CONTINUOUS REAL-TIME MONITORING OF FACTORY WATER SYSTEMS IDENTIFIES OPPORTUNITIES FOR PROCESS AND OPERATING COST IMPROVEMENTS

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Continuous Real-time Monitoring of Factory Water Systems Identifies Opportunities for Process and Operating Cost Improvements

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Wyndham Orlando Resort
3D TRASAR® Technology

Unique Process Monitoring Capability for Beet Sugar Processing

- Nalco Overview
- 3D TRASAR for Cooling
- 3D TRASAR for Boilers
- 3D TRASAR for Sugar
Nalco Company Profile

People you trust, delivering results.

NALCO
Overview of Nalco

• SUSTAINABLE VALUE CREATION
• PEOPLE INVESTMENT
• INDUSTRY ALIGNMENT
• DIFFERENTIATING TECHNOLOGY
Worldwide Leadership
“We are Where You Are”

North America
- Factories: 18
- Employees: 4,700

Europe/Middle East/Africa
- Factories: 12
- Employees: 3,000

European Operations:
Leiden, The Netherlands

Corporate Headquarters:
Naperville, IL

Latin America
- Factories: 6
- Employees: 1,400

Latin America Operations:
Sao Paulo, Brazil

Pacific Rim:
Singapore

Operations and Research Centers:
U.S., the Netherlands, Singapore

Asia/Pacific
- Factories: 13
- Employees: 1,600
# World-Class Support Team

- **Service Driven Business**
  - 11,600 degreed sales, research and marketing professionals world-wide
  - Key success factors: recruiting, development and retention

- **Local Experts**
  - Global knowledge management system links selling and service professionals
  - Share best practice expertise across the world

- **Customer Care Approach**
  - Selling reps generate new sales and expand share in existing accounts
  - Service reps provide maintenance services to existing accounts
  - Six Service Standards

- **Strong Training Investment**
  - One year for reps to reach productivity
  - 50% of 1st year spent on training

- **Deep Experience**
  - 45% of the North American sales force has greater than 10 years of service
Nalco commitment to Research & Development

165 Scientists (80 Doctorate Level)

>375 Patents in 35 Countries

(50+ in Progress)

5% of Sales Reinvested Annually
Sustainability

• We are all stakeholders in the global future, charged with safeguarding the world for future generations.

• We recognize the need for the Sustainable Development

• This means working towards a time when there will be no net loss of non-renewable resources. This can be achieved through conservation, re-use and recycle activity, and alternate technology, while minimizing the environmental impacts caused by emissions.
For over 80 years, Nalco has focused on providing solutions to our customers that result in:

- water conservation
- energy savings
- asset protection
- a competitive advantage

Sustainability is not new to Nalco......

......just a new term.
Nalco’s Environmental Performance

PORTA-FEED® Chemical Delivery

• Introduced 1985
• Nalco’s largest asset - $300 Million Plus
• Eliminated over 4 Million drums from land-fills

Drum costs: Manpower, Chemical Waste, Drum Disposal and Safety
Engineering approach: process

A data-driven process
3D TRASAR® Technology

Winner of the 2008 Presidential Green Chemistry Award

“3D TRASAR Systems saved 40.2 billion gallons of water for Nalco customers in 2007”

3D TRASAR Automation Control helps customers:

• Reduce water use
• Lower energy consumption
• Extend asset life
3D TRASAR® Technology

- Covered by 14 global patents
- Innovative chemistries – Tagged polymer & Bio-reporter
- Nalco proprietary fluorescence technology
- Nalco proprietary software – Optimizer & configurator
- Nalco proprietary hardware – Controller & fluorometer
- Online monitoring and reporting – 3D TRASAR® Web
- 24/7 Expert analysis and alarm coverage – Nalco 360 Service™
3D TRASAR® Technology for Cooling Water Overview

1. System Survey
2. MakeUp Analysis

Optimize

Configure

Direct Connect

Dial Up

ISP

3D Web

Alarms & Reports

NALCO
3D TRASAR® Technology for Cooling Water

**THE** Total Solution

- **Corrosion** failure = Maintenance costs
- **Scale**
- **Bio-Fouling**

- Scaled exchangers = Operating costs
- Bio-Film = Operating costs + Corrosion

NALCO
3D TRASAR® Scale Control

- Dispersant and “tag” incorporated into scale while inert TRASAR remains in bulk water

**Graph:**
- Inert Tracer (blue) and Polymer (purple) vs. Elapsed Time (hr)

**Diagram:**
- Inert TRASAR
- Chemical “tag”

**Image:**
- Electro-micrographic image of “tag” incorporated into mineral scale

**Text:**
- Controller detects instantaneous rate change between TRASAR and “tag.”
As system stress varies, 3D TRASAR adjusts dosage to compensate. At times of high stress, more inhibitor is fed. When stress decreases, less inhibitor is fed.
1. Fluorescent Bio-reporter reacts enzymatically with microbe.

2. Reacted bio-reporter fluoresces at a different wavelength.

3. 3D TRASAR® Fluorometer measures both un-reacted and reacted bio-reporter.
3D TRASAR® Technology for Corrosion Control

Two integrated corrosion probes using Linear Polarization Resistance (LPR)

Mild steel and copper metallurgies standard in the 3DT-5000 controller
3D TRASAR® Corrosion Control

Graph showing ORP (mV) and Copper Corrosion Rate (mpy) over time (each division = 1 day). The graph indicates a significant decrease in ORP and Copper Corrosion Rate after 3D Bio-Control Started.
3D TRASAR® Technology for Cooling Water in Beet Sugar Processing
TEMPERATURE & TURBIDITY

Vantage v100

Temperatures and turbidities over time from July 24, 2008, to September 30, 2008. The graphs show fluctuations in temperature and turbidity levels during this period.
Tower pH
3D TRASAR® Boiler Technology
What is 3D TRASAR® Boiler Technology?

- 3D TRASAR Web
- 3D TRASAR Boiler Configurator
- Corrosion Stress Monitor
- T3 Fluorometer
- TRASAR 3 probe
- TRASAR 1 probe
- Pretreatment
- Boiler
- Condensate
- Conductivity
- Hardness
- pH
- Cond.
- Breakthrough Detection
- TRASAR 3 probe
- pH
- Conductivity
- Particle counter
- NCM & LCM
- pH
Taking a closer look …

Boiler Scale and Deposit Control
### 24/7 TARGETED SCALE CONTROL

**NORTH AMERICAN - CAMPUS UTILITY**  
**NALCO 3D TRASAR BOILER AUTOMATION**  
*NexGuard 22310 FW DOSAGE*

<table>
<thead>
<tr>
<th></th>
<th><strong>3D TRASAR CONTROL</strong></th>
<th><strong>MANUAL CONTROL</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TARGET</strong></td>
<td>4.00 ppm</td>
<td>4.00 ppm</td>
</tr>
<tr>
<td><strong>AVG</strong></td>
<td>3.99 ppm</td>
<td>3.08 ppm</td>
</tr>
<tr>
<td><strong>Std. Dev</strong></td>
<td>0.24 ppm</td>
<td>1.48 ppm</td>
</tr>
<tr>
<td><strong>3 SIGMA</strong></td>
<td>3.27 ppm</td>
<td>0.00 ppm</td>
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<tr>
<td></td>
<td>4.71 ppm</td>
<td>7.53 ppm</td>
</tr>
<tr>
<td><strong>OFFSET</strong></td>
<td>-0.2%</td>
<td>-23%</td>
</tr>
<tr>
<td><strong>TIME</strong></td>
<td>92 days</td>
<td>50 days</td>
</tr>
</tbody>
</table>
LARGE STEAM LOAD SWINGS

540% STEAM LOAD SWINGS

3D TRASAR CONTROL

TARGET  4.00 ppm
AVG     3.99 ppm
Std. Dev 0.24 ppm
3 SIGMA  3.27 ppm
          4.71 ppm
Taking a closer look …

Pre-Boiler Corrosion Control

Controller

Nalco Corrosion Stress Monitor
Preboiler Corrosion Control
NCSM Technology

• **Measures** REDOX stress
  – Includes simultaneous corrosion mechanisms
  – Includes all chemicals in the feed water that could undergo a REDOX reaction

• **Detects** variations from desired state

• **Responds** real-time
  – Varies oxygen scavenger feed
  – Maintains ideal reduced, low corrosion state

• **Communicates** via controller and web
Feedwater Corrosion Stress Event

NCSM Monitoring Data

MANUAL CONTROL of SULFITE SCAVENGER DOSAGE

Next Shift Operator Realizes Mistaken Lack of Sulfite Feed to the FW. Sulfite Treatment Feed is Restarted to Reduce the FW Corrosion Stress

UNDER MANUAL CONTROL HUMAN ERROR WILL OCCUR AT SOME POINT

Operator Turns Off Sulfite Feed Because BW Sulfite Residual Remains Over the Target Range

S.O.P. at UTILITY CHANGED in JANUARY NEVER go to zero feed of sulfite, no matter what the BD residual concentration is.

NALCO
Feedwater Corrosion Stress Event

NCSM Control of Corrosion Stress

AT ORP control of sulfite treatment and Feedwater corrosion stress events
3D TRASAR® Technology for Sugar
3D TRASAR® Technology for Sugar
Nalco 360 Service

3D TRASAR + Web Connection + 24/7 Expert Center + Nalco Sales Engineer + Advanced Reporting = NALCO 360™

Peace of Mind
Profitable Performance

with a smaller environmental footprint

Delivering Sustainable Development