

ASHLAND'S AUTOMATION PORTFOLIO

A patented and proprietary Technology Platform that encompasses the latest innovations in:

On Line Performance Monitoring

- Using Extremely accurate water and process Performance Analyzers
- Offers “Proof of Performance”

Water Treatment Process Control

- State-of-the-art controllers
- Imbedded algorithms for PBC* and KBC*

Mobile and Cloud Computing

- Data Management Services

- *Performance Based Control
- *Knowledge Based Control



EVOLUTION OF WATER TREATMENT MONITORING

Manual Chemical Analysis

- Gives a 'snapshot' of your water chemistry



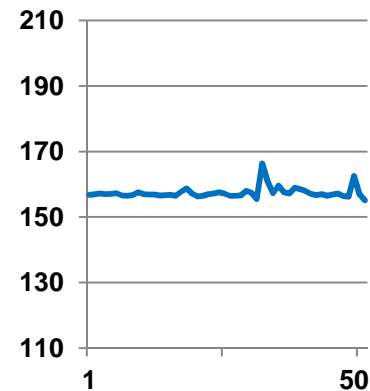
Corrosion & Scale Coupons

- Provides data on historical system condition



Real-time chemical monitoring

- Measures chemical levels and provides feedback if dosing problems

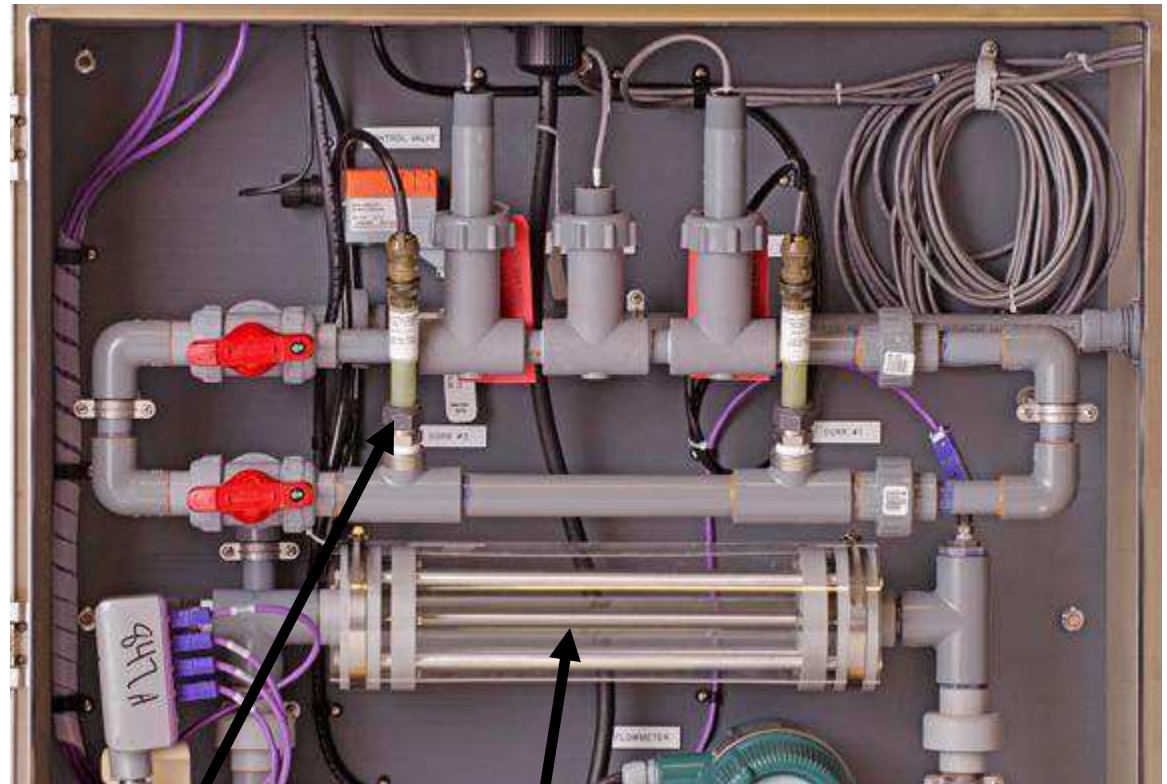


Real-time performance monitoring and control

- Most accurate and meaningful feedback on system condition



COOLING WATER PERFORMANCE MONITORING



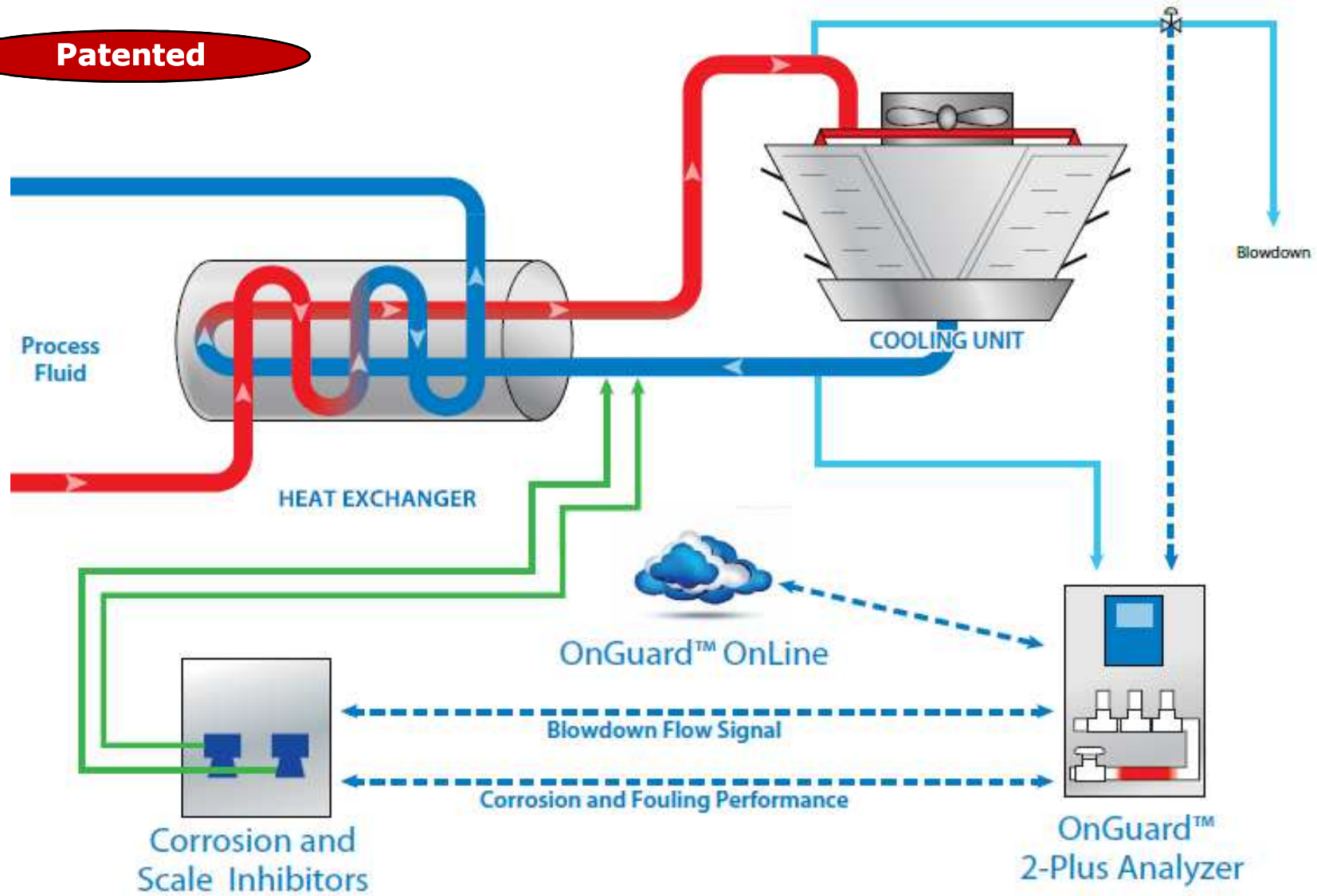
Corrater

Fouling Monitor

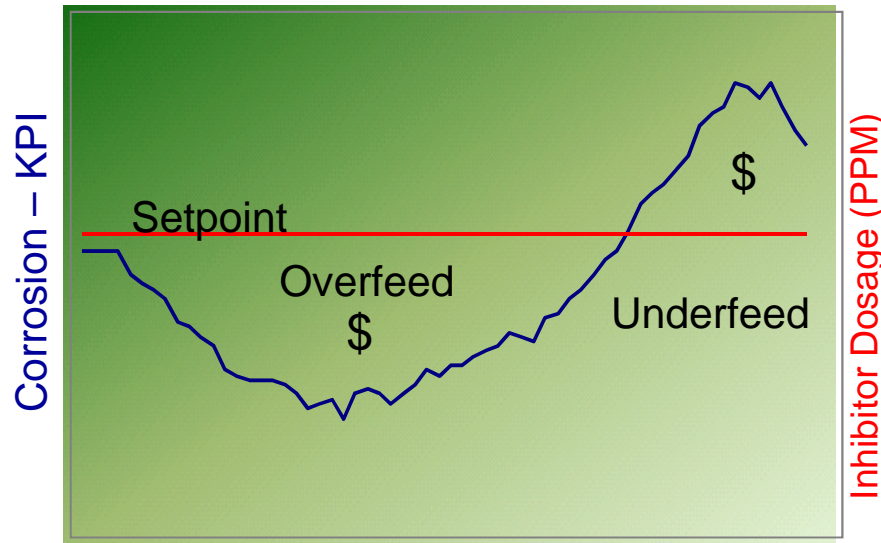
ONGUARD™ 2-PLUS CONTROL SYSTEM

Proprietary

Patented

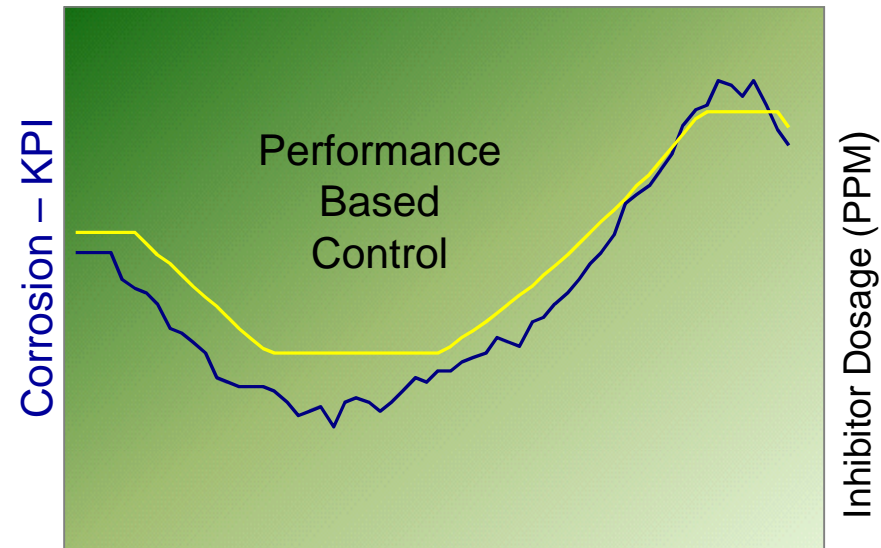


STANDARD CONTROL VS. PERFORMANCE CONTROL



— Corrosion Rate — Inhibitor Dosage (PPM)

Cooling Water Chemical Control
 Typical inhibitor feed program, based on tracer level set point or blowdown



— Corrosion Rate — Inhibitor Dosage (PPM)

Cooling Water Performance Monitoring & Control - Continuous process control responds to process key performance indicators

OPERATIONAL & PERFORMANCE MONITORING

KOI's

pH

ORP

Cycles

Conductivity

Water Consumption

Chemical Concentration

KPI's

Fouling

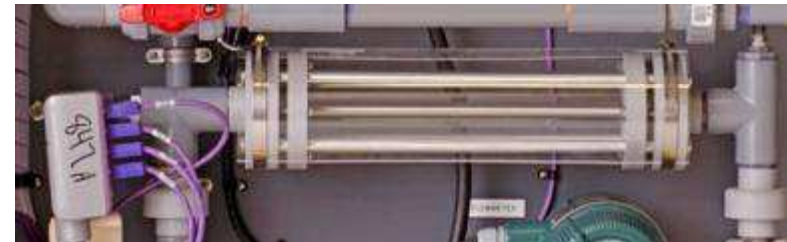
General Corrosion Rate

Imbalance/Pitting Corrosion
Index



COOLING WATER FOULING MONITORING

- HX design or operational values inputted
- Proprietary algorithms duplicate critical plant heat exchangers online
 - Using Heat Flux and Shear Stress
 - In compliance with NACE monitoring protocols



- Calculates Fouling Factor
 - Fouling Factor (FF) $\times 10^{-5}$ hr ft² °F / BTU
- Accounts for all types of fouling
 - Inorganic and bio-fouling

POWER CASE HISTORY - ONGUARD 2-PLUS OPTIMIZES PROGRAM PERFORMANCE AND INCREASES POWER PRODUCTION \$300K/YR

Background

- New England 19 MW zero liquid discharge power plant with 5 ppm iron in well water
- Excessive condenser and tower fill fouling

Customer Needs

- Reduce frequency of shutdowns for condenser cleanings
- Maintain peak power generation efficiency
- Clean-up tower fill

Ashland Solution

- OnGuard™ 2-plus proved fouling and ORP correlation
- Relocated chlorination feed to oxidize iron. Prevented reaction with silica.
- Established ORP target for halogen control, removing slime

Benefits

- Improved power generation 5%; revenue increased over \$300,000 per year
- Reduced outages and maintenance costs
- Increased side-stream silica removal from 10%-90% via coagulant optimization reducing fouling tendency

POWER CASE HISTORY - COOLING WATER TECHNOLOGY INCREASES REVENUE \$1.6 MILLION, CHEMICAL SPEND CUT 20%

Background

- US independent power producer faced changing environmental discharge restrictions, which limited cooling tower water chemistry control

Customer Needs

- Improve fouling and corrosion control
- Meet environmental discharge limits

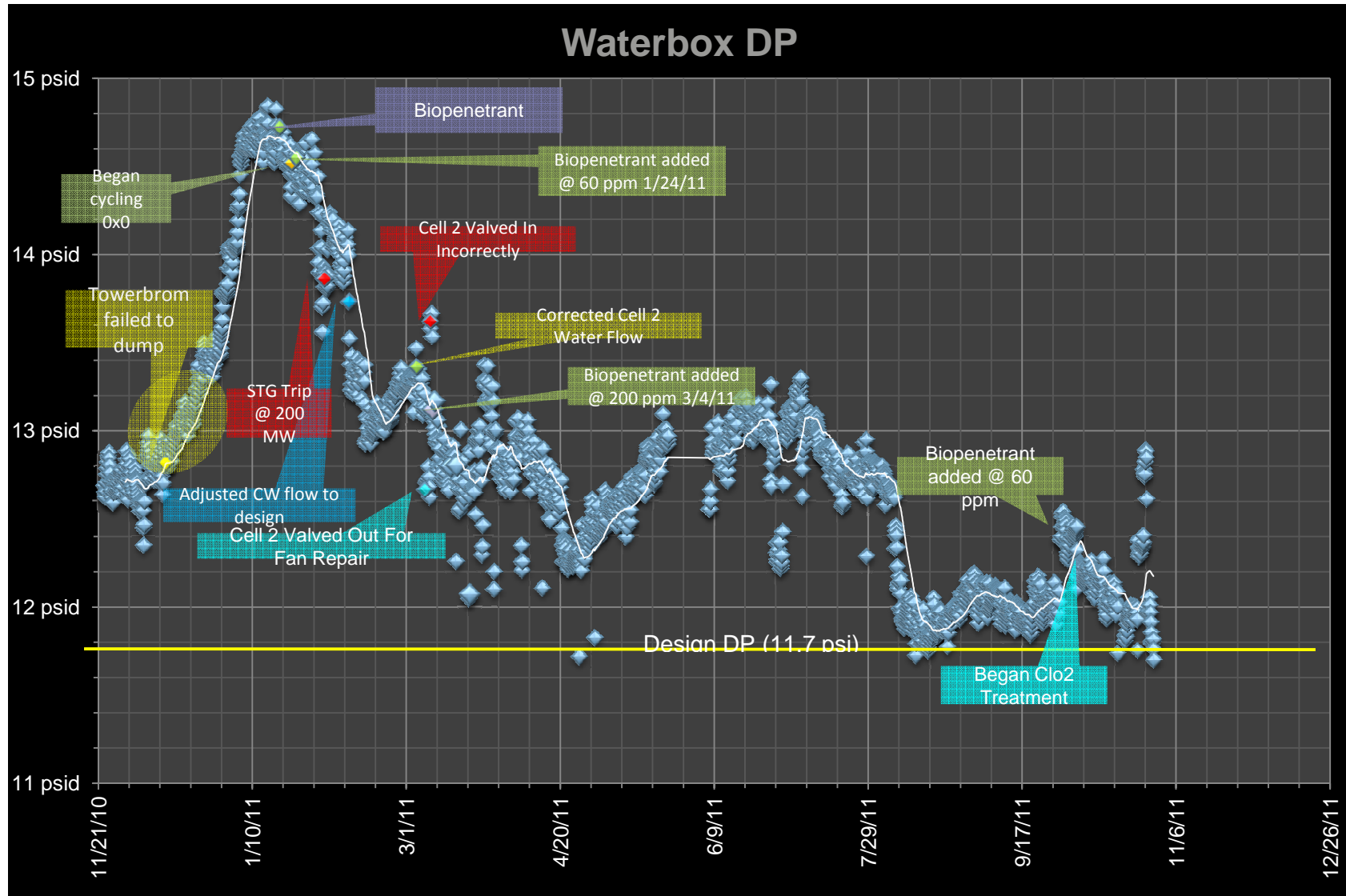
Ashland Solution

- Treatment program including OnGuard™ 2-plus analyzer performance-based monitoring and control equipment and augmentation with Drewspense 7130 dispersant to eliminate organic fouling

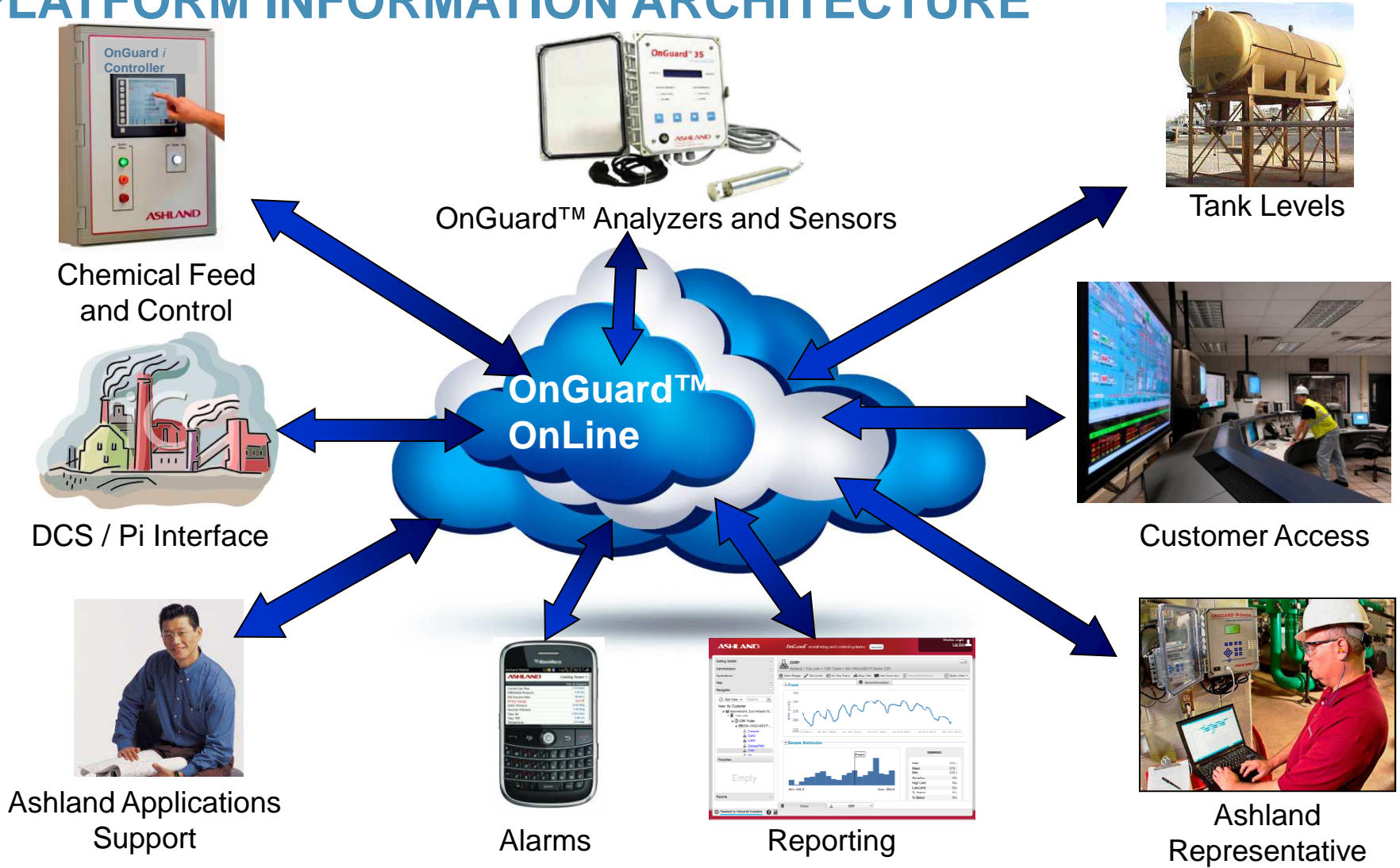
Benefits

- Increased power generation 6.7 MW; revenue increased over \$1.6 million
- Reduced chemical spend 20%
- Exceeded corrosion and fouling control targets
- Improved condenser cleanliness by 15%

CONDENSER WATER BOX DP WITH DREWSPERSE 7130



ONGUARD™ ONLINE PLATFORM INFORMATION ARCHITECTURE



Performance, Reliability, Cost Efficiency