERY | HP | HFIPS | |
| 745 | HPSCP_PST_OUT_GATE_ODS | FINE SCREENS OUTLET GATE OPSTRUCTION | HP | HPIPS | |
| 747 | HPSCP_PSS_OUT_GATE_TSH | FINE SCREENS OUTLET GATE HIGH TEMP | HF | HFIPS | |
| 748 | HPSCP_PSS_PWR_ALH | FINE SCREEN S POWER LOSS ALARM | HP | HFIPS | HP_ALM: common from alarm 1 |
| 745 | HPSCP_PS3_VPD_PLT | FINE SCREENS VPD FAULT | HF | HPIPS | |
| 758 | | FINE SCREEN 4 VPD COMMUNICATION ALARM | | HPIPS | 110 ALM. A 1 A |
| | HFSCF_FS4_COHH_ALH | | HF | | HI_ALH: comment from alarm 1 |
| 754 | HPSCP_PS4_ESTOP | FINE SCREEN 4 EMERGENCY STOP | | HPIPS | HP_ALH1 |
| 752 | HPSCP_PS4_PTR_ALH | FINE SCREEN 4 FAIL TO RUN | HP | HPIPS | HP_ALH1 |
| 755 | HPSCP_PSQ_HL_TEMP | FINE SCREEN 4 HIGH TEMP | HP | HPIPS | |
| 754 | HESCE FSE IN GATE DHET ALM | FINE SCREEN 4 INLET GATE DHET COMM FAIL | HP | HPIPS | |
| 755 | HPSCP_PSCIN_GATE_PTC | FINE SCREEN 4 INLET GATE FAIL TO CLOSE | HF | HFIPS | HF_ALH1 |
| 755 | HESCE FSE IN GATE FTO | FINE SCREEN 4 INLET GATE FAIL TO OPEN | HF | HFIPS | HP_ALH1 |
| 757 | HESCE FSE IN GATE JAH | FINE SCREEN 4 INLET GATE JAM | HP | HFIPS | |
| 758 | HPSCP_PS4_IH_GATE_LO_DAT_ALH | FINE SCREEN 4 INLET GATE LOW PATTERY | ĤP | HPIPS | |
| 755 | HESCETSEIN_CHIE_CO_PHI_HER | FINE SCREEN 4 INLET GATE OPSTRUCTION | HF | HPIPS | |
| | HPSCP_PS4_IH_GATE_ODS | | | | |
| 758 | HPSCP_PS4_IH_GATE_TSH | FINE SCREEN 4 INLET GATE HIGH TEMP | HP | HPIPS | |
| 751 | HPSCP_PS4_JAH | FINE SCREEN 4 JAM | HF | HPIPS | HI_ALM1 |
| 762 | HPSCP_PS4_MAINT_ALM | FINE SCREEN 4 MAINTENANCE MODE ALARM | HF | HFIPS | |
| 755 | HPSCP_PS4_HOTIOH_ALH | FINE SCREEN 4 MOTION SENSOR ALARM | HF | HFIPS | |
| 754 | HPSCP_PS4_HUD_VLV_DHET_ALH | FINE SCREEN 4 MUD VALVE DHET COMM FAIL | HF | HPIPS | |
| 765 | HESCE ESCHUD_VLV_FTC | FINE SCREEN 4 MUD VALVE FAIL TO CLOSE | HP | HFIPS | HF_ALM1 |
| 755 | HPSCP_PS4_HUD_VLV_PTO | FINE SCREEN 4 MUD VALVE FAIL TO OPEN | HP | HFIPS | |
| 757 | HFSCF_FS4_HUD_VLV_JAH | FINE SCREEN 4 MUD VALVE JAM | Hr | HPIPS | |
| | HISCITS HUD YEY JAH | | HF | HPIPS | |
| 768 | HPSCP_PS4_HUD_VLV_LO_DAT_ALH | FINE SCREEN 4 MUD VALVE LOW PATTERY | | | |
| 765 | HPSCP_PS4_HUD_VLV_OBS | FINE SCREEN 4 MUD VALVE OPSTRUCTION | HF | HPIPS | |
| 778 | HPSCP_PS4_HUD_VLV_TSH | FINE SCREEN 4 MUD VALVE HIGH TEMP | HP | HPIPS | |
| 774 | HPSCP_PSCOL_ALH | FINE SCREEN 4 MOTOR OVERLOAD | HP | HPIPS | HP_ALH: remain from slare 1 |
| 772 | HPSCP_PS4_OUT_GATE_DHET_ALM | FINE SCREEN & OUTLET GATE DHET COMM FAIL | HP | HFIPS | |
| 775 | HPSCP_PS4_OUT_GATE_PTC | FINE SCREEN 4 OUTLET GATE FAIL TO CLOSE | HF | HEIPS | |
| 774 | HESCE FSCOUT GATE FTO | FINE SCREEN 4 OUTLET GATE FAIL TO OPEN | HF | HFIPS | |
| 775 | HESCE ESA OUT COTE IOM | FINE SCREEN 4 OUTLET GATE JAM | HP | HPIPS | |
| 775 | HFSCF_FS4_OUT_GATE_JAH HFSCF_FS4_OUT_GATE_LO_BAT_ALH | | H. | HPIPS | |
| | HISCF_PSE_ODI_GHIE_CO_PHI_HCH | FINE SCREEN 4 OUTLET GATE LOW PATTERY | | | |
| 777 | HPSCP_PS4_OUT_GATE_ODS | FINE SCREEN 4 OUTLET GATE ODSTRUCTION | HP | HPIPS | |
| 778 | HPSCP_PS4_OUT_GATE_TSH | FINE SCREEN 4 OUTLET GATE HIGH TEMP | HF | HPIPS | |
| 775 | HESCE FSE PWR_ALH | FINE SCREEN 4 POWER LOSS ALARM | HP | HPIPS | HP_ALH: remain from slare 1 |
| 788 | HPSCP_PS4_VPD_PLT | FINE SCREEN 4 VPD FAULT | | | |
| | | | HF | HFIPS | |
| 784 | HPSCP_PSS_COHH_ALH | | HF | HPIPS HPIPS | HP_ALM: common from alloca 1 |
| | HFSCF_FSS_COMM_ALM | FIRE SCREEKS VFD COMMUNICATION ALARM | HP | HPIPS | HF_ALH1 common from alarm 1 HF_ALH1 |
| 782 | HFSCF_FSS_COMM_ALM HFSCF_FSS_ESTOP | FINE SCREEN S VPD COMMUNICATION ALARM FINE SCREEN SEMERGENCY STOP | | HPIPS HPIPS | HF_ALH1 |
| 782 | HFSCP_FSS_COHH_ALM HFSCP_FSS_ESTOP HFSCP_FSS_FTR_ALM | FINE SCREEN S VPD COMMUNICATION ALARM FINE SCREEN S EMERGENCY STOP FINE SCREEN S FAIL TO RUN | HF HF HF | HPIPS HPIPS HPIPS | HP_ALM: common from alarm 1 HP_ALM1 HP_ALM1 |
| 782 785 784 | NPSCP_PSS_CONH_ALM NPSCP_PSS_ESTOP NPSCP_PSS_PTR_ALM NPSCP_PSS_NL_TEMP | PHE SCREENS VPD COMMUNICATION ALARM PHE SCREENS EMERGENCY STOP PHE SCREENS PAIL TO RUN PHE SCREENS NIGH TEMP | HF HF HF | HPIPS HPIPS HPIPS HPIPS | HF_ALH1 |
| 782 785 784 785 | HFSCF_FSS_COMH_ALM HFSCF_FSS_ESTOP HFSCF_FSS_HTR_ALM HFSCF_FSS_HL_TEMP HFSCF_FSS_IN_GATE_DHET_ALM | PHE SCREEN S VFD COMMUNICATION ALARM PHE SCREEN S EMERGENCY STOP PHE SCREEN S MAIL TO RUH PHE SCREEN S HIGH TEMP PHE SCREEN S HILET GATE DHET COMM PAIL | HF HF HF | HPIPS HPIPS HPIPS HPIPS HPIPS | HF_ALM1 HF_ALM1 |
| 782 785 784 785 785 | HFSCF_FSS_COMH_ALM HFSCF_FSS_ESTOP HFSCF_FSS_FTS_ALM HFSCF_FSS_HL_TEMP HFSCF_FSS_HL_GATE_PHET_ALM HFSCF_FSS_HL_GATE_FTC | FINE SCREEN SYND COMMUNICATION ALARM NNE SCREEN SEMERGENCY STOP NNE SCREEN SANL TO RUN NNE SCREEN SANL TO RUN NNE SCREEN SINLET GATE DNET COMM PAIL NNE SCREEN SINLET GATE DNET COMM PAIL NNE SCREEN SINLET GATE FAIL TO CLOSE | HF HF HF HF | HPIPS HPIPS HPIPS HPIPS HPIPS HPIPS | HF_ALH1 HF_ALH1 |
| 782 785 784 785 785 785 785 | HFSCT_FS2_COHH_ALH HFSCT_FS2_ESTOP HFSCT_FS2_ESTOP HFSCT_FS2_HL_TEMP HFSCT_FS2_HL_GATE_DHET_ALH HFSCT_FS3_HL_GATE_FTC HFSCT_FS3_HL_GATE_FTC | INESCREENS VID COMMUNICATION ALARM INESCREENS ENERGENCYSTOP VINESCREENS HIGHT ORUN INESCREENS MIGHT ORUN INESCREENS INICT GATE ONET COMM PAIL INESCREENS INICT GATE FAILT OCLOSE INESCREENS INICT GATE FAILT OCENSE | HF HF HF HF | HPIPS HPIPS HPIPS HPIPS HPIPS HPIPS | HF_ALM1 HF_ALM1 |
| 782 785 784 785 785 | HFSCF_FSS_COHH_ALH HFSCF_FSS_ESTOP HFSCF_FSS_FTS_ALH HFSCF_FSS_HT_EAH HFSCF_FSS_HT_GATE_PTC HFSCF_FSS_HT_GATE_FTC HFSCF_FSS_HT_GATE_FTC HFSCF_FSS_HT_GATE_FTC | INTERGERE SUP COMMUNICATION ALARM INTERGERE SE CHERCENCY STOP INTE SCREEN STAIL TO RUN INTE SCREEN SINCH TEMP INTE SCREEN SINCT GATE POHT COMM PAIL INTE SCREEN SINCT GATE PAIL TO CLOSE INTERSCREEN SINCT GATE PAIL TO OPEN INTE SCREEN SINCT GATE PAIL TO ADEN | | HPIPS HPIPS HPIPS HPIPS HPIPS HPIPS HPIPS | HF_ALH1 HF_ALH1 |
| 782 785 784 785 785 785 785 | HFSCF_FSS_COHH_ALH HFSCF_FSS_ESTOP HFSCF_FSS_FTS_ALH HFSCF_FSS_HT_EAH HFSCF_FSS_HT_GATE_PTC HFSCF_FSS_HT_GATE_FTC HFSCF_FSS_HT_GATE_FTC HFSCF_FSS_HT_GATE_FTC | INESCREENS VID COMMUNICATION ALARM INESCREENS ENERGENCYSTOP VINESCREENS HIGHT ORUN INESCREENS MIGHT ORUN INESCREENS INIGT GATE ONET COMM PAIL INESCREENS INIGT GATE FAILT OCLOSE INESCREENS INIGT GATE FAILT OCENSE | HF HF HF HF | HPIPS HPIPS HPIPS HPIPS HPIPS HPIPS | HF_ALH1 HF_ALH1 |
| 782 785 784 785 785 785 787 788 788 | HTSCT_FSS_COHH_ALH HTSCT_FSS_ESTOP HTSCT_FSS_ESTOP HTSCT_FSS_IN_GATE_DHET_ALH HTSCT_FSS_IN_GATE_DHET_ALH HTSCT_FSS_IN_GATE_TTC HTSCT_FSS_IN_GATE_JAH HTSCT_FSS_IN_GATE_JAH | THE SCREEMS VPD COMMUNICATION ALARM THE SCREEMS FAILTORUM THE SCREEMS FAILTORUM THE SCREEMS FAILTORUM THE SCREEMS HIGH TEMP THE SCREEMS HIGH TEMP TEMPT THE SCREEMS HILLE TATE THAI TO OPEN THE SCREEMS HILLE TATE LAW PATTERY | | HPIPS HPIPS HPIPS HPIPS HPIPS HPIPS HPIPS HPIPS | HF_ALH1 HF_ALH1 |
| 782 785 784 785 785 785 787 788 788 788 788 | HFSCT_FSL_CONH_ALH HFSCT_FSL_FSLOP HFSCT_FSL_HL HFSCT_FSL_HL HFSCT_FSL_HLGATE_DHET_ALH HFSCT_FSL_HLGATE_LTC HFSCT_FSL_HLGATE_LTC HFSCT_FSL_HLGATE_LOP HFSCT_FSL_HLGATE_LOP HFSCT_FSL_HLGATE_LOP HFSCT_FSL_HLGATE_LOP HFSCT_FSL_HLGATE_DOPS | THE SCREEN SUP CONHUMICATION ALARM THE SCREEN STALT OR UN THE SCREEN STALT OR UN THE SCREEN SHICH TEMP THE SCREEN SHICH TEMP THE SCREEN SHILET GATE POHT COMM FAIL THE SCREEN SHILET GATE FAIL TO OPEN THE SCREEN SHILET GATE AM THE SCREEN SHILET GATE AM THE SCREEN SHILET GATE OW FAITTEN THE SCREEN SHILET GATE OW FAITTEN | | HTIPS HTIPS HTIPS HTIPS HTIPS HTIPS HTIPS HTIPS HTIPS | HF_ALH1 HF_ALH1 |
| 782 785 786 786 786 787 786 787 788 787 788 788 | HISCT, FS2, CONH, ALH HISCT, FS2, FSTOP HISCT, FS2, HT, ALH HISCT, FS3, HT, CHP HISCT, FS3, HT, GATE, FTC HISCT, FS3, HT, GATE, FTC HISCT, FS3, HT, GATE, ANH HISCT, FS3, HT, GATE, ANH HISCT, FS3, HT, GATE, ANH HISCT, FS3, HT, GATE, ANH HISCT, FS3, HT, GATE, ANH | THE SCREEMS VID COMMUNICATION ALARM THE SCREEMS FAILTO RUH THE SCREEMS FAILTO RUH THE SCREEMS NIGHT FAIL THE SCREEMS NIGHT FAIL TO COMM FAIL THE SCREEMS NIGHT GATE FAIL TO OPEN FINE SCREEMS NIGHT GATE FAIL TO OPEN FINE SCREEMS NIGHT GATE FAIL THE SCREEMS NIGHT GATE FAIL THE SCREEMS NIGHT GATE OPSTRUCTION THE SCREEMS NIGHT GATE OPSTRUCTION | | HTIPS HTIPS HTIPS HTIPS HTIPS HTIPS HTIPS HTIPS HTIPS HTIPS | HF_ALH1 HF_ALH1 HF_ALH1 |
| 782 785 786 786 787 786 787 786 787 788 787 788 788 | HFSCT_FSL_CONH_ALH HFSCT_FSL_FSL_ALH HFSCT_FSL_HT_ALH HFSCT_FSL_HT_CHP HFSCT_FSL_HL_GATE_INTC HFSCT_FSL_HL_GATE_INTC HFSCT_FSL_HL_GATE_INT HFSCT_FSL_HL_GATE_INT HFSCT_FSL_HL_GATE_INT HFSCT_FSL_HL_GATE_INT HFSCT_FSL_HL_GATE_INT HFSCT_FSL_HL_GATE_INT HFSCT_FSL_HL_GATE_INT HFSCT_FSL_HL_GATE_INT | THE SCREEN SUP CONHUMICATION ALARM THE SCREEN STAIL TO RUN THE SCREEN STAIL TO RUN THE SCREEN SINCH TEMP THE SCREEN SINCH TEMP THE SCREEN SINLET GATE POHT COMM FAIL THE SCREEN SINLET GATE FAIL TO OPEN THE SCREEN SINLET GATE FAIL TO ADEN THE SCREEN SINLET GATE LOW PATTERY THE SCREEN SINLET GATE OWTRUCTION THE SCREEN SINLET GATE OWTRUCTION THE SCREEN SINLET GATE OWTRUCTION | HT HT HT HT HT HT HT HT | 47195 47195 47195 47195 47195 47195 47195 47195 47195 47195 47195 | HF_ALH1 HF_ALH1 |
| 782 783 784 785 786 787 785 786 787 785 787 788 789 791 791 791 792 793 | HISCT, FISL, CONHL, ALH HISCT, FISL, STOP HISCT, FISL, TTE, ALH HISCT, FISL, MI, TEMP HISCT, FISL, MI, GATE, THC HISCT, FISL, MI, GATE, THC HISCT, FISL, MI, GATE, JAN HISCT, FISL, MINT, ALH | THE SCREEM SUP COMMUNICATION ALARM THE SCREEM STALE TO RUH THE SCREEM STALE TO RUH THE SCREEM SHICH TEMP THE SCREEM SHICH TEMP THE SCREEM SHILET GATE POHET COMM FAIL THE SCREEM SHILET GATE PAIL TO CLOSE THE SCREEM SHILET GATE OPTRUCTION THE SCREEM SHILET GATE OPTRUCTION THE SCREEM SHILET GATE OPTRUCTION THE | 47 47 47 47 47 47 47 47 47 47 | 2411H 2417H 2417H 2417H 2417H 2417H 2417H 2417H 2417H 2417H 2417H 2417H 2417H 2417H 2417H | HF_ALH1 HF_ALH1 HF_ALH1 |
| 782 783 784 785 786 787 788 787 788 787 788 788 799 799 799 | HFSCT_FSL_CONH_ALH HFSCT_FSL_FSL_ALH HFSCT_FSL_HT_EAH HFSCT_FSL_HT_EAH HFSCT_FSL_H_GATE_HTE HFSCT_FSL_H_GATE_HTE HFSCT_FSL_H_GATE_JAH HFSCT_FSL_H_GATE_JAH HFSCT_FSL_H_GATE_JAH HFSCT_FSL_H_GATE_JAH HFSCT_FSL_HAH HFSCT_FSL_HAH HFSCT_FSL_HAH HFSCT_FSL_HAH HFSCT_FSL_HAH HFSCT_FSL_HAHT_ALH | THE SCREED SUP CONHUMICATION ALARM THE SCREED STAIL TO RUN THE SCREED STAIL TO RUN THE SCREED SHICH TEMP THE SCREED SHICT GATE POHT COMM FAIL THE SCREED SHILT GATE FAIL TO CLOSE THE SCREED SHILT GATE FAIL TO OPEN THE SCREED SHILT GATE LAW THE SCREED SHILT GATE LAW THE SCREED SHILT GATE LOW FATTERY THE SCREED SHILT GATE HOW FATTERY THE SCREED SHILT GATE HIGH TEMP THE SCREED SHILT GATE HIGH TEMP THE SCREED SHILT GATE BHOTH SHARE | HF HF HF HF HF HF HF HF | 44194 44195 44194 44195 44195 44195 44195 44195 44195 44195 44195 44195 44195 | HF_ALH1 HF_ALH1 HF_ALH1 |
| 782 785 786 785 786 787 786 787 788 787 788 787 788 789 789 799 799 | HFSCT_FSL_CONH_ALH HFSCT_FSL_TSC_ALH HFSCT_FSL_TSC_ALH HFSCT_FSL_HCATE_HC HFSCT_FSL_HCATE_TC HFSCT_FSL_HCATE_TC HFSCT_FSL_HCATE_TC HFSCT_FSL_HCATE_TO HFSCT_FSL_HCATE_TS HFSCT_FSL_HCATE | THE SCREEM SUP COMMUNICATION ALARM THE SCREEM STALE TO RUM THE SCREEM STALE TO RUM THE SCREEM SHICH TO RUM THE SCREEM SHICH TO RUM THE SCREEM SHILET GATE POHET COMMON THE SCREEM SHILET GATE PAIL TO CLOSE THE SCREEM SHILET GATE AND ATTERY THE SCREEM SHILET GATE OPTRUCTION THE SCREEM SHILT FOR THE OPT GALARM THE SCREEM SHILT FOR THE OPT COMMON | HF HF HF HF HF HF HF HF HF | 44114 44145 44145 44145 44145 44145 44145 44145 44145 44145 44145 44145 44145 44145 44145 44145 | HF_ALH1 HF_ALH1 HF_ALH1 HF_ALH1 |
| 782 785 786 785 787 787 787 787 787 787 787 787 787 | HFSCT_FSL_CONH_ALH HFSCT_FSL_FSL_OHH_ALH HFSCT_FSL_HL_CHP HFSCT_FSL_HL_GATE_NFT HFSCT_FSL_HL_GATE_NFT HFSCT_FSL_HL_GATE_NFT HFSCT_FSL_HL_GATE_NFT HFSCT_FSL_HL_GATE_NFT HFSCT_FSL_HL_GATE_NFT HFSCT_FSL_HL_GATE_NFT HFSCT_FSL_HL_GATE_NFT HFSCT_FSL_HL_GATE_NFT HFSCT_FSL_HL_GATE_NFT HFSCT_FSL_HL_NT HFSCT_FSL_HL_NT HFSCT_FSL_HLD_VVV_FTC HFSCT_FSL_HLD_VVV_FTC | THE SCREED SUP COMMUNICATION ALARM THE SCREED STAIL TO RUN THE SCREED SIGHT FOR UN THE SCREED SIGHT FOR UN THE SCREED SIGHT FAIL THE SCREED SINCE TATE POHT COMM FAIL THE SCREED SINCE TATE FAIL TO CLOSE THE SCREED SINCE TATE FAIL TO CLOSE THE SCREED SINCE TATE FAIL TO CLOSE THE SCREED SINCE TATE FAIL THE SCREED SINCE TATE FOR THE FAIL THE SCREED SINCE TATE FOR THE FAIL THE SCREED SINCE TATE FOR THE FAIL THE SCREED SHOT FAIL TO CLOSE ALARM THE SCREED SHOT ON SENSE ALARM THE SCREED SHOT ON SUP ALL TO CLOSE | HF HF HF HF HF HF HF HF HF HF HF | ALIANA | HF_ALH1 HF_ALH1 HF_ALH1 |
| 782 783 784 785 786 785 786 785 788 798 799 798 799 799 799 799 799 799 | HFSCT_FSL_CONH_ALH HFSCT_FSL_FSL_ALH HFSCT_FSL_HT_ALH HFSCT_FSL_HT_CHH HFSCT_FSL_HLGATL_FTC HFSCT_FSL_HLGATL_FTC HFSCT_FSL_HLGATL_FTC HFSCT_FSL_HLGATL_ANT_ALH HFSCT_FSL_HAH HFSCT_FSL_HAH HFSCT_FSL_HAHT_ALH HFSCT_FSL_HAHT_ALH HFSCT_FSL_HALD_VVV_FTC HFSCT_FSL_HALD_VVV_FTC HFSCT_FSL_HALD_VVV_FTC | THE SCREEM SUP COMMUNICATION ALARM THE SCREEM SCHEEGENCY STOP THE SCREEM SIGHT FORM THE SCREEM SIGHT FOR TO ALM THE SCREEM SIGHT FOR TO ALT COMPANY THE SCREEM SIGHT GATE POHET COMPANY THE SCREEM SINLEY GATE FAIL TO ODEN THE SCREEM SINLEY GATE FAIL TO ODEN THE SCREEM SINLEY GATE FAIL TO ODEN THE SCREEM SINLEY GATE LOOK TEMP THE SCREEM SINLEY GATE AND TEMP | | 29194 29194 29194 29194 29194 29194 29194 29194 29194 20194 20194 20194 20194 20194 20194 20194 20194 20194 20194 20194 20194 | HF_ALH1 HF_ALH1 HF_ALH1 HF_ALH1 |
| 782 785 786 785 787 787 787 787 787 787 787 787 787 | HFSCT_FSL_CONH_ALH HFSCT_FSL_FSL_ALH HFSCT_FSL_HT_ALH HFSCT_FSL_HT_CHH HFSCT_FSL_HLGATL_FTC HFSCT_FSL_HLGATL_FTC HFSCT_FSL_HLGATL_FTC HFSCT_FSL_HLGATL_ANT_ALH HFSCT_FSL_HAH HFSCT_FSL_HAH HFSCT_FSL_HAHT_ALH HFSCT_FSL_HAHT_ALH HFSCT_FSL_HALD_VVV_FTC HFSCT_FSL_HALD_VVV_FTC HFSCT_FSL_HALD_VVV_FTC | THE SCREED SUP COMMUNICATION ALARM THE SCREED STAIL TO RUN THE SCREED SIGHT FOR UN THE SCREED SIGHT FOR UN THE SCREED SIGHT FAIL THE SCREED SINCE TATE POHT COMM FAIL THE SCREED SINCE TATE FAIL TO CLOSE THE SCREED SINCE TATE FAIL TO CLOSE THE SCREED SINCE TATE FAIL TO CLOSE THE SCREED SINCE TATE FAIL THE SCREED SINCE TATE FOR THE FAIL THE SCREED SINCE TATE FOR THE FAIL THE SCREED SINCE TATE FOR THE FAIL THE SCREED SHOT FAIL TO CLOSE ALARM THE SCREED SHOT ON SENSE ALARM THE SCREED SHOT ON SUP ALL TO CLOSE | HF HF HF HF HF HF HF HF HF HF HF | ALIANA | HF_ALH1 HF_ALH1 HF_ALH1 HF_ALH1 |
| 782 783 784 785 786 786 787 788 798 799 798 799 799 799 799 799 | HFSCT_FSL_CONH_ALH HFSCT_FSL_FSL_FSL HFSCT_FSL_HL HFSCT_FSL_HL HFSCT_FSL_HL GATE_DFSL HFSCT_FSL_HL GATE_DFSL HFSCT_FSL_HL GATE_DFSL HFSCT_FSL_HL GATE_DFSL HFSCT_FSL_HL HFSCT_FSL_HL HFSCT_FSL HFSCT | THE SCREED SUB COMMUNICATION ALARM THE SCREED STAIL TO RUN THE SCREED SIGHT FOR UN THE SCREED SIGHT FOR UN THE SCREED SIGHT FAIL THE SCREED SINCT GATE POHT COMM FAIL THE SCREED SINCT GATE FAIL TO COSE THE SCREED SINCT GATE FAIL TO COSE THE SCREED SINCT GATE LOW PATTERY THE SCREED SHOT WALVE PAIL TO COSE AND THE SCREED SHOT WALVE PAIL TO COSE THE SCREED SHOT WALVE PAIL TO COSE THE SCREED SHOT WALVE PAIL TO COSE THE SCREED SHOT WALVE FAIL TO COSE THE SCREED SHOT WALVE FAIL TO COSE | | 29194 29194 29194 29194 29194 29194 29194 29194 29194 20194 20194 20194 20194 20194 20194 20194 20194 20194 20194 20194 20194 | HF_ALH1 HF_ALH1 HF_ALH1 HF_ALH1 |
| 782 783 784 785 786 787 788 787 788 783 798 798 799 799 799 799 799 799 799 799 | HFSCT_FSL_CONH_ALH HFSCT_FSL_FSL_ALH HFSCT_FSL_HIT_EALH HFSCT_FSL_HIT_EALH HFSCT_FSL_HIGATL_FTC HFSCT_FSL_HIGATL_FTC HFSCT_FSL_HIGATL_FTC HFSCT_FSL_HIGATL_ANL HFSCT_FSL_HIGATL_ANL HFSCT_FSL_HINT_ALH HFSCT_FSL_HINT_ALH HFSCT_FSL_HINT_ALH HFSCT_FSL_HINT_ALH HFSCT_FSL_HINT_ALH HFSCT_FSL_HIND_VVV_FTC HFSCT_FSL_HID_VVV_FTC HFSCT_FSL_HID_VVV_ALH HFSCT_FSL_HID_VVV_ALH HFSCT_FSL_HID_VVV_ALH HFSCT_FSL_HID_VVV_ALH | THE SCREEM SUP COMMUNICATION ALARM THE SCREEM SCHEEGENCY STOP THE SCREEM SIGHT FOR UN THE SCREEM SIGHT FOR UN THE SCREEM SIGHT FOR TO ALL TO SUP THE SCREEM SIGHT FOR TO ALL TO SUP THE SCREEM SIGHT FOR TO ALL TO ALL THE SCREEM SIGHT FOR THE ALL THE SCREEM SIGHT FOR THE ALL TO ALL THE SCREEM SIGHT FOR THE ALL TO ALL THE THE SCREEM SIGHT FOR THE ALL TO ALL THE ALL THE SCREEMS SIGHT FOR THE ALL TO ALL THE THE SCREEMS SIGHT FOR THE ALL THE ALL THE ALL THE ALL THE ALL THE SCREEMS SIGHT FOR THE ALL THE ALL THE THE SCREEMS SIGHT FOR THE ALL TH | | 29174 | HF_ALH1 HF_ALH1 HF_ALH1 HF_ALH1 |
| 782 783 784 785 786 787 788 787 788 789 799 799 799 799 799 | HFSCT_FSL_CONH_ALH HFSCT_FSL_FSL_FSL HFSCT_FSL_HL_GATE_NFT HFSCT_FSL_HL_GATE_NFT HFSCT_FSL_HL_GATE_NFT HFSCT_FSL_HL_GATE_NFT HFSCT_FSL_HL_GATE_NFT HFSCT_FSL_HL_GATE_NFT HFSCT_FSL_HL_GATE_NFT HFSCT_FSL_HL_GATE_NFT HFSCT_FSL_HL_GATE_NFT HFSCT_FSL_HL_GATE_NFT HFSCT_FSL_HL_ML HFSCT_FSL_HLD_VVV_NET HFSCT_FSL HFSCT_FSL HFSCT HFSC | THE SCREEN SUP CONHUMICATION ALARM THE SCREEN STALT OR UN THE SCREEN STALT OR UN THE SCREEN SHICH TAR UN THE SCREEN SHICH TAR DHET COMM FAIL THE SCREEN SHILET GATE PAIL TO CLOSE THE SCREEN SHILET GATE PAIL TO CLOSE THE SCREEN SHILET GATE VAM THE SCREEN SHILET GATE VAM THE SCREEN SHILET GATE UND FAITTEN THE SCREEN SHILD VALVE PAIL TO CLOSE THE SCREEN SHILD VALVE PAIL TO COPEN THE SCREEN SHILD VALVE VAM THE SCREEN SHILD VALVE VAM THE SCREEN SHILD VALVE VAM | | 2417474 2417474 2417474 2417474 2417474 2417474 2417474 2417474 2417474 2417474 241747474 24174747474 24174747474747474747474747747777777777 | HF_ALH1 HF_ALH1 HF_ALH1 HF_ALH1 |
| 782 783 784 785 786 787 785 787 785 738 738 738 739 739 739 735 735 735 735 735 735 735 735 735 735 | HFSCT_FSL_CONH_ALH HFSCT_FSL_FSL_FK_ALH HFSCT_FSL_HIT_CHP HFSCT_FSL_HIT_CHP HFSCT_FSL_HIGATE_ITC HFSCT_FSL_HIGATE_ITC HFSCT_FSL_HIGATE_ITC HFSCT_FSL_HIGATE_ALH HFSCT_FSL_HIGATE_ALH HFSCT_FSL_HINT_ALH HFSCT_FSL_HINT_ALH HFSCT_FSL_HINT_ALH HFSCT_FSL_HINT_ALH HFSCT_FSL_HINT_ALH HFSCT_FSL_HINT_ALH HFSCT_FSL_HIND_VVV_FTC HFSCT_FSL_HIND_VVV_AAH HFSCT_FSL_HIND_VVV_AAH HFSCT_FSL_HIND_VVV_AAH HFSCT_FSL_HIND_VVV_AAH HFSCT_FSL_HIND_VVV_AAH HFSCT_FSL_HIND_VVV_AAH | THE SCREED SUB COMMUNICATION ALARM THE SCREED STALTORUM THE SCREED SIGHT FOR UN THE SCREED SIGHT FOR UN THE SCREED SIGHT FOR UNT COMM FAIL THE SCREED SIGHT GATE FOR TO OPEN THE SCREED SINLET GATE FAIL TO OPEN THE SCREED SINLET GATE FAIL TO OPEN THE SCREED SINLET GATE LOW FAITTRY THE SCREED SINLET GATE HORT TENP THE SCREED SINLET GATE HORT COMM FAIL THE SCREED SINLE WAIVE FAIL TO OPEN THE SCREED SINLE WAIVE FAIL TO OPEN | | 241947 24194 | HF_ALH1 HF_ALH1 HF_ALH1 HF_ALH1 HF_ALH1 |
| 712 713 714 715 716 717 718 717 718 719 719 719 719 721 721 721 721 721 721 723 723 723 723 723 723 723 723 723 723 | HFSCT_FSL_CONH_ALH HFSCT_FSL_FSL_FSL_H HFSCT_FSL_HL_GATE_NFT HFSCT_FSL_HL_GATE_NFT HFSCT_FSL_HL_GATE_NFT HFSCT_FSL_HL_GATE_NFT HFSCT_FSL_HL_GATE_NFT HFSCT_FSL_HL_GATE_NFT HFSCT_FSL_HL_GATE_NFT HFSCT_FSL_HL_GATE_NFT HFSCT_FSL_HL_GATE_NFT HFSCT_FSL_HL_GATE_NFT HFSCT_FSL_HLD_VLV_NFT HFSC | THE SCREEN SUP CONHUMICATION ALARM THE SCREEN STALT OR UN THE SCREEN STALT OR UN THE SCREEN SHICH TAR UN THE SCREEN SHICH TAR DUT CONH TAIL THE SCREEN SHILET GATE PAIL TO CLOSE THE SCREEN SHILET GATE PAIL TO CLOSE THE SCREEN SHILET GATE PAIL TO OPEN THE SCREEN SHILET GATE PAIL THE SCREEN SHILET GATE PAIL THE SCREEN SHILET GATE DOTSNUCTION THE SCREEN SHILD YALVE PAIL TO CLOSE THE SCREEN SHILD YALVE DAT TO POPEN THE SCREEN SHILD YALVE DAT THE SCREEN SHILD YALVE DAT | | 241947 24194 | HF_ALH1 HF_ALH1 HF_ALH1 HF_ALH1 |
| 712 713 714 715 716 717 711 711 711 711 711 711 711 711 | HFSCT_FSL_CONH_ALH HFSCT_FSL_FSL_FSL_H HFSCT_FSL_HL HFSCT_FSL_HL HFSCT_FSL_HL HFSCT_FSL_HL GATE_ITC HFSCT_FSL_HL GATE_ITC HFSCT_FSL_HL GATE_ITC HFSCT_FSL_HL GATE_ITC HFSCT_FSL_HL HFSCT_FSL_HL HFSCT_FSL_HL HFSCT_FSL_HL HFSCT_FSL_HLD_VIV_ITC HFSCT_FSL_HLD_VIV | THE SCREED SUB COMMUNICATION ALARM THE SCREED STALTORUM THE SCREED STALTORUM THE SCREED SHICH TAR THE SCREED SHICT TAR THE SCREED SHICT GATE POHET COMM PAIL THE SCREED SHILT GATE PAIL TO CLOSE THE SCREED SHILT GATE PAIL TO OPEN THE SCREED SHILT GATE PAIL TO OPEN THE SCREED SHILT GATE LOW PATTERY THE SCREED SHILT GATE DOTENLOTTON THE SCREED SHILT GATE DOTENLOTTON THE SCREED SHILT GATE DOTENLOTTON THE SCREED SHILT GATE DOTENLOT THE SCREED SHILT GATE UNON TENP THE SCREED SHILT GATE UNON TENP THE SCREED SHILD VALVE PAIL TO CLOSE THE SCREED SHILD VALVE PAIL TO COEN THE SCREED SHILD VALVE AND TO STR THE SCREED SHILD VALVE AND TENP THE SCREED SHILD VALVE AND TENP THE SCREED SHILD VALVE OPTENLOTION THE SCREED SHILD VALVE DOTENLOTION THE SCREED SHILD VALVE DOTENLOTION | | 241947 24194 | HF_ALH1 HF_ALH1 HF_ALH1 HF_ALH1 HF_ALH1 |
| 742 743 744 745 746 747 747 747 748 749 749 749 749 749 749 749 749 749 749 | HFSCT_FSL_CONH_ALH HFSCT_FSL_FSL_FSL_H HFSCT_FSL_HL HFSCT_FSL_HL HFSCT_FSL_HL HFSCT_FSL_HL GATE_ITC HFSCT_FSL_HL GATE_ITC HFSCT_FSL_HL GATE_ITC HFSCT_FSL_HL GATE_ITC HFSCT_FSL_HL HFSCT_FSL_HL HFSCT_FSL_HL HFSCT_FSL_HL HFSCT_FSL_HLD_VIV_ITC HFSCT_FSL_HLD_VIV | THE SCREEM SUP COMMUNICATION ALARM THE SCREEM SCHEEGENCY STOP THE SCREEM SIGHT FOR UN THE SCREEM SIGHT FOR UN THE SCREEM SIGHT FOR UNT COMMUNICATION THE SCREEM SOUTH COMMUNICATION | | 24114 24144 241141 | HF_ALH1 HF_ALH1 HF_ALH1 HF_ALH1 HF_ALH1 |
| 712 713 714 715 717 717 717 717 717 717 717 718 717 718 717 718 717 718 717 718 718 | HFSCT,FSS_CONH_ALH HFSCT,FSS_TSOP HFSCT,FSS_HTE,ALH HFSCT,FSS_HT_GATE,HC HFSCT,FSS_HT_GATE,HC HFSCT,FSS_HT_GATE,HC HFSCT,FSS_HT_GATE,HC HFSCT,FSS_HT_GATE,HC HFSCT,FSS_HT_GATE,HC HFSCT,FSS_HTM | THE SCREED SUB COMMUNICATION ALARM THE SCREED SCHEDGENCY STOP THE SCREED SHICH TO RUM THE SCREED SHICH TO RUM THE SCREED SHICH TO RUM THE SCREED SHICH TO ATE ONE TO ONE TO THE SCREED SHILET GATE PAIL TO CLOSE THE SCREED SHILET GATE PAIL TO ONE TO THE SCREED SHILET GATE PAIL TO TO THE THE SCREED SHILET GATE PAIL TO PATH THE SCREED SHILET GATE PAIL TO PATH THE SCREED SHILET GATE PAIL TO OPEN THE SCREED SHILET PAIL TO PATH THE SCREED SHILE VALVE PAIL TO CLOSE THE SCREED SHILD VALVE PAIL TO OPEN THE SCREED SHILD VALVE PAIL TO OPEN THE SCREED SHILD VALVE PAIL TO PATH THE SCREED SHILD VALVE PAIL TO CLOSE THE SCREED SOUTH TO GATE PAIL TO OPEN | | 24114 24144 241141 | HF_ALH1 HF_ALH1 HF_ALH1 HF_ALH1 HF_ALH1 |
| 742 743 744 745 746 746 746 747 746 747 747 747 747 747 | HISC.TSILCONHLALH HISC.TSILCONHLALH HISC.TSILT.ALH HISC.TSILT.ALH HISC.TSILT.GATLING HISC.TSILT.GATLI | THE SCREEM SUP COMMUNICATION ALARM THE SCREEM SCHEEGENCY STOP THE SCREEM SCHEEGENCY STOP THE SCREEM SUGAT THE THE SCREEM SUGAT THE THE SCREEM SUGAT CALL ON THE SCREEM THE SCREEM SUGAT CALL ON THE SCREEM THE SCREEM SUGAT CALL ON THE SCREEM THE SCREEM SUBJECT AND AND AND AND THE SCREEM SUBJECT AND AND AND AND AND THE SCREEM SUBJECT AND AND AND AND AND THE SCREEM SUBJECT AND AND AND AND AND AND THE SCREEM SUBJECT AND AND AND AND AND AND AND THE SCREEM SUBJECT AND AND AND AND AND AND THE SCREEM SUBJECT AND AND AND AND AND AND THE SCREEM SUBJECT AND AND AND AND AND AND AND THE SCREEM SUBJECT AND AND AND AND AND AND AND THE SCREEM SUBJECT AND | | 24114 2417474 2417474 2417474 2417474 2417474 2417474 2417474 241747474 2417474747474747474747474774774777777777 | HF_ALH1 HF_ALH1 HF_ALH1 HF_ALH1 HF_ALH1 |
| 712 713 714 715 717 717 717 717 717 717 717 718 717 718 717 718 717 718 717 718 718 | HISC.TSI.CONH.LILH HISC.TSI.SI.OP HISC.TSI.TE.ALH HISC.TSI.TE.ALH HISC.TSI.M.GATE.TC HISC.TSI.M.GATE.TC HISC.TSI.M.GATE.TC HISC.TSI.M.GATE.TO HISC.TSI.M.GATE.ALH HISC.TSI.M.GATE.ALH HISC.TSI.TSI.M.GATE.ALH HISC.TSI.TALAH HISC.TSI.ALH HISC.TSI.TALAH HISC.TS | THE SCREED SUB COMMUNICATION ALARM THE SCREED STALTORUM THE SCREED SIGHT FOR UN THE SCREED SIGHT FOR UN THE SCREED SIGHT FOR UN THE SCREED SIGHT GATE POHET COMM FAIL THE SCREED SINCE GATE PAIL TO CLOSE THE SCREED SINCE AND PAIL TO CLOSE THE SCREED SINCE TO TO STRUED ALL TO CLOSE THE SCREED SINCE TO THE PAIL TO CLOSE THE SCREED SINCE TO THE PAIL TO CLOSE THE SCREED SINCE TO AN UNITE OFFICE THE PAIL TO CLOSE THE SCREED SOUTH CE GATE PAIL TO CLOSE | | 24114 24144 241141 | HF_ALH1 HF_ALH1 HF_ALH1 HF_ALH1 HF_ALH1 |
| 742 743 744 745 746 746 746 747 746 747 747 747 747 747 | HISC.TSI.CONH.LILH HISC.TSI.SI.OP HISC.TSI.TE.ALH HISC.TSI.TE.ALH HISC.TSI.M.GATE.TC HISC.TSI.M.GATE.TC HISC.TSI.M.GATE.TC HISC.TSI.M.GATE.TO HISC.TSI.M.GATE.ALH HISC.TSI.M.GATE.ALH HISC.TSI.TSI.M.GATE.ALH HISC.TSI.TALAH HISC.TSI.ALH HISC.TSI.TALAH HISC.TS | THE SCREEM SUP COMMUNICATION ALARM THE SCREEM SCHEEGENCY STOP THE SCREEM SCHEEGENCY STOP THE SCREEM SUGAT THE THE SCREEM SUGAT THE THE SCREEM SUGAT CALL ON THE SCREEM THE SCREEM SUGAT CALL ON THE SCREEM THE SCREEM SUGAT CALL ON THE SCREEM THE SCREEM SUBJECT AND AND AND AND THE SCREEM SUBJECT AND AND AND AND AND THE SCREEM SUBJECT AND AND AND AND AND THE SCREEM SUBJECT AND AND AND AND AND AND THE SCREEM SUBJECT AND AND AND AND AND AND AND THE SCREEM SUBJECT AND AND AND AND AND AND THE SCREEM SUBJECT AND AND AND AND AND AND THE SCREEM SUBJECT AND AND AND AND AND AND AND THE SCREEM SUBJECT AND AND AND AND AND AND AND THE SCREEM SUBJECT AND | | 24114 2417474 2417474 2417474 2417474 2417474 2417474 2417474 241747474 2417474747474747474747474774774777777777 | HF_ALH1 HF_ALH1 HF_ALH1 HF_ALH1 HF_ALH1 |
| 742 743 744 745 746 747 746 747 748 747 748 749 749 749 749 749 749 749 749 749 749 | HISC.TSILCONHLALH HISC.TSILCONHLALH HISC.TSILT.ALH HISC.TSILT.ALH HISC.TSILT.GATLING HISC.TSILT.GATLI | THE SCREED SUB COMMUNICATION ALARM THE SCREED STALTORUM THE SCREED SIGHT FOR UN THE SCREED SIGHT FOR UN THE SCREED SIGHT FOR UN THE SCREED SIGHT GATE POHET COMM FAIL THE SCREED SINCE GATE PAIL TO CLOSE THE SCREED SINCE AND PAIL TO CLOSE THE SCREED SINCE TO TO STRUED ALL TO CLOSE THE SCREED SINCE TO THE PAIL TO CLOSE THE SCREED SINCE TO THE PAIL TO CLOSE THE SCREED SINCE TO AN UNITE OFFICE THE PAIL TO CLOSE THE SCREED SOUTH CE GATE PAIL TO CLOSE | | 24114 24144 241141 | HF_ALH1 HF_ALH1 HF_ALH1 HF_ALH1 HF_ALH1 |

Working through initial alarm rationalization pre-deployment reduces alarm troubleshooting efforts during commissioning.

| | | | | ALM1 |
|---------------------------|------------------------------------|----|-------|----------------------------|
| CF_QVC1_AUG_JAH_ALARH | GWC1 GRINDER JAH ALARH | HF | HPIPS | HP_ALH: commentary alarm 1 |
| CP_GWC1_AUG_OL_ALH | GWC 1 AUGER OVERLOAD | HP | HPIPS | |
| CF_GWC1_AUG_OVER_TEMP_ALH | GWC 1 GRINDER OVER TEMP ALARH | HF | HFIPS | HP_ALH: commentary alarm 1 |
| CF_GWC1_AUG_TSH_ALM | GWC 1 AUGER HIGH TEMP | HF | HFIPS | |
| CF_GWC1_COMHOH_FAIL_ALH | GWC 1 COMMON FAIL ALARM | HF | HPIPS | |
| CF_GWC1_COMP_FAIL | GWC1 COMPACTOR FAIL | HF | HPIPS | |
| CP_GWC1_EPW_ALH | GWC 1 EPPLUENT PLUSHINGWATER ALARM | HF | HPIPS | |
| CP_QVC1_EPV_LOW_PRES_ALH | GWC 1 EFW LOW PRESSURE ALARH | HP | HPIPS | |
| CP_QWC1_ESTOP | GWC 1 EMERGENCY STOP | HF | HFIPS | HF_ALH1 |

ALM: comment from allow