AGENDA

• Who is Solenis and who is Norris Johnston?
• Why Boiler System Treatment, Monitoring, and Control
• Evolution of Treatment, Monitoring, and Control
• Monitoring and Control: Where, What, How
• Decision Making and Data Management
• Summary
INTRODUCTION

WHO IS SOLENEIS?  WHO IS NORRIS JOHNSTON?
WHO IS SOLENEIS?

A HISTORY OF TRUSTED PARTNERS

- Drew Industrial founded 1907
- Hercules founded 1912
- Betz Laboratories founded 1925

1907 – 1925

1981 - 1998

WATER

Ashland acquires Drew Industrial Division

Stockhausen Utility Water and Wastewater Polymer acquired

Betz Laboratories acquires Dearborn division of W.R. Grace

Hercules acquires Houghton

BetzDearborn acquired by Hercules Inc.

1998 - 2015

PULP & PAPER

Solenis is launched

3500+ Employees
118 Countries
30 Manufacturing sites

Ashland acquires Hercules

Solenis acquires Clearwater Specialties

2014 - 2015

2000

Hercules acquires Houghton

2015

2007

Solenis acquires Clearwater Specialties

2014

2008

Ashland acquires Hercules

2008

2007

1998

1996

1996

1981

1981

1996

1998

1907 – 1925

Drew Industrial founded 1907

Hercules founded 1912

Betz Laboratories founded 1925
WHO IS NORRIS JOHNSTON?

- Director: Applications, Platform Launch and Equipment
- BSChE: University of Arkansas 1972
- 42+ years in Water Treatment, 37+ years with same company
- Past Chairman, TAPPI Steam & Power / Energy Management
- Founding Member, BLRBAC Water Treatment Subcommittee
- Author: 9th edition, Betz Handbook
- Author/Co-Author: 8 TAPPI Technical Information Papers
- Author: Various Technical Publications/Presentations
BOILER WATER TREATMENT, MONITORING, CONTROL: WHY?
CRITICAL SUCCESS METRICS

- Compliance
- Sustainability
- Resources
- System Assurance
WHY BOILER WATER TREATMENT?

Safe, Reliable, and Economic Operation

NO SURPRISES!
WHY MONITORING AND CONTROL?

Good Chemistry is Not Enough

• Trust
• Comfort
• Confirmation

Action is Required

• Key Operating Indicators
• Key Performance Indicators
• Measure/React/Measure/React/……

“Assure, Verify, Protect”
EVOLUTION OF TREATMENT, MONITORING, CONTROL
WHERE WE STARTED

- Basic Treatment
  - Phosphate
  - Chelant
  - Sulfite
- Crude Manual Tests
  - Soap Test
  - Color Comparator – pH +
  - Grab samples
- Elementary Control Methods
  - Gross adjustments
  - Shot feed
  - Reactive
EVOLUTION OF TREATMENT, MONITORING, CONTROL

WHERE WE ARE HEADED

• Advanced Treatment
  • High Purity Boiler Feedwater
  • AVT, AP, Phosphate
  • Dispersants
  • Volatile Scavengers and Passivators

• Advanced Analytical Techniques
  • Continuous automated analysis
  • Precision titration methods
  • Ultra low detection limits in the field

• Advanced Control Methods
  • Smart Pumps
  • PLC and DCS systems
  • Artificial Intelligence
ONGUARD™ ONLINE PLATFORM ARCHITECTURE

- OnGuard™ Analyzers and Sensors
- Controllers
- Tank Levels
- DCS / Pi Interface
- Customer Access
- Solenis Applications Support
- Alarms
- Reporting
- Solenis Representative

Performance, Reliability, Cost Efficiency
MONITORING AND CONTROL
WHERE? WHAT? HOW?
MONITORING: WHAT?

Key Operating Indicators (KOI)

- Specific ions or water characteristics
- Specific flows

Key Performance Indicators (KPI)

- Corrosion
- Deposition
- Carryover
MONITORING: HOW?

Boiler System Monitoring
WHAT NOW?

DECISION MAKING AND DATA MANAGEMENT
DECISION MAKING

Monitoring Results

- Grab Test Data
- Continuous Test Data

Control Results

- Process Variable Data
- Event Data
- Trends
DATA MANAGEMENT

Real Time
- KOI and/or KPI tracking
- Trending

Historian
- KOI / KPI history
- Trend history
- Manual entry trends
- Continuous variable trends
SUMMARY
ONGUARD™ ONLINE PLATFORM ARCHITECTURE

- Tank Levels
- Controllers
- OnGuard™ Analyzers and Sensors
- Carryover
- Safe, Efficient, and Economic Operation
- NO SURPRISES!
- Corrosion
- Deposition
- DCS / Pi Interface
- Customer Access
- Solenis Applications Support
- Alarms
- Reporting
- Solenis Representative

Performance, Reliability, Cost Efficiency