Ethylene Middle East Technology Conference

EMET CONFERENCE

3DTRASAR for Dilution Steam Systems

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Petrochemicals, Nalco Champion

Overview

- Background and vision that led to this new technology
- Technology summary and evolution to current 3DTfDSS model
- Benefits and capabilities
- Trials and case history

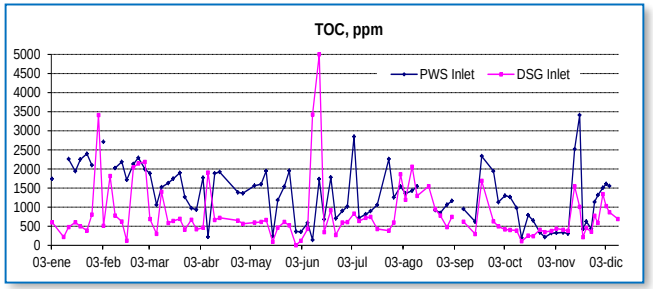
Problems in DSS

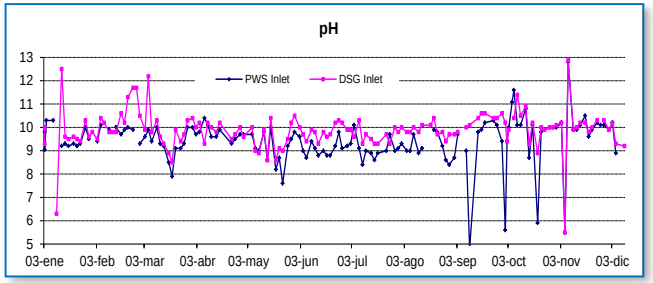
- Nalco's Best Practices are based on a project started in 1997, this survey has to date analysed 96 plant operations in 74 locations globally
- Corrosion rates greatly influenced by acetic acid loading, temperature, pH and oxygen
- Emulsions formation is dependant on feedstock, pH, residence. time and recycle streams
- Downstream fouling heavily dependent on the total organic loading in the process water
- Foaming control
- Need the correct pH balance between corrosion protection and emulsion stability

Dilution Steam System Needs

DS System Monitoring and Control is a challenge for ethylene plants

- Potential for exposure and extensive manpower required to capture samples and track system changes
- Corrosion rates increase with frequent pH swings
- System upsets are often missed due to High variability of system parameters
- Most process including pH are controlled manually
- Unstable separator operation increases PWS and DSG fouling





Dilution Steam Automation System

Main features

Continuous online monitoring module and controller platform

- Innovative pH probe designed for high temperatures and "dirty" water
- Conductivity

Turbidity Meter

- Patented Nalco Champion technology
- Online monitoring of turbidity
- Flow through sample cell
- Ultrasonic cleaner for optimum performance

Connectivity

- USB
- Analogic and digital input/output signals (signal to DCS).
- Wireless connection to Nalco's Refined Knowledge database

Sample Conditioning System

- Customized filtration and sampling system to allow efficient analysis of dirty water

Dilution Steam Automation System

Functionalities and Benefits

Physical display of pH without exposure to sample source

- Simple and safe to visually verify while in the field (no laptop needed)

Online Analysis of pH, conductivity, corrosion and turbidity

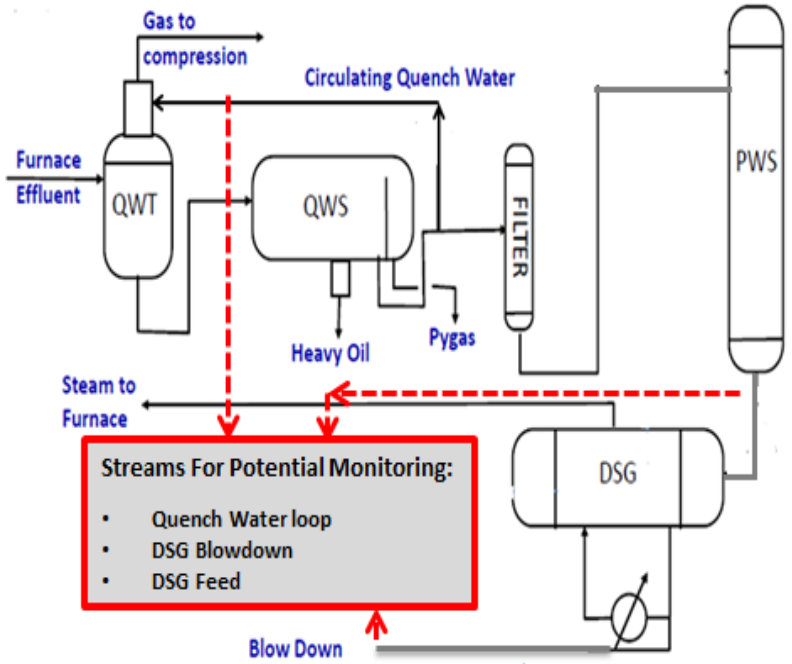
- Minimizing human errors while sampling & lab analysis
- Less manpower required for analysis and control of the system
- Accurate results at high temperatures and for "dirty" water
- Detection of intermittent system upsets

Feedback control of pH by adjusting neutralizer pump

- Stabilizing pH trend & corrosion control
- Prevent chemical waste by over dose
- Prevent corrosion by under dose of chemical
- Can select manual or auto mode

Evolution to current model

Beta model installed in ME -> February 2015



Beta Unit:

- All sample points to converge to one location
  - Sample quality an issue for longer runs
- No visual pH display
- 3 samples from Quench/PWS bottom / DSG BD taken

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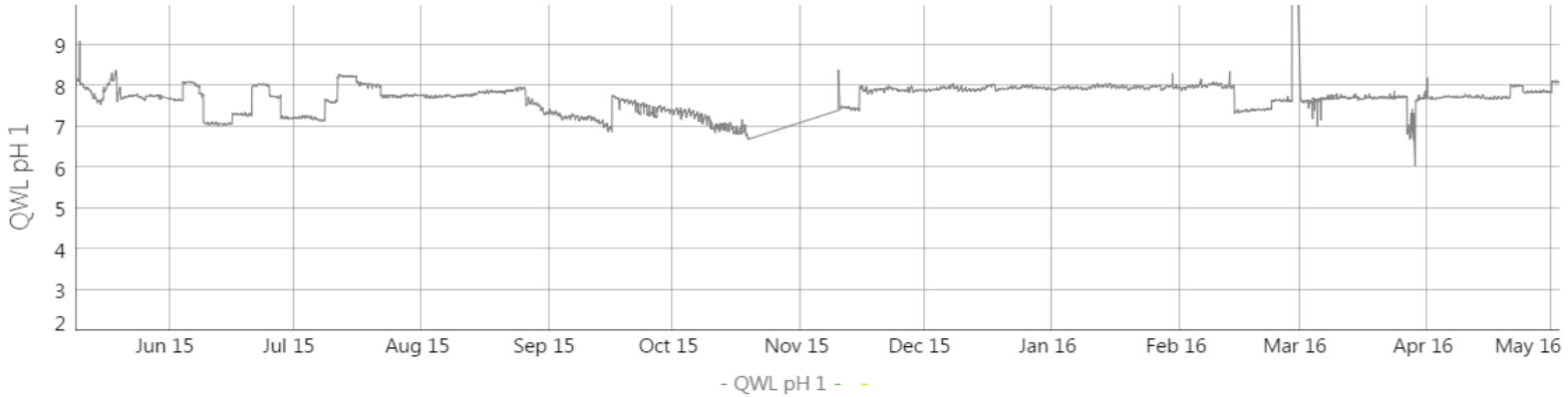
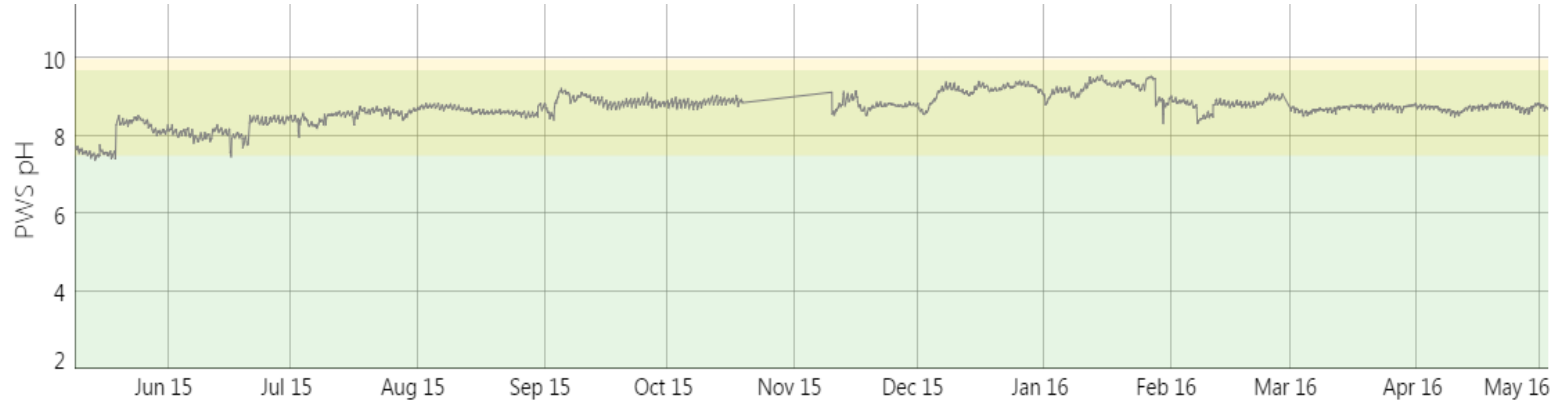
pH data from the unit

pH for Quench Loop

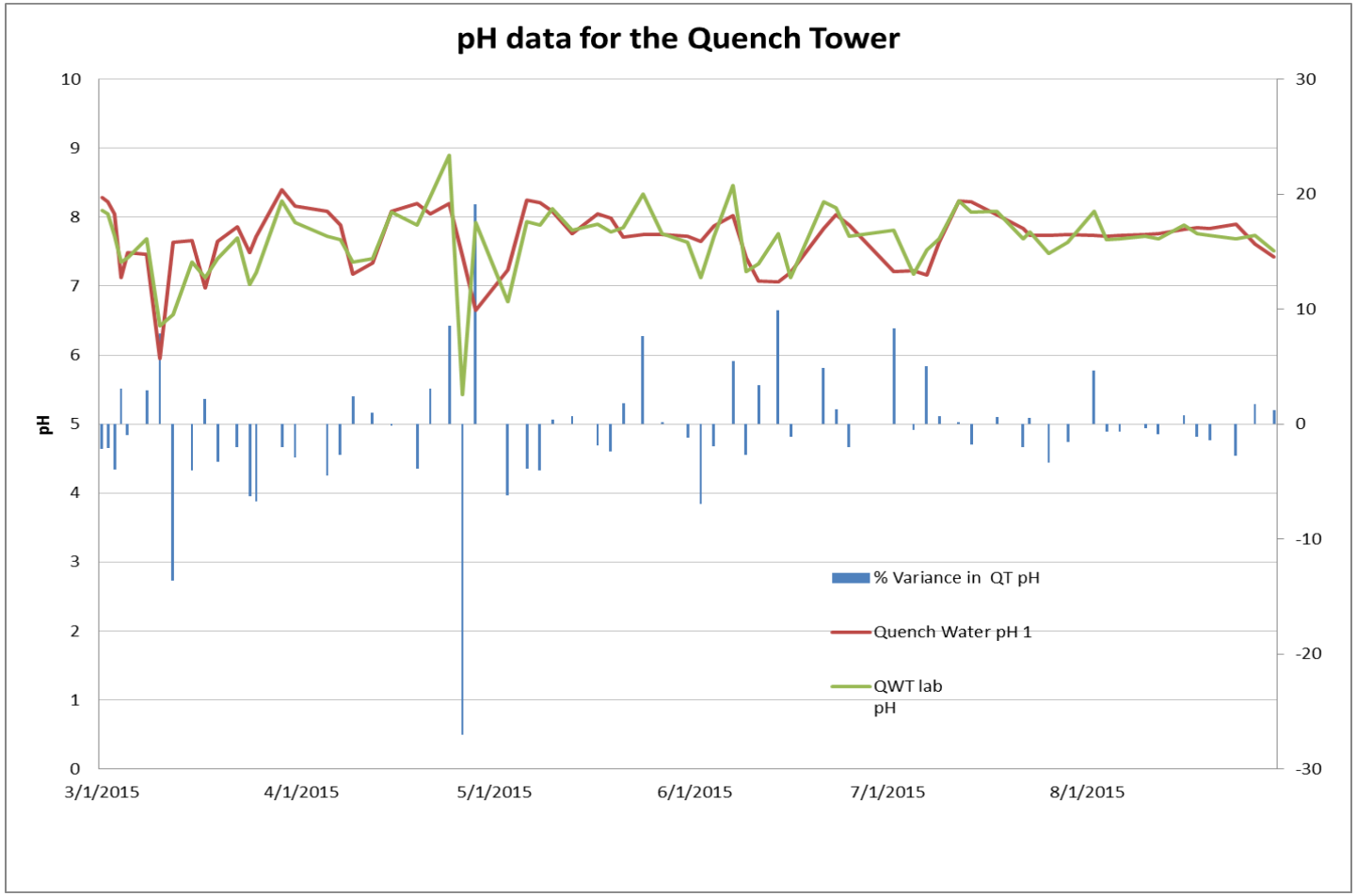


pH Process Water Stripper outlet



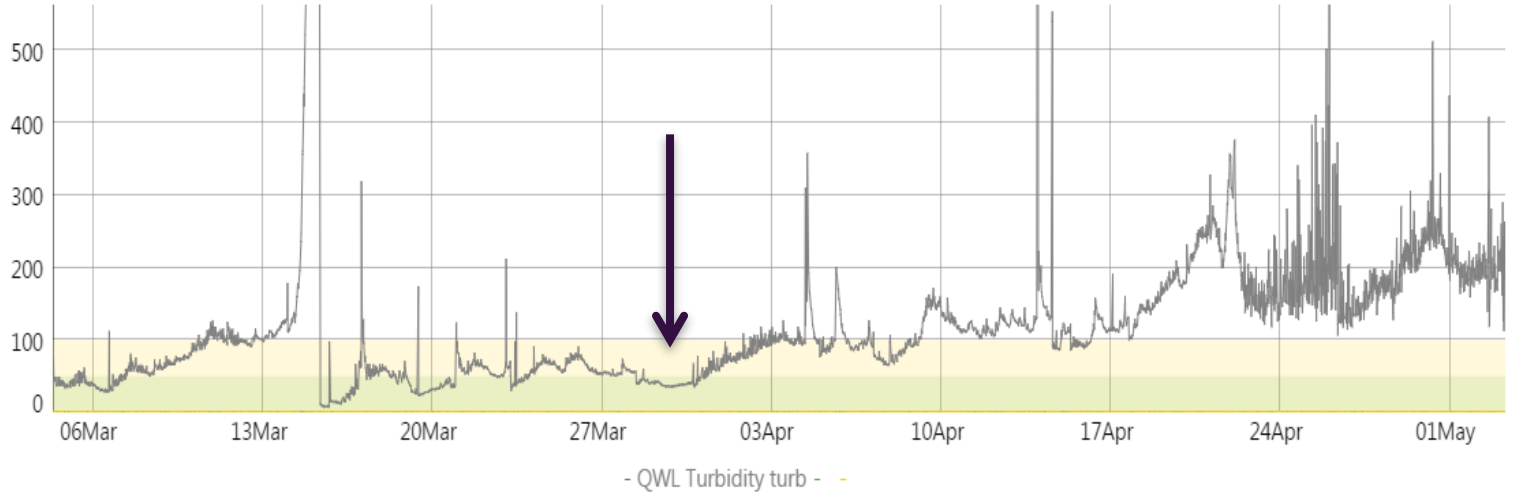
pH validation with lab data

pH for Quench Loop



Turbidity data post auto cleaner installation

Turbidity for Quench Loop

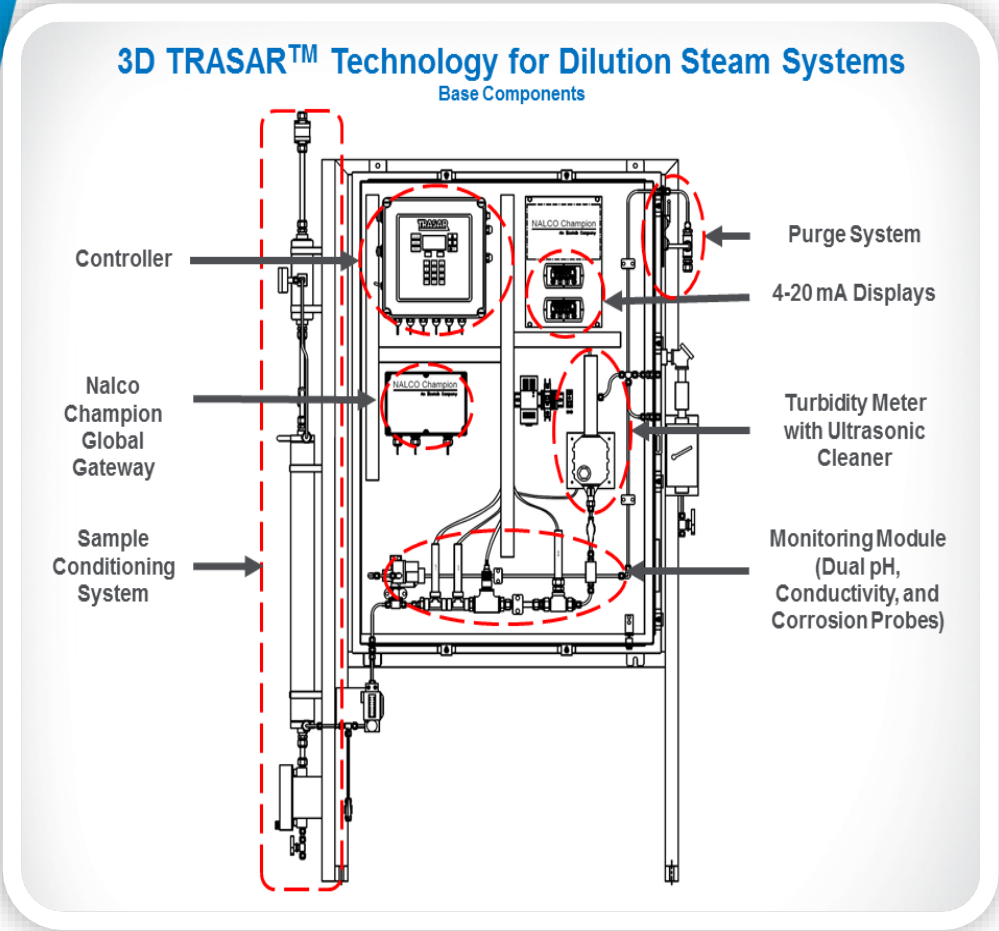


- Turbidity levels after the installation of auto cleaner.
- C3 cracking increased from April & the turbidity levels started to rise, but still we are getting good readings from the unit.

Field Trial Conclusions

1. pH for all the system showed good results with a deviation of <5% on the lab data, which was +/- 0.1 pH
2. pH probes were off only during the quench & BD sample line clogging, else they gave the readings continuously and accurately.
3. ORP & corrosion probes did match up with the pH & the lab Fe data
4. Turbidity data is within 20% std. deviation compared to the lab data. Auto cleaner helped to increase turbidity accuracy.

3DTRASAR for DSS commercial unit



Commercial unit

Equipment Overview

- **Sampling Conditioning System (SCS)** – Designed to safely cool sample process streams from the quench water loop, process water stripper, and dilution steam generator. It is achieved by sampling from a high pressure feed and returning the sample to a low pressure return.
- **Monitoring Module** - The pH & turbidity of the feed water can be continuously measured using this module. The sensors are mounted on the piping connecting the SCS and the fluorescent meter
- **Nalco Champion Global Gateway** - The global gateway allows the 3DTfDSS system to safely interface remotely with Nalco Champion's advanced Refined Knowledge Software.
- **Purge System** - The purge system is panel mounted. It controls the air flow and monitors the flow and pressure through the enclosure.
- **4-20ma Displays** - Two display screens are installed to allow the user to locate at two key parameters without opening the cabinet. The system comes prewired for pH on both screens.

Gulf Coast Case Study

Background

Need for improved pH control in QWT

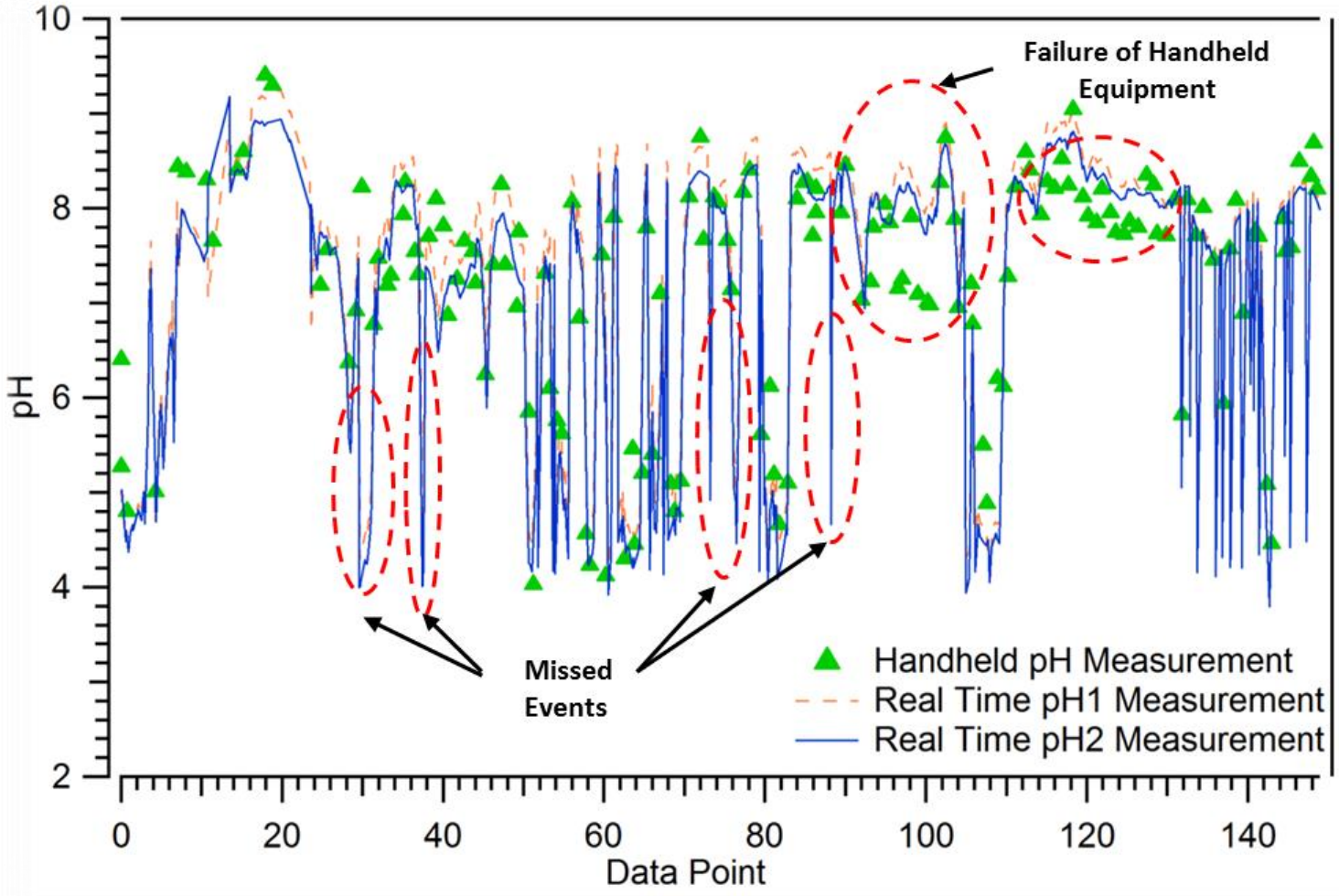
- Excessive pH swings due to acidic recycle stream
- Prior corrosion issues in quench tower resulted in reduced rates

Nalco Champion was granted a 6 week trial to prove 3D TRASAR™ Technology for Dilution Steam Systems on the quench water

- During trial, handheld pH measurements were performed twice a shift and compared to the 3DTfDSS readings
- ***Success Factors:*** Show that the analyzer can reliably monitor pH and match with handheld pH measurements within +/- 0.5 pH units 90% of the time

Gulf Coast Case Study

On-line versus handheld pH measurements



Gulf Coast Case Study

Commercial trial success summary

- During trial, handheld pH measurements were performed twice a shift and compared to analyzer
- ***Success Factors:*** Show that the analyzer can reliably monitor pH and match with handheld pH measurements within +/- 0.5 pH units 90% of the time

Trial Criteria	Delivered
+/- 0.5 pH	+/- 0.3 pH (all data points)
90% of the time	91% (all data points)
Statisical Data After Handheld Outliners Removed	
Time within +/- 0.5 pH	**100%**
Percent Error	**2%**
pH Deviation	**+/- 0.1 pH**

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THANK YOU

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