



Enterprise-wide Operational Intelligence System at San Francisco Wastewater

Presented by Max Chung
SFPUC Electrical Engineering



Our Background

- The city under The City
 - Wastewater Enterprise (WWE) operates and maintains the collection system, treatment plants, and outfalls
 - 1,000 miles of sewer lines
 - 27 pumping stations
 - 3 treatment plants
 - 8 deep water outfalls



How much water can we treat?

- Wastewater Enterprise (WWE) has 2 major and 1 standby sewage treatment plants.
 - Southeast plant (SEP) –treats up to 250 MGD (1G = 3.78L)
 - Oceanside plant (OSP) –treats up to 65 MGD
 - Northpoint plant (NPP) –activated during major rain events, treats up to 150 MGD (during major rain events only)
 - There are 27 sewage collection stations scattered throughout SF which pump flows to these treatment plants

Sewer System Improvement Program

- Our aging infrastructure will embark on a **20-year, 6.9 billion dollar** capital improvement program
- A part of this program is the upgrade to our 15 year old DCS
- After going through several historians we finally found the right fit, the **PI System**

How do we use the PI System?

- PI Coresight
- PI DataLink
- Notifications
- Linked tables through Asset Framework (AF)
- Future uses: Asset Management through AF

- Process Engineers use it
- The old data retrieval process required writing SQL queries
- PI DataLink
 - Familiar
 - No SQL queries
 - Great support

Notification Snapshots

FW: ***** SEP PLANT FLOW HIGH > 100MGD ***** - Message (HTML)

File Message McAfee E-mail Scan

From: Engel, George| Sent: Tue 8/18/2015 8:40 AM
To: Chung, Max
Cc:
Subject: FW: ***** SEP PLANT FLOW HIGH > 100MGD *****

TRIGGERED BY: SEP Plant Flow HIGH > 100
4/7/2015 12:54:48 PM Pacific Daylight Time (GMT-07:00:00)

----- SEP -----

SEP TOTAL PLANT INFLUENT FLOW	247.4505	MGD
SEP 011 INFLUENT CHANNEL LEVEL 1	10.49502	MGD
SEP 011 MAIN LIFT PUMP FLOW TOTAL	32.39178	MGD
SEP FLOW TO BOOSTER PUMP STATION	149.6225	MGD
SEP ISLAIS CREEK OVERFLOW	96.65031	MGD
SEP RAIN GAUGE LEVEL (BLDG 930)	0.94	in

----- NSS -----

NSS JACKSON/BEACH SEWER LEVEL	128.4689	in
NSS DW CHANNEL FLOW	0	MGD
NSS WW CHANNEL FLOW	24.28327	MGD

----- CHS -----

CHS FLOW	95.88747	MGD
CHS LEVEL	289.9487	in
CHS RAIN GAUGE LEVEL	0.72	in

----- GFS -----

GFS UPSTREAM LEVEL	3.428571	ft
GFS DRY WEATHER FLOW	3.945055	MGD
GFS WET WEATHER FLOW	0	MGD
GFS RAIN GAUGE LEVEL	0.86	in

----- BFS -----

BFS UPSTREAM LEVEL	34.21477	ft
BFS FLOW	129.0997	MGD

----- MPS -----

MP DRY WEATHER SUMP LEVEL	-12.14103	ft
MP DRY WEATHER FLOW	0	MGD
MP WET WEATHER SUMP LEVEL	-24.15989	ft
MP WET WEATHER FLOW	3.784772	MGD

The following link only works on internal SFPUC WWE network:
[PI CORESIGHT](#)

Critical Alerts through Notifications

- This is the money saver. We are heavily regulated. Violations can cost millions of dollars.
- California State Board charges 10 dollars per gallon of violation
- Notifications have helped us mitigate errors in a timely fashion.

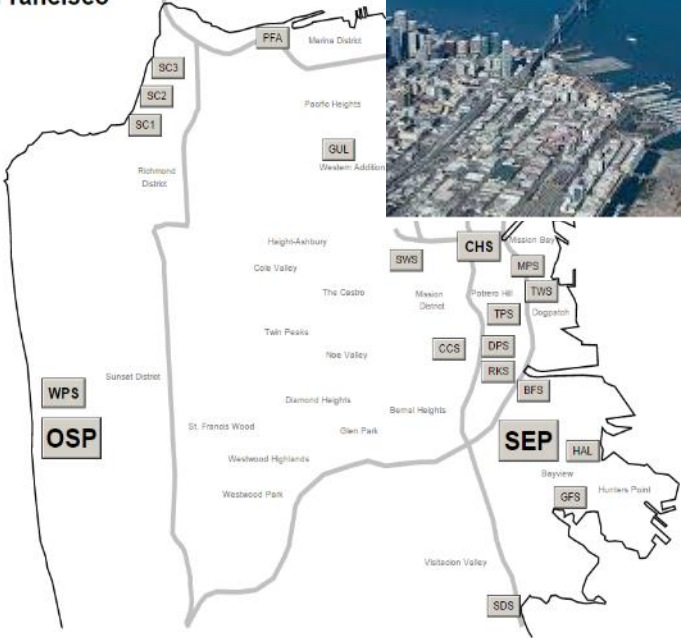
How we use PI Coresight 2014

The screenshot shows the PI Coresight web application interface. The browser address bar displays `http://pi/Coresight/`. The application header includes a search bar labeled "Search All Displays" and a "Filter by Labels" dropdown. A sidebar on the left lists navigation options: "ALL DISPLAYS" (selected), "FAVORITES", "MY DISPLAYS", "RECENT", "FOLDER HOME", "SOUTHEAST PLANT", "OCEANSIDE PLANT", "NORTHPOINT PLANT", "TREASURE ISLAND", and "SHARED". The main content area, titled "All Displays (334)", features a grid of 12 display thumbnails. Each thumbnail includes a visual representation of a process (e.g., pump stations, collection overview, maps, graphs) and a title. The thumbnails are arranged in a 3x4 grid. The titles of the displays are: Griffith Pump Station, Collection Overview, San Francisco Overview, Booster Pump Station, Channel Pump Station, Treasure Island Overview, PIML TEST, George's Magic, BLDG 911 HYPOCHLORITE STORAGE, NORTH SPINE PUMP STATION, PLANT OVERVIEW, and NPP-BLUDGE AND SCUM. Each thumbnail also shows a user icon and a star icon.

San Francisco Overview



San Francisco



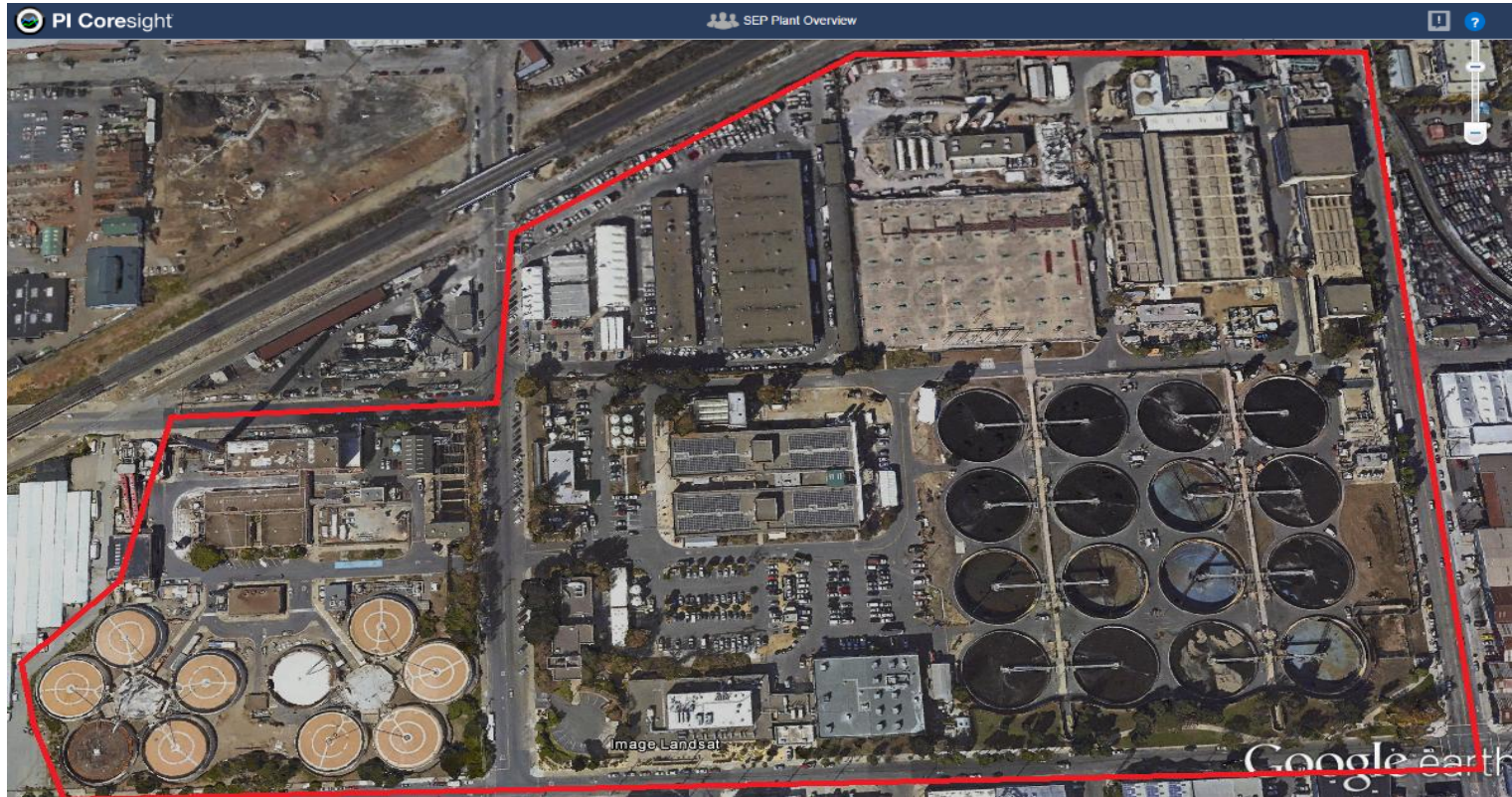
4/13/2015 12:43:27 AM

< 8h >

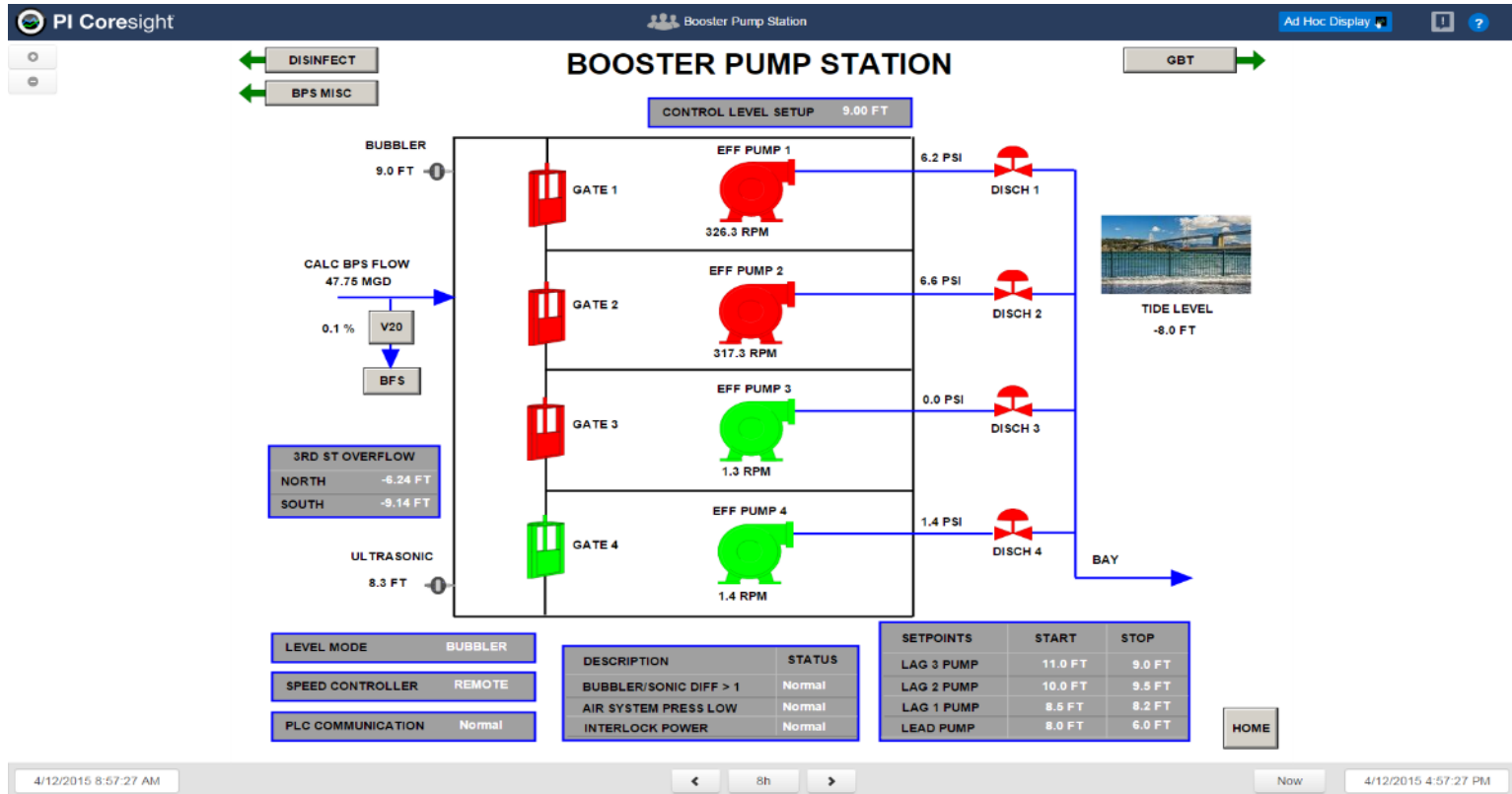
Now

4/13/2015 8:43:27 AM

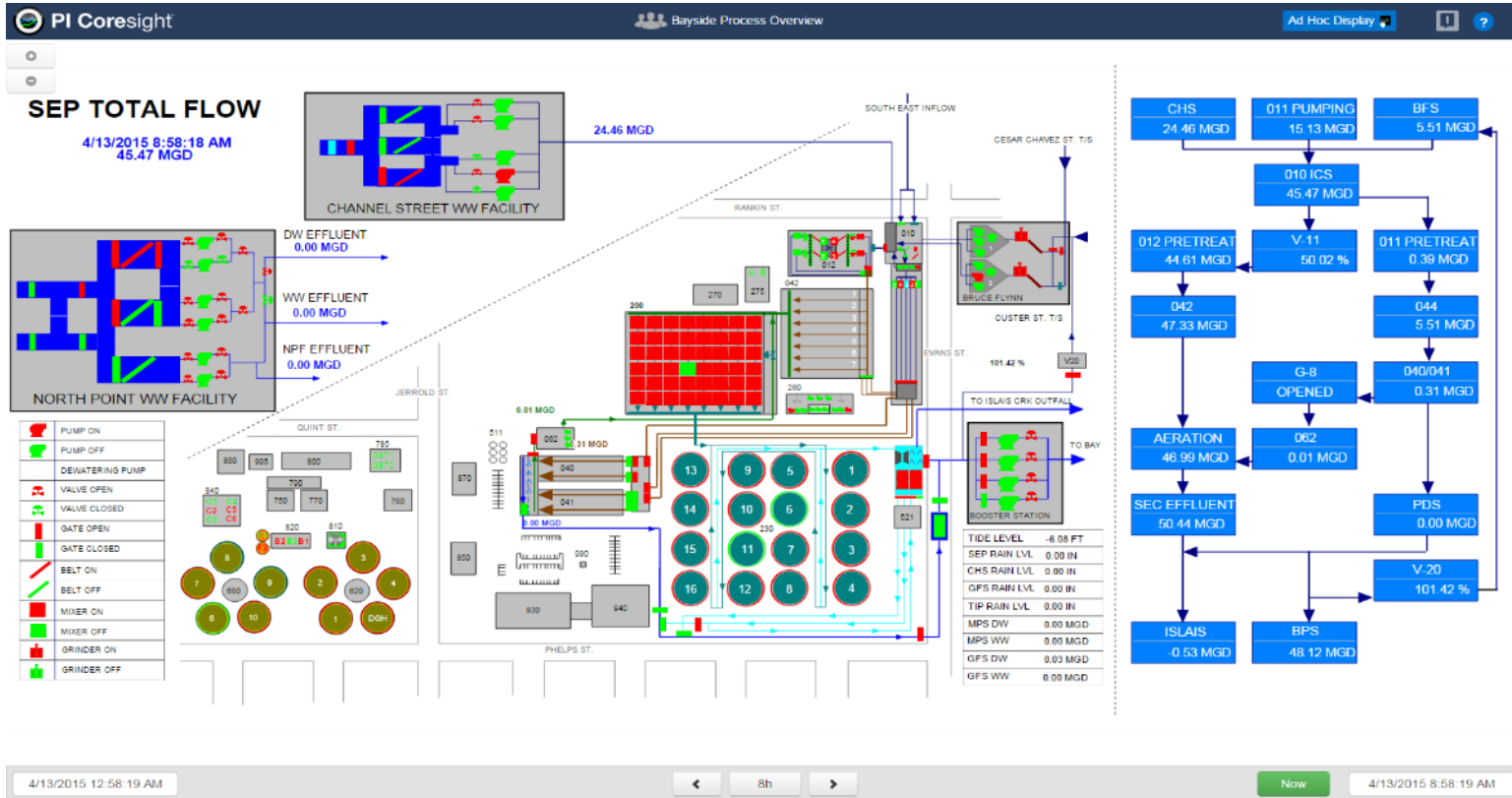
Southeast Plant Overview



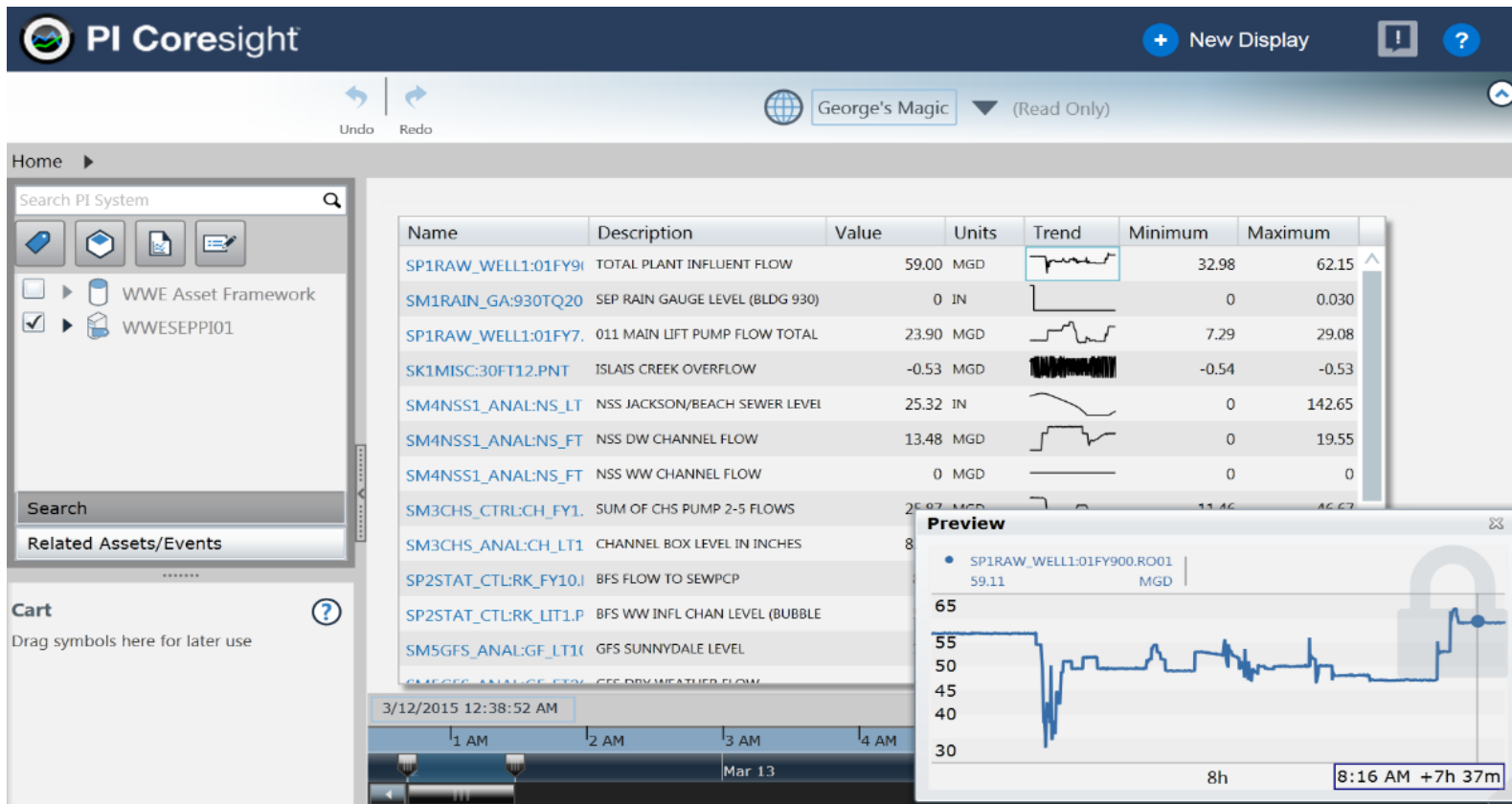
Booster Pump Station Training



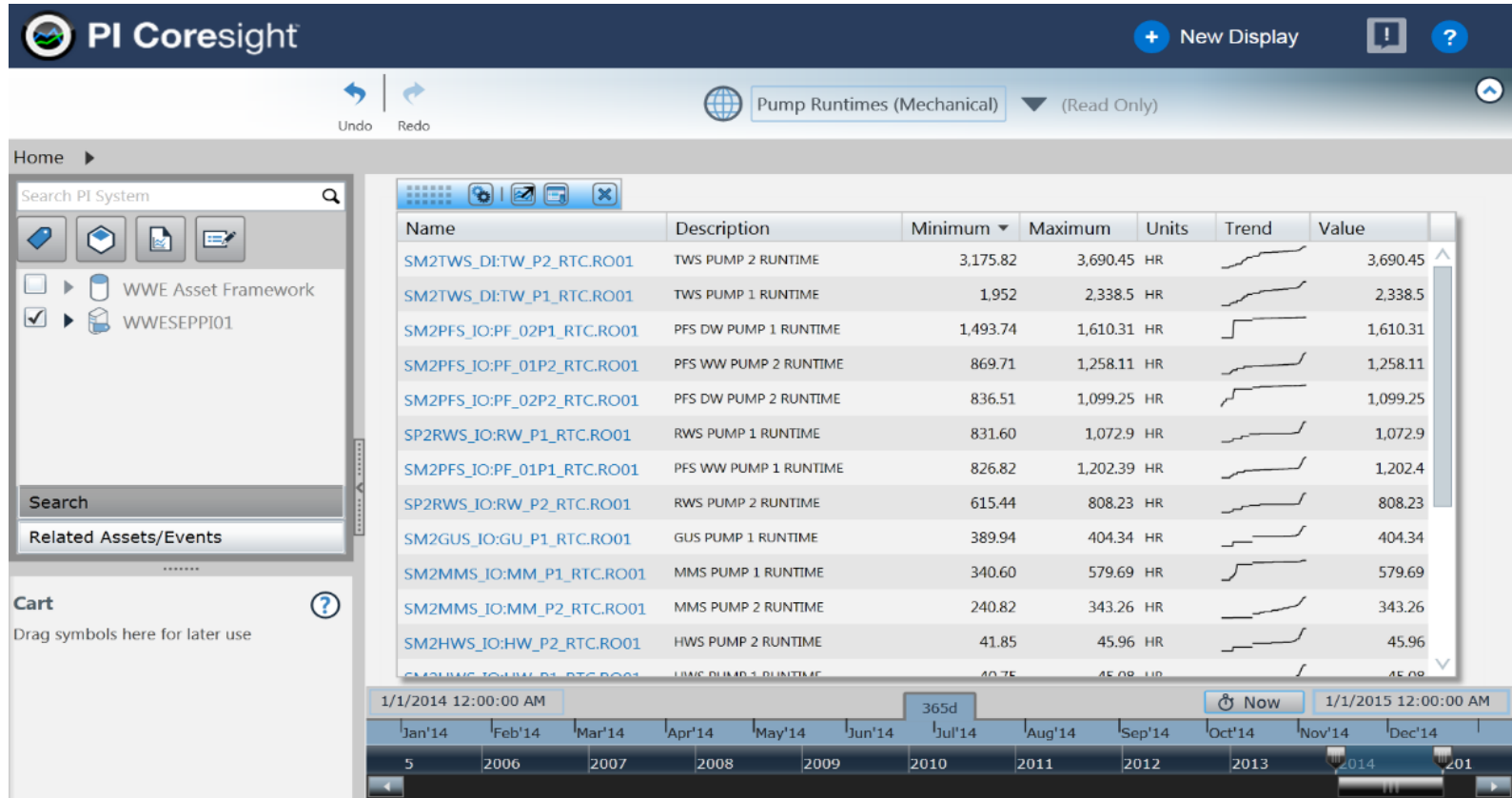
SEP Process Overview



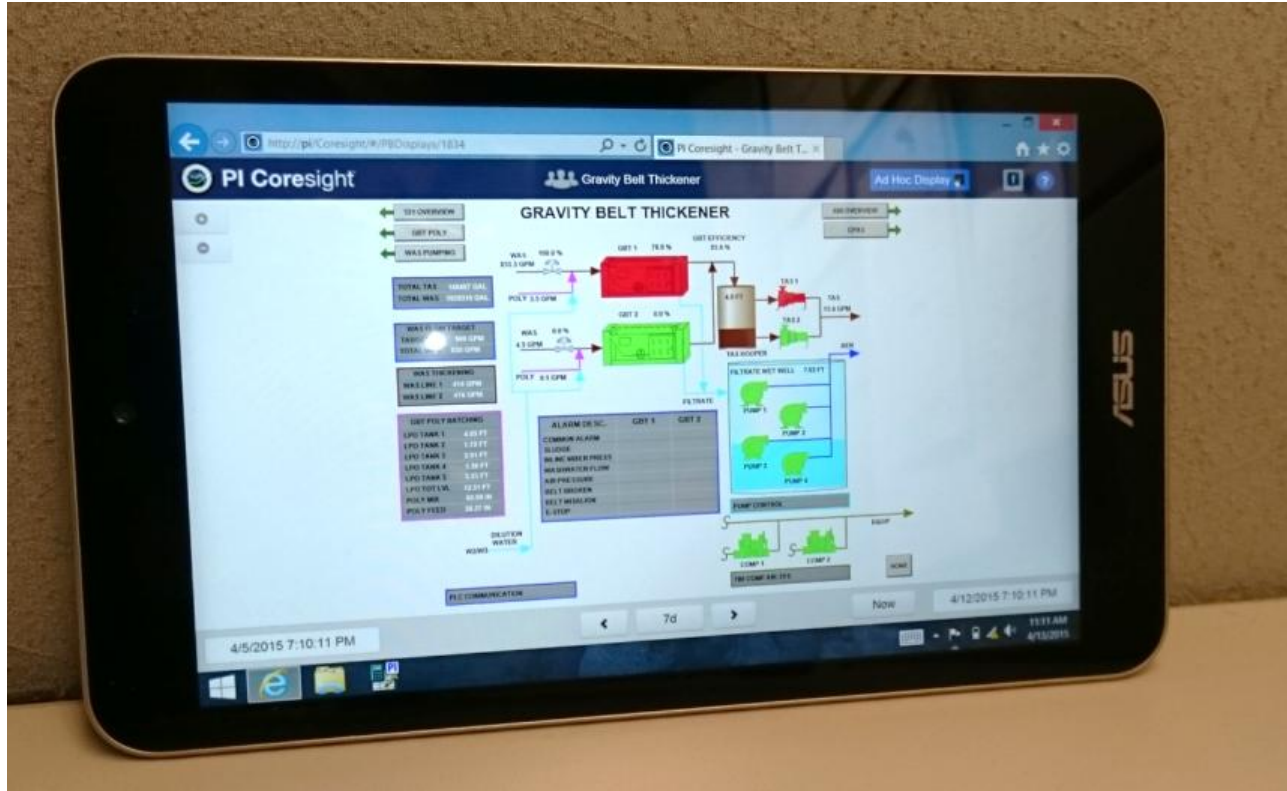
Critical Flows and Levels



Finding Pump Runtimes



Access PI Coresight w/ Tablet Devices



Asset Framework

WAPWWE - PI System Explorer

File Edit View Go Tools Help

Database Query Date Back Check In Refresh New Element New Attribute

Elements

- Elements
 - LIMS
 - SEP
 - CAKE
 - CENTRATE
 - CPAS
 - DIGESTER01
 - DIGESTER02
 - DIGESTER03
 - DIGESTER04
 - DIGESTER06
 - DIGESTER07
 - DIGESTER10
 - ACID_VOL
 - ALKALINITY
 - PH
 - TEMP_F
 - TS
 - TVS
 - FE
 - FILTRATE
 - GREASETANK
 - MLN
 - MLS
 - PPR
 - PRI
 - RAS
 - RAW
 - SEC_EFF
 - TAS
 - WAS
 - Maximo
 - Pilots
 - Reclaimed Water
 - Bauman Landscape and Construction Inc
 - Cal-Con Pumping Inc
 - Candlestick Contractors
 - CSD Sewer Operation - WVE
 - Devcon Construction Inc
 - Foundation Constructor
 - Golden Gate Bridge Highway and Transportation
 - S.F. DPW-BSES
 - Skyline Construction
 - Team North Construction Services, Inc

PH

General Child Elements Attributes Ports Version

Filter

Name	Value	Timestamp
GRAB	7.32 pH	6/29/2015 12:00:00 AM

Time Series Data

Archive Sampled Plot Summary

Attribute: GRAB

Start Time: 6/1/2015 7:25:46 AM End Time:

Retrieval Type: Time Range Boundary Type: Inside

Filter: ☐ Show Filtered

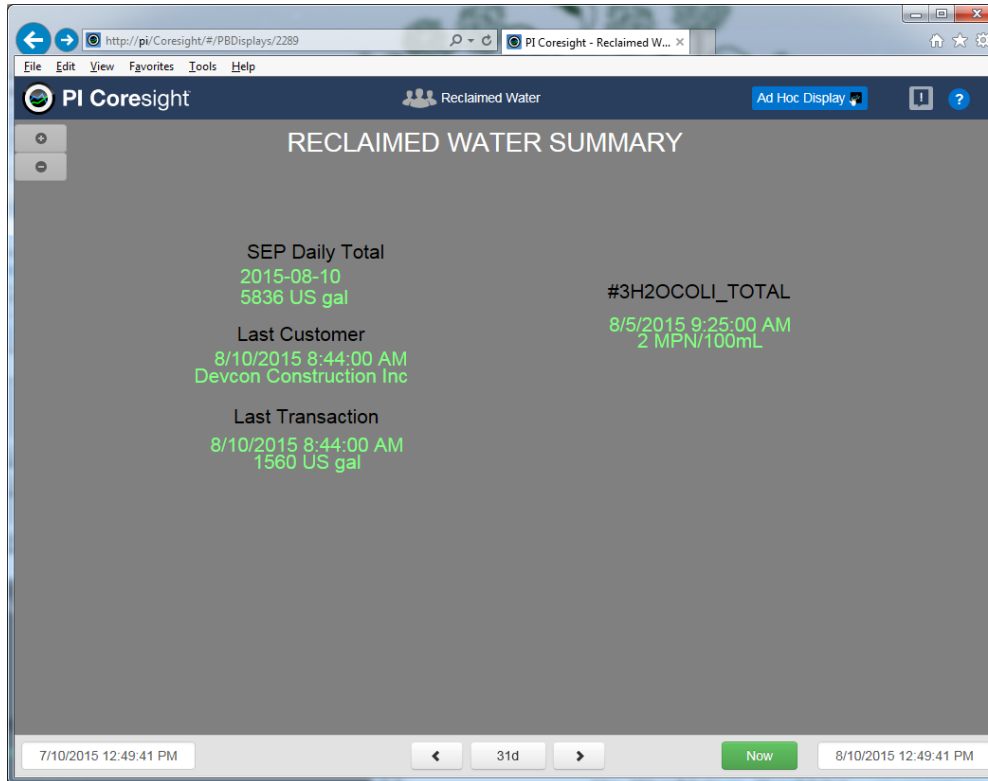
Reset Refresh

Timestamp	Value
6/15/2015 12:00:00 AM	7.46 pH
6/17/2015 12:00:00 AM	7.23 pH
6/19/2015 12:00:00 AM	7.41 pH
6/22/2015 12:00:00 AM	7.27 pH
6/24/2015 12:00:00 AM	7.4 pH
6/26/2015 12:00:00 AM	7.3 pH
6/29/2015 12:00:00 AM	7.32 pH

12 results returned in 0.2028039 seconds.

Close

Reclaimed Water



Asset Framework in the Future

- Link our PI System Data to our asset management software, Maximo.
- We have over 160,000 assets, of which 4000 are worth \$5000 or more.
- Predictive maintenance
 - Using Event Frames
 - Hourly runtime counters

Summary

Our industry is data-driven. Without data, we are operating 2 meters in front of us, hoping that we don't hit a wall 10 meters away.



BUSINESS CHALLENGES

- A. Wastewater discharge violations
- B. Data silos within our network
- C. Data from pilot programs hard to find

SOLUTION

- A. Notifications gets the right people the right alert, at the right time, saving you money right now.
- B. PI Coresight and PI DataLink have universal access. Anyone on the domain can access it
- C. Universal integration of foreign DB can be displayed in PI Coresight via AF-linked tables.

RESULTS AND BENEFITS

- A. Have not been in violation since Notifications was installed.
- B. PI DataLink and PI Coresight are easy to use, self-service tools. Time is money. Specialized report engineers are no longer needed.
- C. Data from pilot programs can now be easily obtained for ROI reporting

Contact Information

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Questions

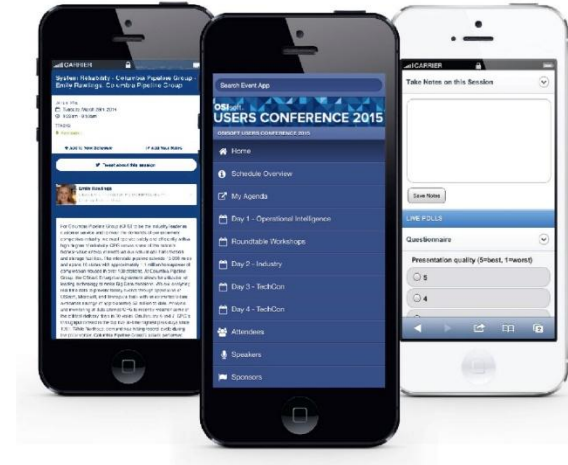
Please wait for the **microphone** before asking your questions



State your
name & company

Please don't forget to...

Complete the Online Survey
for this session



<http://eventmobi.com/emeauc15/>



감사합니다

谢谢

Danke

Merci

Gracias

Thank You

ありがとう

Спасибо

Obrigado