

REINHOLD ENVIRONMENTAL Ltd.



**2013 NO_x-Combustion Round Table
& Expo Presentations**

February 18 & 19, 2013, in Salt Lake City, UT / Hosted by PacifiCorp

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SCR REGENERATION EXPERIENCE



2013 NOx-Combustion/PCUG Conference

February 18, 2013

AGENDA

➤ **FE SCR Management**

- Drivers
- Goals
- Challenges

➤ **FE Regeneration**

- Experience
- Expectations

➤ **FE Routine SCR Practice's**

➤ **Summary**

FE SCR FLEET DRIVERS

➤ **Environmental Compliance**

- **CAIR / MATS**
- **Layer position**
- **Possible future regulation**

➤ **Plant Outage Schedule**

➤ **NOx Allowance Market**

➤ **Ammonia Costs**



FE SCR FLEET GOAL

- **Meet All Environmental Requirements**
- **Minimize SCR Operating Costs**
 - Achieve cost-effective NO_x reduction
 - Maintain ammonia slip
 - Maintain SO₂ conversion within acceptable limits
 - Consider future mercury oxidation requirements
- **Meet the Plant's Outage Schedule**
 - Minimal impact to plant operations
 - Not critical path during outage
 - Extensive pre-planning for "Hot Regenerations"

FE SCR FLEET CHALLENGES

- **Fuel Changes**
- **Dispatch Changes**
- **SCR Access**
 - Inspections, catalyst sampling and testing
 - Catalyst decay rates and remaining life
- **Plant Limitations Now and Future**
- **Changing Outage Schedules**
- **Craft Labor Availability**
- **Lowering Total Costs**

FE BALANCED APPROACH

- **Fleet Environmental Goals**
- **Risk Tolerance**
- **Burner Staging**
- **Tube Wastage**
- **Air Heater Pluggage**
- **NOx Credits**
- **Ammonia Costs**
- **Overall Costs**



CONFLICTING PARAMETERS

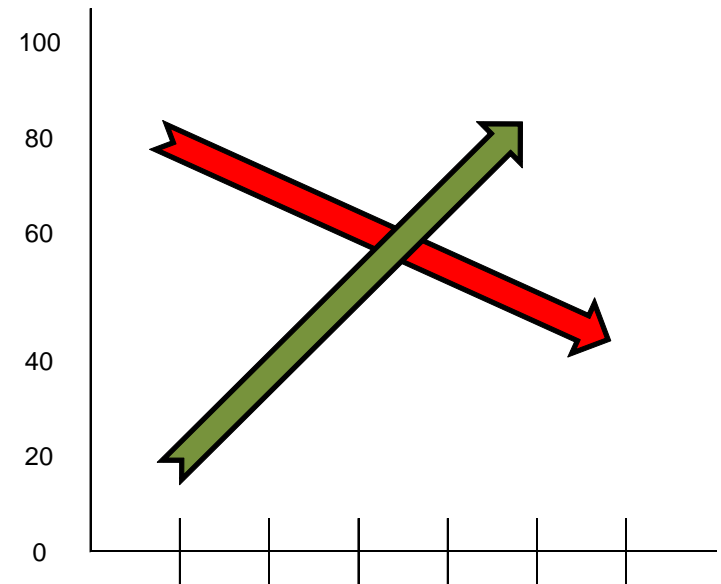
Increasing Catalyst “Pitch” will Generally:

➤ Improve:

- Pressure drop
- Pluggage resistance
- SO₂ conversion

➤ Negatively Impact

- NO_x removal efficiency
- Catalyst life
- Mercury oxidation



Selection is Very Unit Specific

FE REGENERATION EXPERIENCE

- **LTSA with AE since 2008**
- **Regenerated more than 3,500 modules**
 - First commercial corrugated regeneration
 - 10 Layers regular regeneration
 - 10 layers “Hot Regeneration”
 - 1.5 Layers purchased from inventory
- **Annual Inspections and Sample Analysis**
- **SCR Ammonia Tuning**
- **Field SO₃ Testing**

FE REALIZED BENEFITS 2008 thru 2011

- **Savings versus New Catalyst**
 - > \$14 million
 - > 50%
- **Eliminated disposal of >3,500 modules**
- **Purchase Catalyst From Inventory**
- **Warehouse Storage for New and Regenerated**
- **Additional Savings thru 2017 ~ \$19 million**

FE EXPECTATIONS

- **Performance Equal to the Original Catalyst**
 - DeNO_x Potential
 - SO₂ conversion
 - Hg oxidation
 - Pressure drop - % pluggage < 5% per layer
- **Customized Process for Proposed Operation**
- **Mechanical Integrity for Transport and Life**

FE EXPECTATIONS

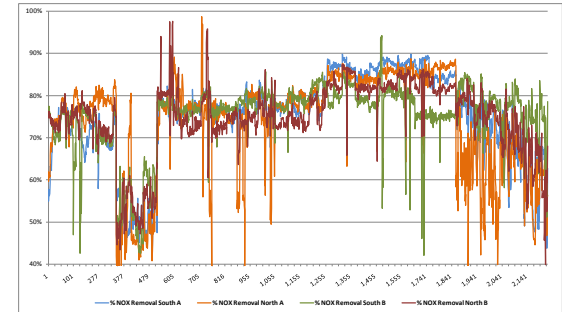
- **Catalyst Availability in Weeks**
- **Hot Regeneration** – Regenerate During Outage
- **Brokering of Catalyst (Purchase and Sell)**
- **Assist in Disposal Options**
- **Storage of New and Regenerated Catalyst**

FE ROUTINE PRACTICES

➤ Annual Inspections and Sampling

- Evaluates SCR condition
- Determines decay rates
- Determines catalyst physical condition
- Basis for recommendations

➤ Routinely Evaluate DCS Data



➤ Update 5-Year Catalyst Plans at Least Annually

FE ROUTINE PRACTICES

- **Regeneration / Layer – Assume Twice for Budgets**
 - Determine at annual inspections
 - Dependent on many variables

- **Maintain On-Line Cleaning Systems**

- **Pro-active Evaluation of Coal Changes**

- **Tune System as Required**



FE REGENERATION SUMMARY

- **Proven Technology**
- **Important Part of FE's SCR Strategy**
- **Savings of > 50% vs. New Catalyst**
- **Improves SCR Management Flexibility**
 - Shorter lead time
 - "Hot Regenerations" available
 - Performance customized for every job
 - Purchasing previously owned catalyst
 - Selling current catalyst



SCR REGENERATION EXPERIENCE

Questions?

