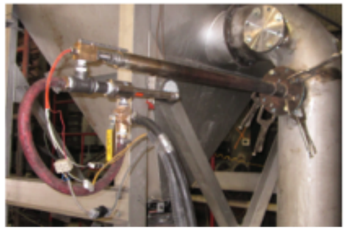
REACTION ENGINEERING INTERNATIONAL

Committed Individuals Solving Challenging Problems

Corrosion Management



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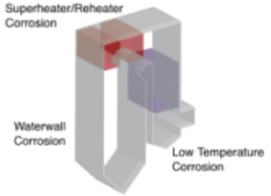
Cost of Corrosion

Corrosion costs the federal government $440 billion/yr or 5% of GDP. Corrosion costs to the electric power industry exceed $10 billion/yr. Technologies aimed at reducing emissions can have adverse effects on corrosion if implementation is not optimized.



Benefits of Corrosion Management

Monitoring combined with modeling can lead to optimized corrosion management by assisting fuel selection, boiler operation, materials selection and intelligent soot blowing operation.

- Reduction in unscheduled outages
- Reduction in maintenance costs
- Material life extension
- Reduction in expensive overlay or coatings
- Improved operational optimization
- Quantitative assistance in fuel selection/blending/additive decisions
- Quantitative assistance in materials selection and life cycle certainty

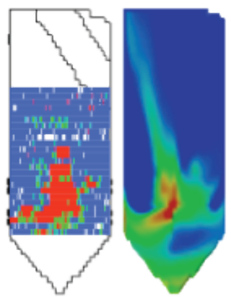
Solution Approach

- Identification of high risk locations
  - Application of CFD/process modeling
  - Wastage measurements and/or observations of material failures
- Evaluation of potential corrosion mechanisms
  - Gas-phase sulfur & chlorine species
  - Deposition of unreacted material
  - Acid gas dew point
- Focus on impacts of firing systems modifications, fuel changes, additive utilization, and operational optimization

Corrosion Modeling

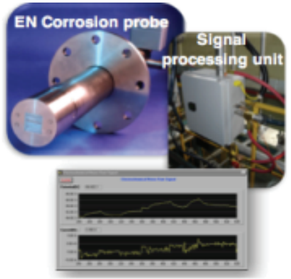
Prediction of fire-side corrosion through detailed 3-D modeling

- Correlation-based approach resulting from collaborations with EPRI and KEPRI
- Integrated with REI's CFD software (GLACIER)



Ultrasonic tube thickness measurements

CFD-based corrosion predictions

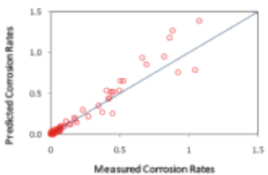


Real-time data output

EN Probe for Corrosion Testing/Monitoring

Real-time corrosion monitoring capability based on electro-chemical noise

- High Sensitivity
- Instantaneous response



- Direct indication of corrosion
- Quantitative measurement
- Response related to corrosion mechanism
- Over 15 years of application to lab-, pilot-, & full-scale
- Advanced Probe design

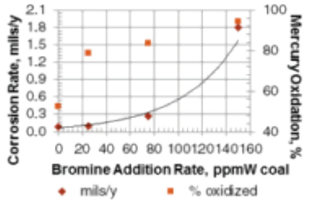
Collaborative development with Dr. William Cox, Corrosion Management Ltd.

- Noted corrosion expert
- 35+ yrs experience with EN tech.

Example Applications

Mercury Control

Recently completed corrosion studies of bromine and iodine use for mercury control



M. Gadgil (B&W), K. Davis (REI) Corrosion Rate Measurements when Adding Iodine and Bromine for Hg Oxidation. Reinhold NOx-Comb Conf. 2015.

Optimization of control technology can have enormous impact on corrosion abatement

REI's Hg Management Tools

MerSim™ Process Modeling
CFD Modeling w/ Advanced Chemistry
Mercury and Corrosion Testing

Metal study for HF Alkylation

- Alloy study in aqueous HF
- Investigated effect of Sulfur content of low-C steel

EN elements after 2 week exposure to aqueous HF

Reaction Engineering International

REI is an R&D consulting firm with internationally recognized expertise in combustion and environmental solutions. REI utilizes simulation and testing for combustion and emissions applications and provides technical support to the industry for: optimizing process production; evaluating equipment and fuel changes; co-firing opportunity fuels; minimizing air pollutants such as NOx, SO_2/SO_3 and trace metals; and assessing new combustion technologies such as gasification and oxy-coal combustion. REI also performs significant R&D work for governmental agencies such as NASA, DOE-NETL, EPA and DoD.

For Energy and Environmental Solutions

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