NOx Users Group Presentation

Date: January 23, 2006

Agenda

- Quick Overview of SCR-Tech
  - Direction of the company
  - Management team
- Discussion of Capabilities
  - Experience
  - Methods
- New Tools
- SO_2 / SO_3 Oxidation Program

Inside Shop

SCR-Tech Infrastructure

Waste Treatment

- Others -

Production & Storage

SCR-T Lab

Management Team

- **Bill McMahon** — 28 years
  President
- **Frank Wenz** — 15 years
  GM Plant Ops.
- **Bob Deneault** — 25 years
  VP Sales & Mktg
- **Howard Franklin** — 35 years
  Dir. Technology
- **Mark Mullett** — 15 years
  Controller / HR / IT

- B&W / Babcock Power / Deutsche Babcock
  - Boilers
  - Environmental systems
  - Multiple growth companies
  - 3 previous start-ups / turnarounds
- Founder SCR-Tech
  - Technology transfer
  - Ongoing upgrades
- CE / ABB / ALSTOM
  - Boilers
  - Turbines
  - Environmental systems
- Foster Wheeler / Hitachi
  - Power
  - SCR design
  - Catalyst design / application
- Experience in manufacturing

Management Team

- **Experience in:**
  - Startup, engineering, sales for boilers, SCRs, FGDs, ESPs, CTs, catalyst
  - Applications and modifications in power plants
  - Multiple start-up / turn-arounds
  - Coal, coal plants
- **Experience covers:**
  - ALL major boiler and environmental companies
  - 98% of all US utility boilers
  - 90%+ of all US environmental systems

SCR Management "Our Base Business"

- **Understand customers overall NOx strategy**
  - Bubble, credits, over – compliance
  - Slip, ash sale, coal variability
  - Outage schedule, FGD installation
- **Develop computer assisted plan**
  - Activity decay, SO_2 conversion
  - Coal affects
  - Inspection and testing program
- **Provide options**
  - Life vs. activity vs. slip
  - Interchangeability between units
  - New / regenerated / brokered / cleaned catalyst
- **Implement plan**
- **Measure results**

Technical Foundation

SCR TECH

SCR TECH

A Catalytica Energy Systems Company

ENVICA KAT GMBH

Largest SCR catalyst regeneration company in the world

Catalytica ENERGY SYSTEMS

Catalytic NOx reduction developments and research

NASDAQ: CESI

EnBW Ingenieure GmbH

Engineering arm of German utility

****** Strong technology, backed by industry leaders ******

Technical Foundation

- Strong Relations with Envica and EnBw – experience base
- Dr. Alex Schluttig Process Inventor who is visiting Charlotte

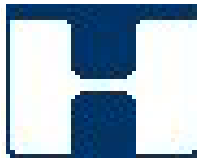
Regeneration Goals

- Maximize Catalyst Life
- Reduce SO_2 Oxidation
- Avoid Environmental Waste / Liability / Cost
- 60% of the Cost of New Catalyst

****** Lower Cost, More Reliable Environmental Compliance ******

All Catalyst Types

SCR TECH



BASF
The Chemical Company

CORMETECH

HITACHI
Inspire the Next

ARGILLON

SIEMENS

CERAM

Kawasaki

North American Experience

- AES
  - Somerset **
  - Harding Street

Cogentrix (NEGT)
  - Indiantown **
  - Logan **
- Southern Company **
  - Alabama Power, Gorgas
  - Georgia Power, Bowen
- Duke Power
  - Belews Creek
- DTE
  - Monroe**
- DP&L
  - Stuart
- Alcoa
  - Warrick

** Indicates Repeat Customers

*** Repeat Customers Are Our Priority ***

Worldwide Experience

- 14,700 MW of bituminous coal-fired boilers
- 300 MW of lignite fired boilers
- 5,000 MW of oil/gas-fired boilers
- 20,000 MW of SCR operating experience
- Over 9 years of commercial regeneration
- More than 18,000 m^3 of all catalyst types
- Over 8,000,000 hours of operation in SCRs

****** Experience, Knowledge, Technology ******

Recommendations for SCR Operators

- 3rd Party testing of catalyst
  - Activity K_0 (if possible), $K_{present}$
  - SO_2 to SO_3 oxidation – K_{23}
  - Chemical analysis
  - ΔP
- Determine overall plan for catalyst management
  - Consistent with activity decay, NH_3 slip, ash sales …
  - Consistent with outage schedule
- Annual inspections: Owner + Non-OEM
- Regenerate spare layer or more depending on above plan
- AIG tuning during major outages or sooner
- Long term agreements - produce even better results

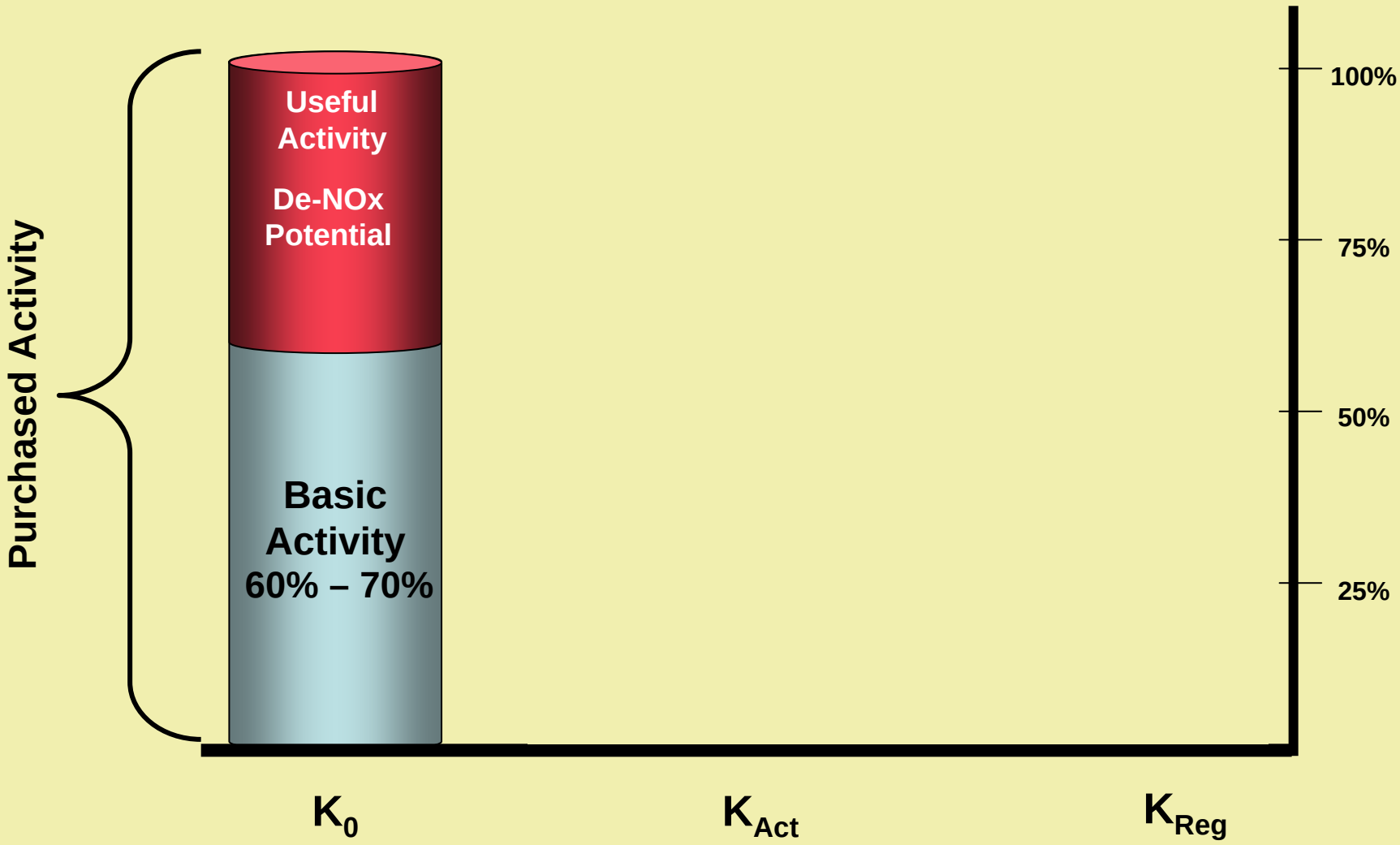
Typical Measurements

- **Independent Testing**

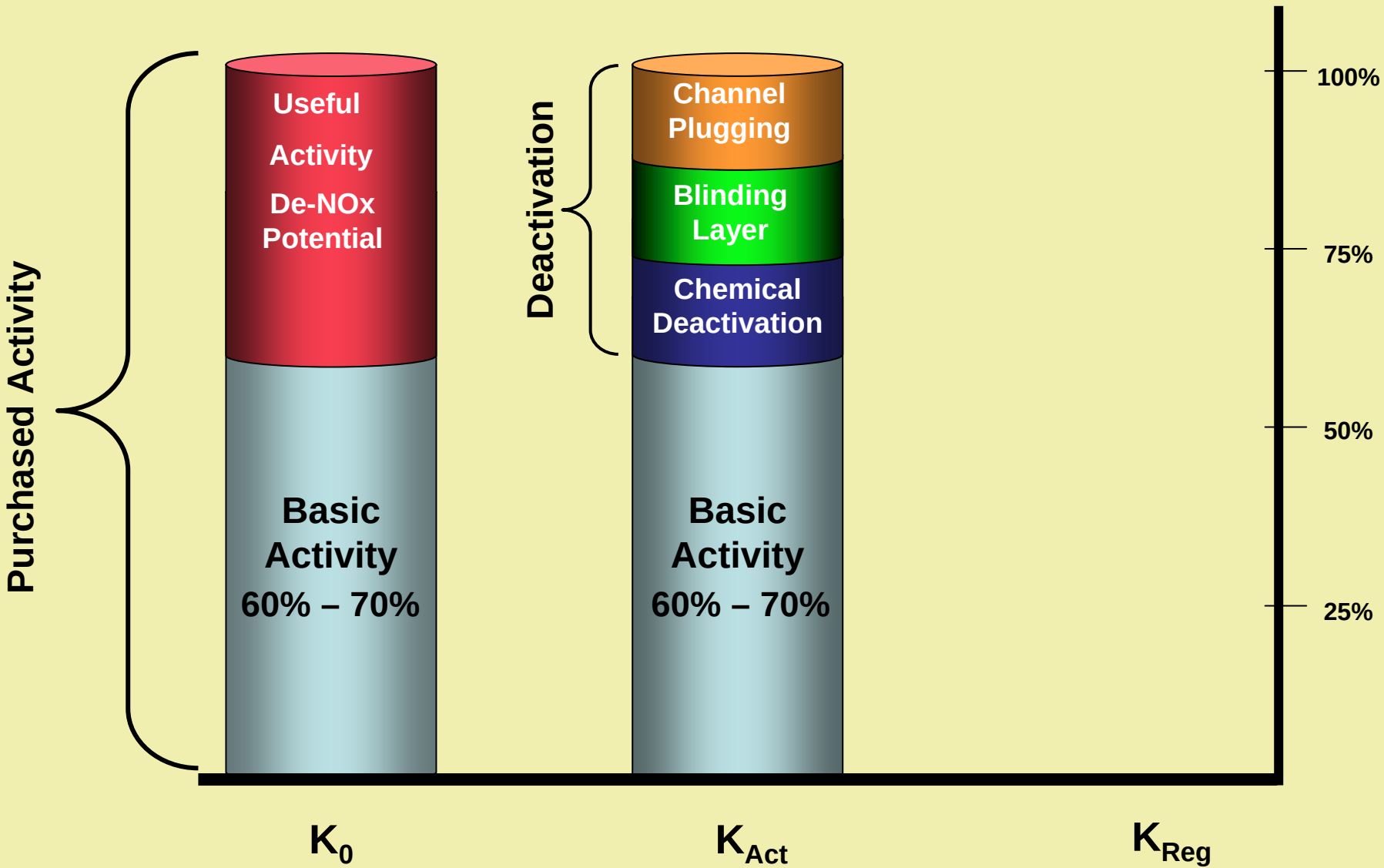
		Specimen I.D.
Temperature	[°F]	Input
Linear Velocity	[act. m/s]	Input
Area Velocity	[m/h]	Input
NO	[ppmvd]	Input
SO_2	[ppmvd]	Input
O_2	[% dry]	Input
H_2O	[%]	Input
Bench Test Results		**Guarantees**
Activity	[m/h]	**K value**
SO_2 Oxidation	%	Future
Pressure lost	[mbar]	**% Open Channels**

		Specimen I.D.	
SiO_2	%	Masking Compound	Masking Compound
Al_2O_3	%	Masking Compound	Masking Compound
Fe_2O_3	%	Masking Compound	Masking Compound
TiO_2	%		
CaO	%	Combines with SO_3	Combines with SO_3
MgO	%		
BaO	%		
Na_2O	%	Chem. Poison	Chem. Poison
K_2O	%	Chem. Poison	Chem. Poison
SO_3	%	Masking Compound	Masking Compound
P_2O_5	%	Chem. Poison	Chem. Poison
V_2O_5	%	Activity Contributor	Activity Contributor
MoO_3	%	Arsenic Protector	Arsenic Protector
As	ppm	Chem. Poison	Chem. Poison

How Does Regeneration Work?



How Does Regeneration Work?



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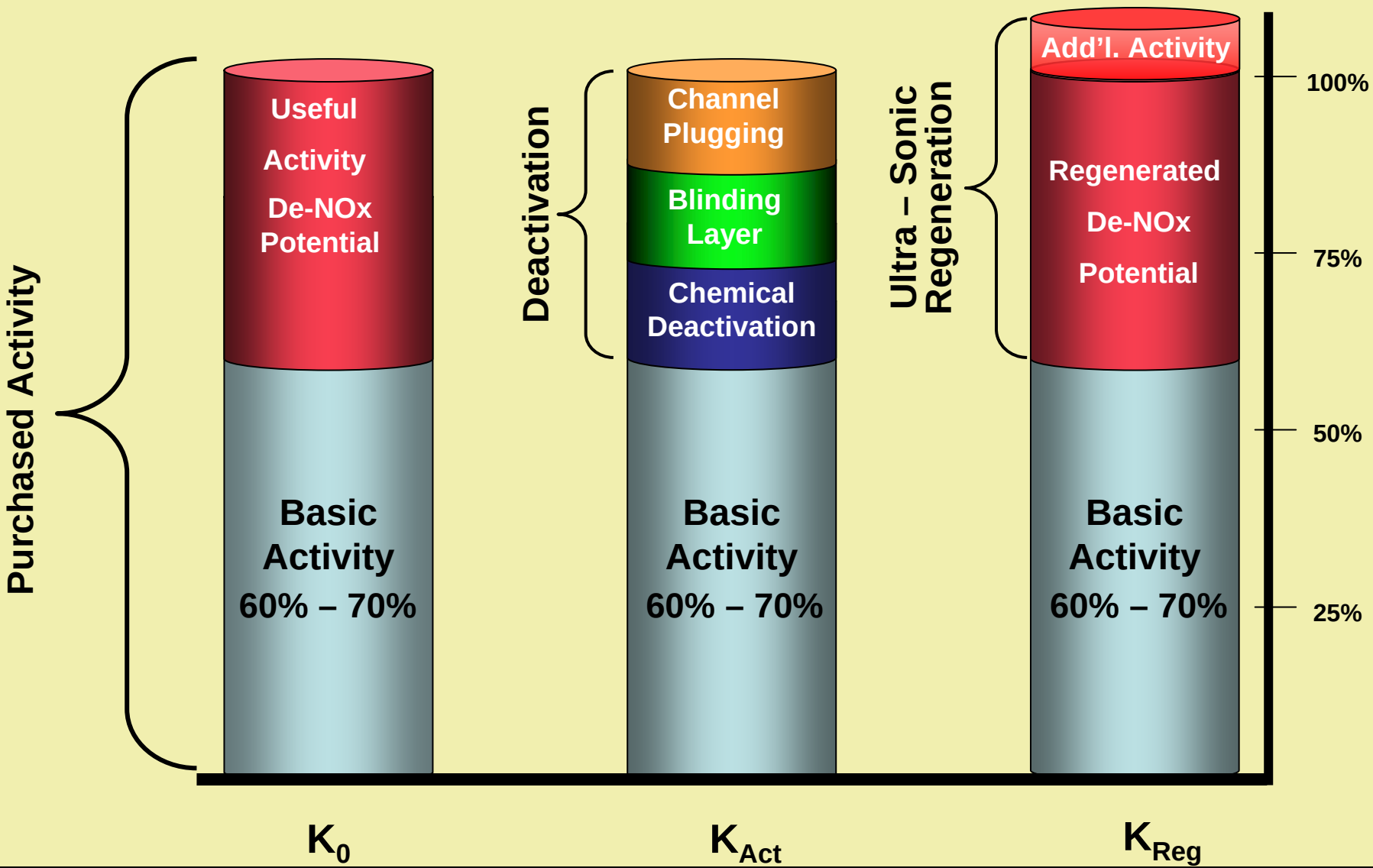
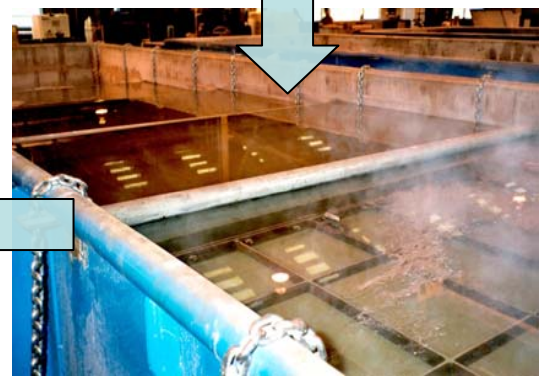


Patented Cleaning & Regeneration Process

Overall Plant

Soaking

Ultrasound



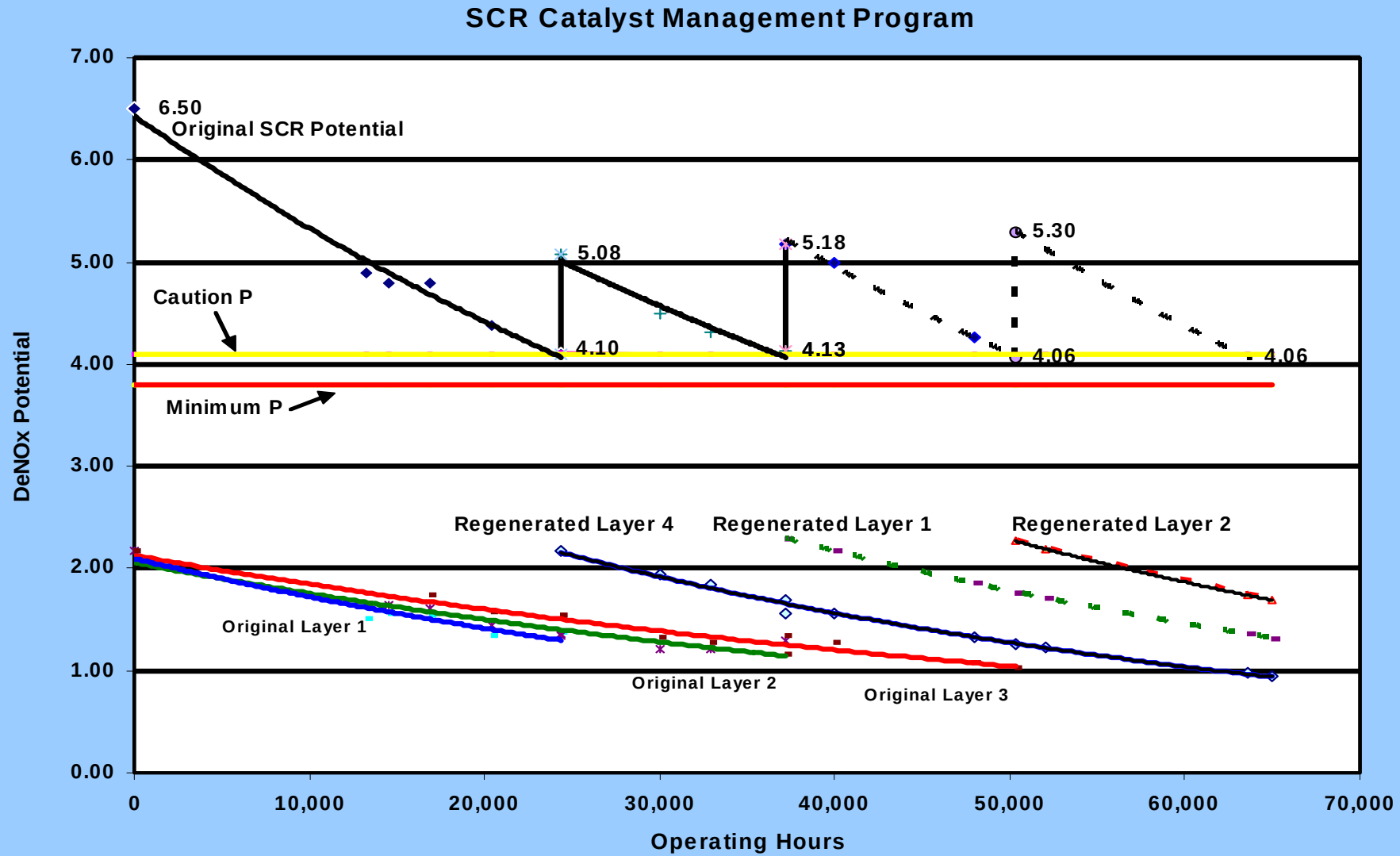
Pacification

Active Chemical Addition

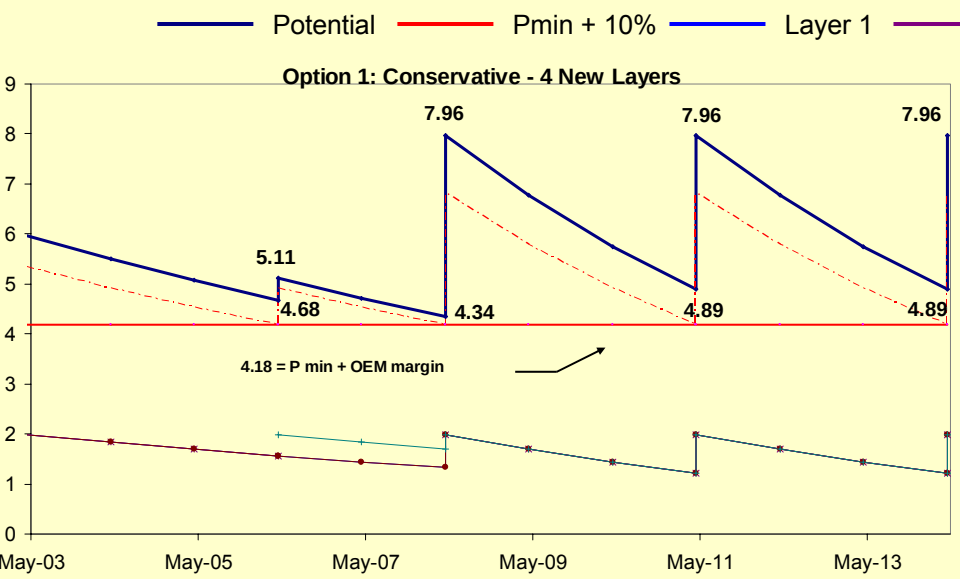
Heat Treatment

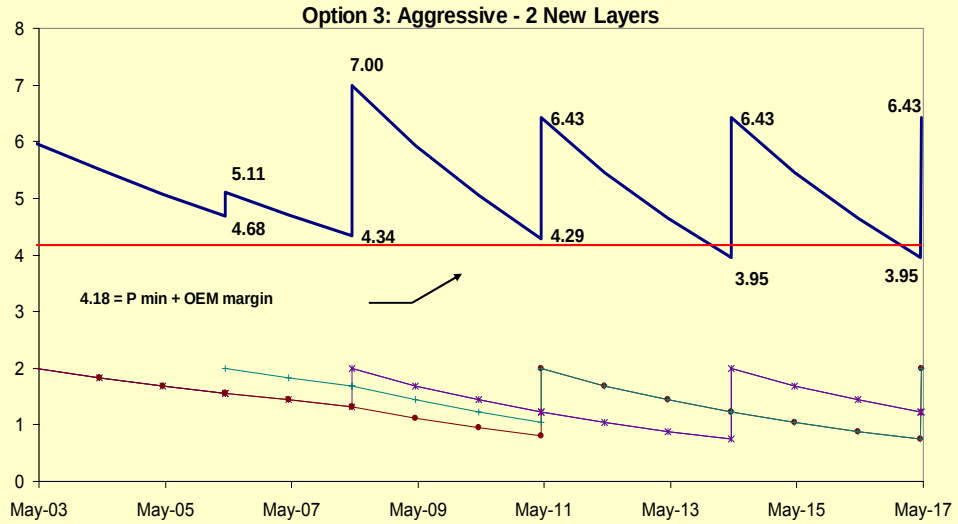
Inspection, Packaging and Shipment

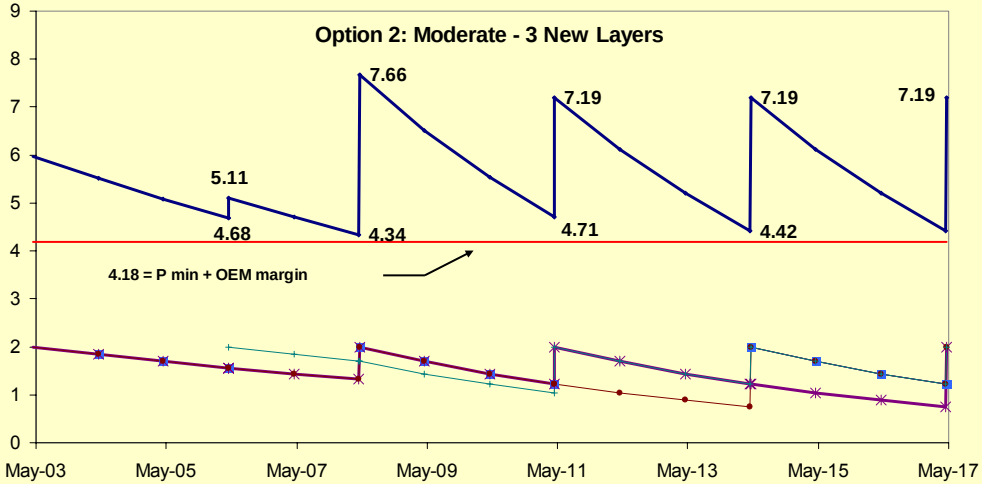
Typical De-NOx Tracking Plan



SCR-Tech Options



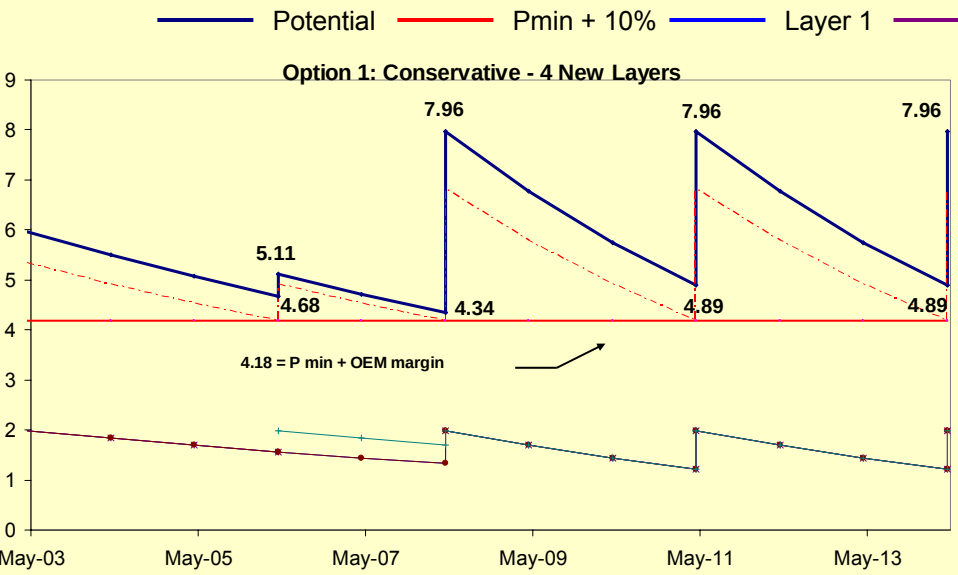


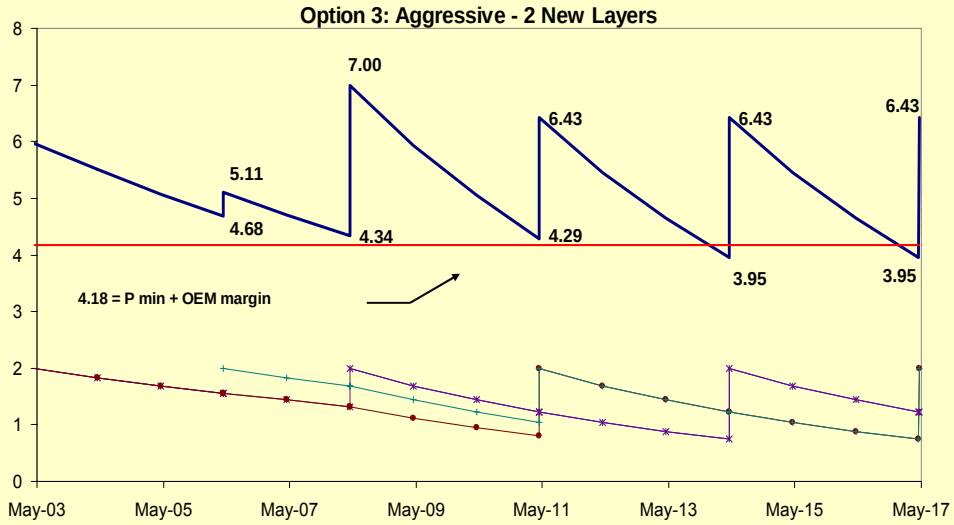


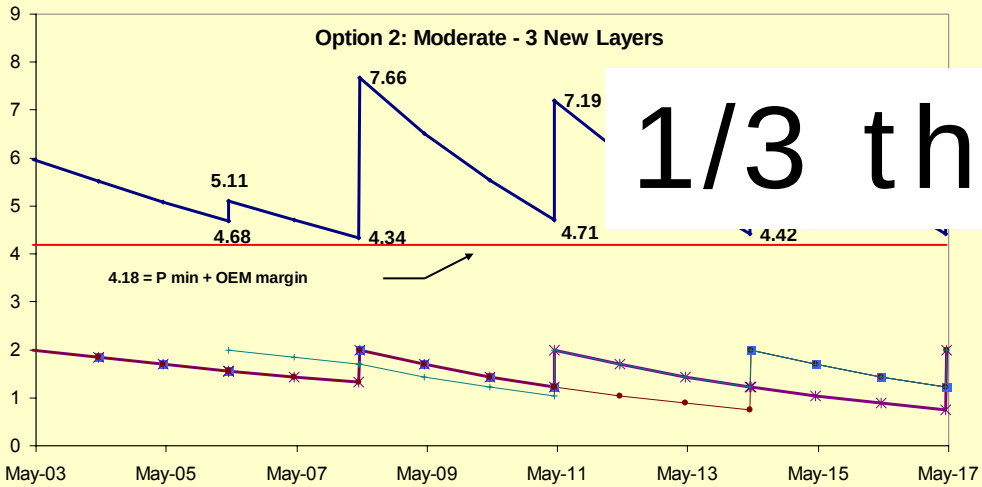
Option Cost Comparison ($000)

		Transition	3 yr Cycle Costs
C	New	$1,654	$6,467
	Regen	$1,092	$4,220
M	New	$1,654	$4,863
	Regen	$1,092	$3,178
A	New	$1,654	$3,258
	Regen	$1,092	$2,135

Leverage Catalyst Management & Regen







1/3 the cost!!

Option Cost Comparison ($000)

			3 yr Cycle Costs
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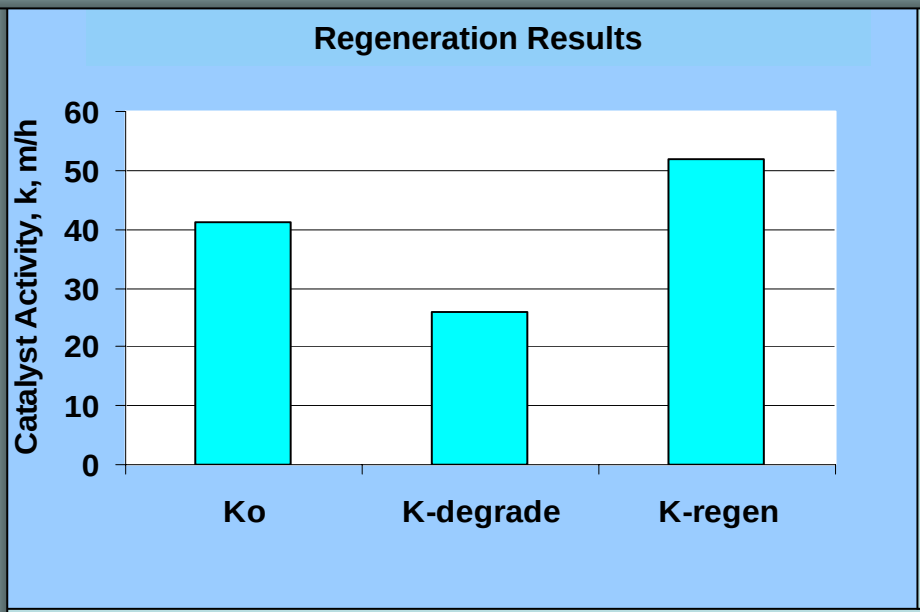
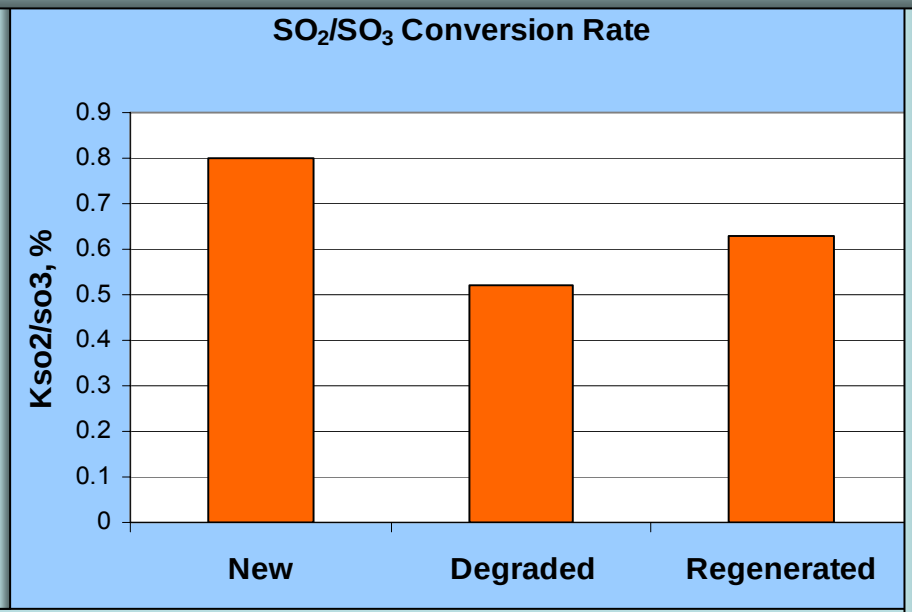
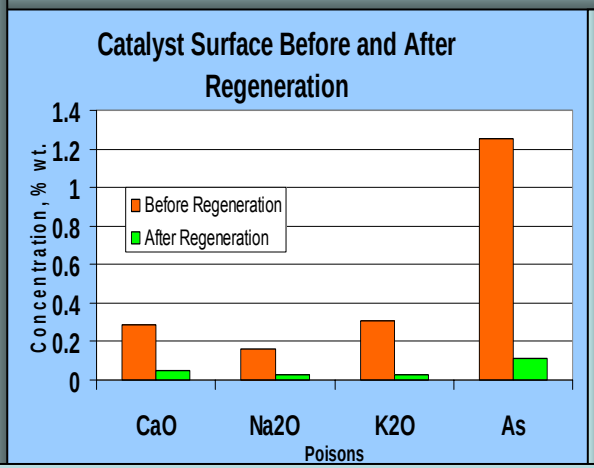
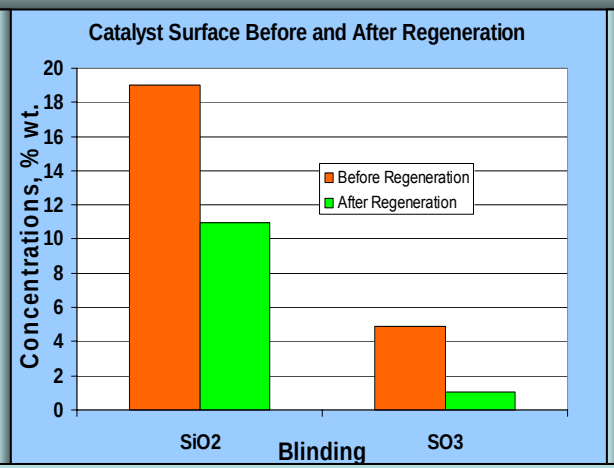
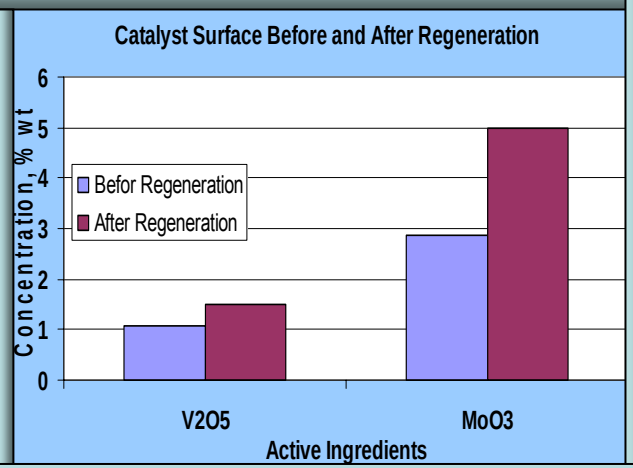
Catalyst Regeneration Results











Honeycomb ReGen

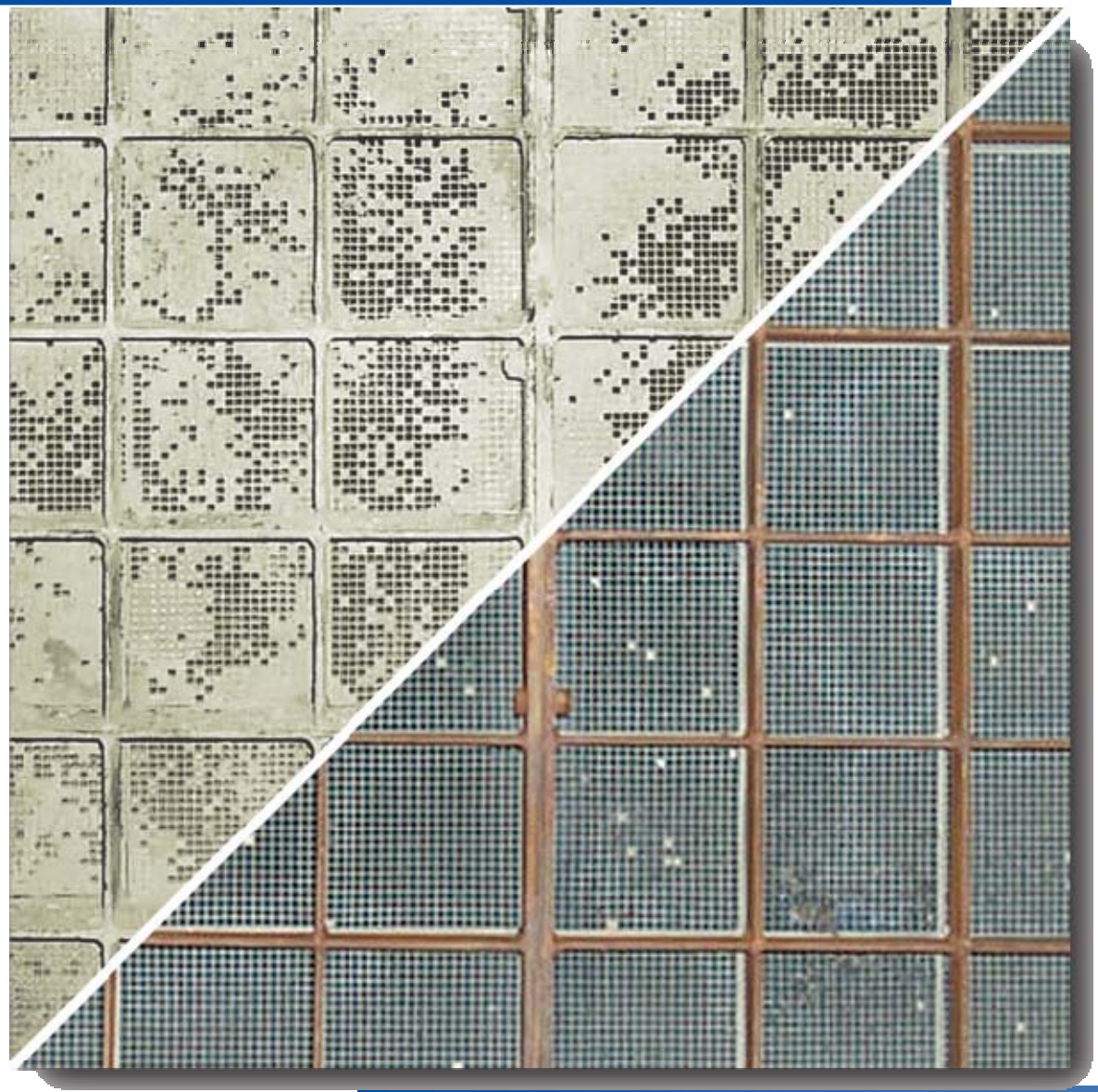
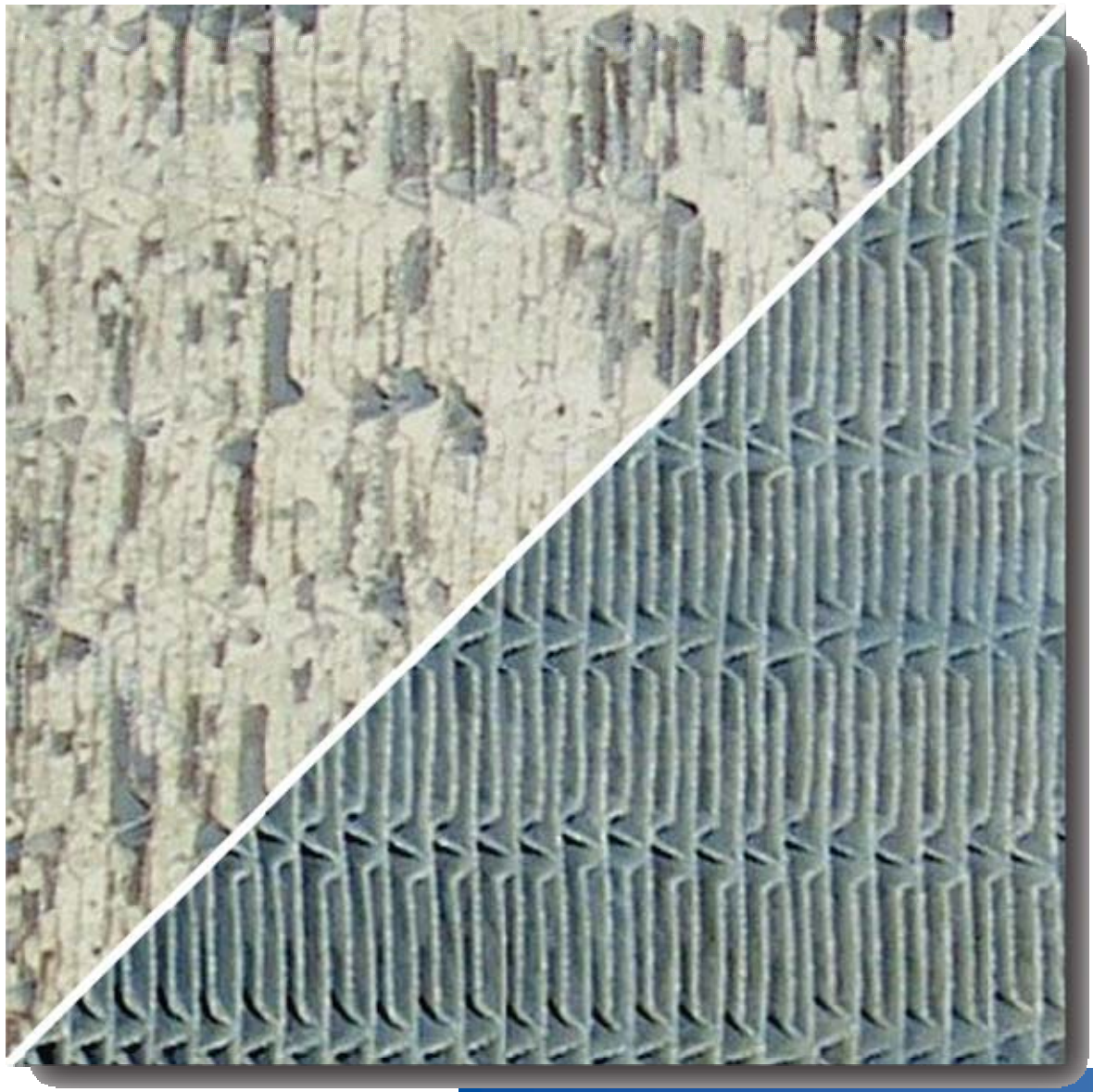
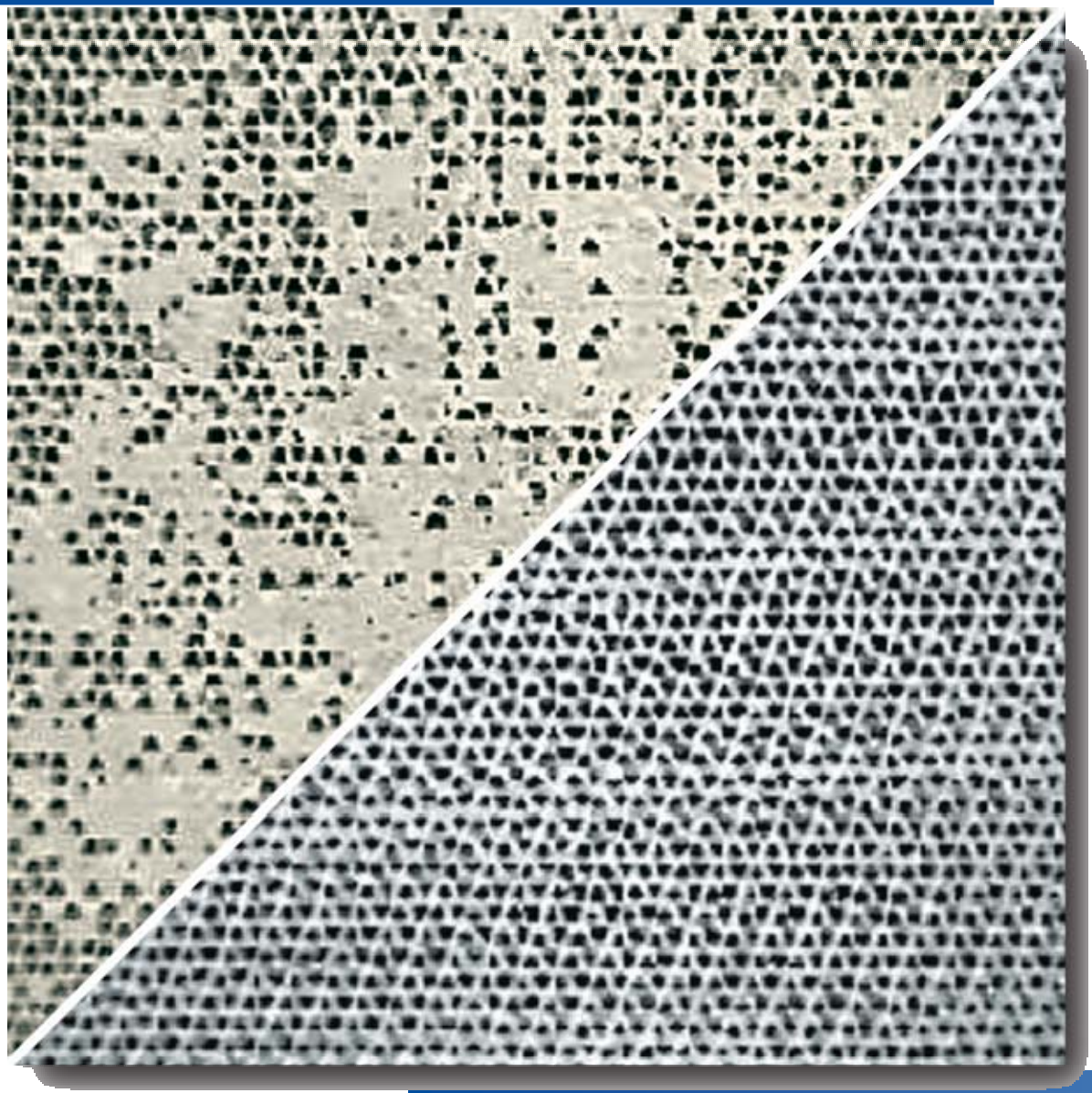


Plate ReGen



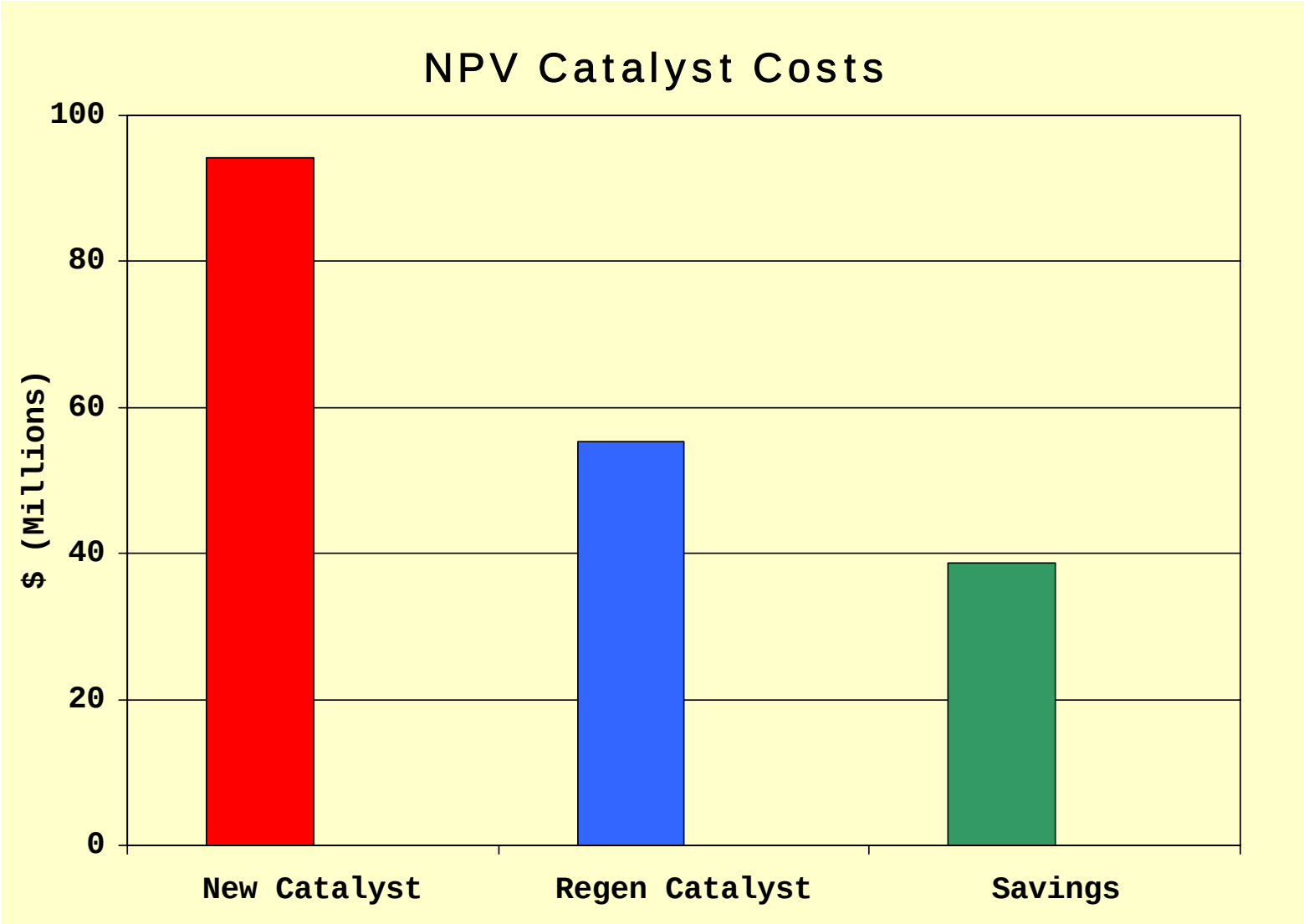
Corrugated ReGen



SCR- Tech Programs

- SCR-Tech buys / owns catalyst
- SCR-Tech manages all catalyst activity for customer
  - Testing
  - Labor in and out
  - Transportation
  - Consulting, optimization
  - Tuning
  - Inspections
  - Catalyst regeneration, new, repair, fill-in, cleaning
  - Spare layer of catalyst
- Customer pays level payment

5,000 MW Utility System



Optimization of SCR Catalyst Regeneration with Respect to SO_2 / SO_3 Conversion

EPRI SCR Workshop

November 15, 2005

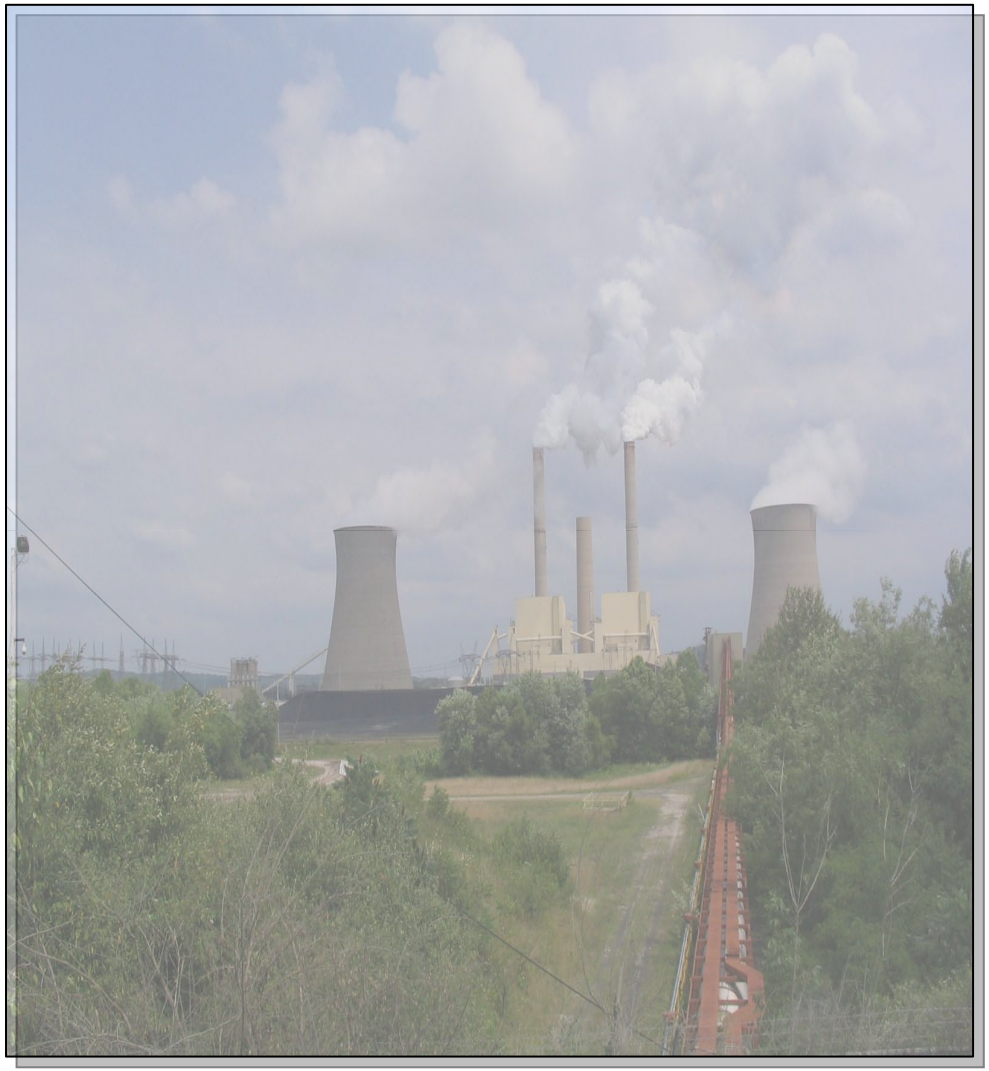
AEP AMERICAN ELECTRIC POWER

SOUTHERN COMPANY

Energy to Serve Your World®

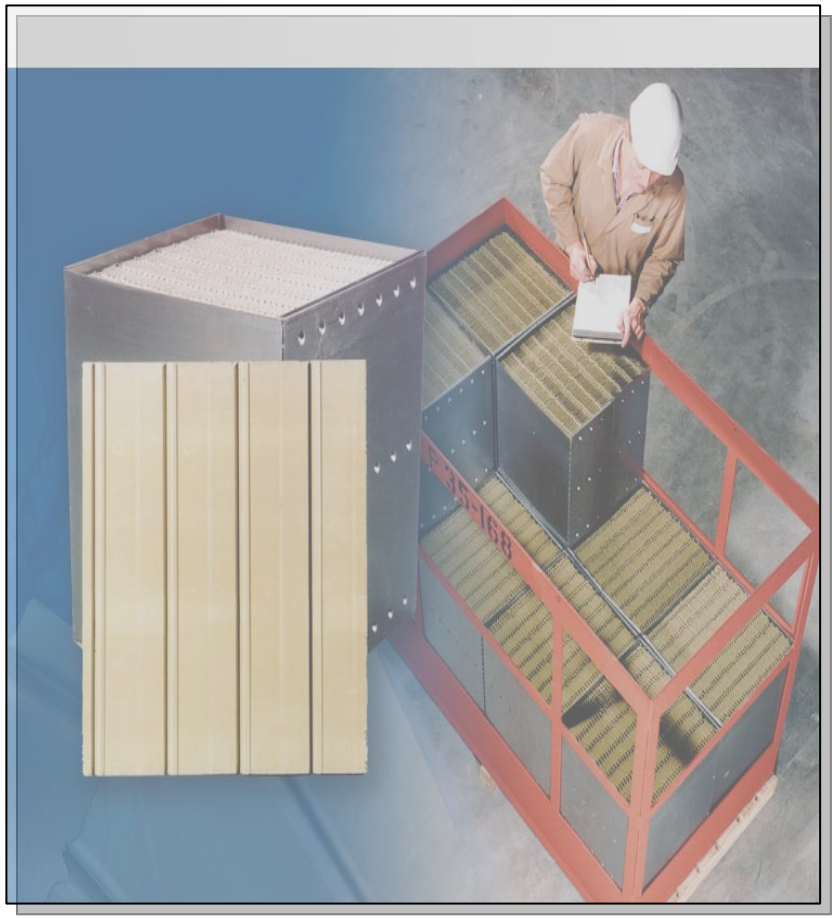
SO_2 Conversion Program Objectives

- Identify and quantify catalyst regeneration parameters for SO_2 / SO_3 conversion
- Develop statistically valid mathematical models
  - SCR-Tech can tune regeneration process
  - Maximize NOx reduction activity ($K\alpha$) while minimizing SO_2 conversion (K_{23})
  - Define treatment chemical concentrations, times, process temperatures, etc.
- Allow SCR-Tech to guarantee SO_2 / SO_3 conversion for regenerated catalyst
- Process validation:
  - Provide statistically sound, objectively verifiable evidence that
    - SO_2 / SO_3 reduced
    - NOx reduction activity restore
  - Investigate two catalyst types: honeycomb and plate
- Hg oxidation outside the scope of this project, follow-on proposed



AEP Gavin Plant

- Located in Cheshire, Ohio
- Two 1300 MWnet units
- Pulverized coal
- Dry bottom boiler
- High sulfur coal – 6.5 lb SO_2/mmBtu



SCR Catalyst

- Plate type catalyst
- Manufactured by Argillon
- Design conversion rate with initial charge – 1.6%
- Unit 1 SCR catalyst was replaced by low conversion rate catalyst in April 2005 due to H_2SO_4 plume
- Unit 2 SCR catalyst will be replaced by low conversion rate catalyst in 2006 and 2007 due to H_2SO_4 plume

GPC Plant Bowen

- Located in Cartersville, GA
- Four units ~3400MW
- Pulverized coal
- T-fired, dry-bottom boiler
- Low sulfur coal, 1 - 1.5%

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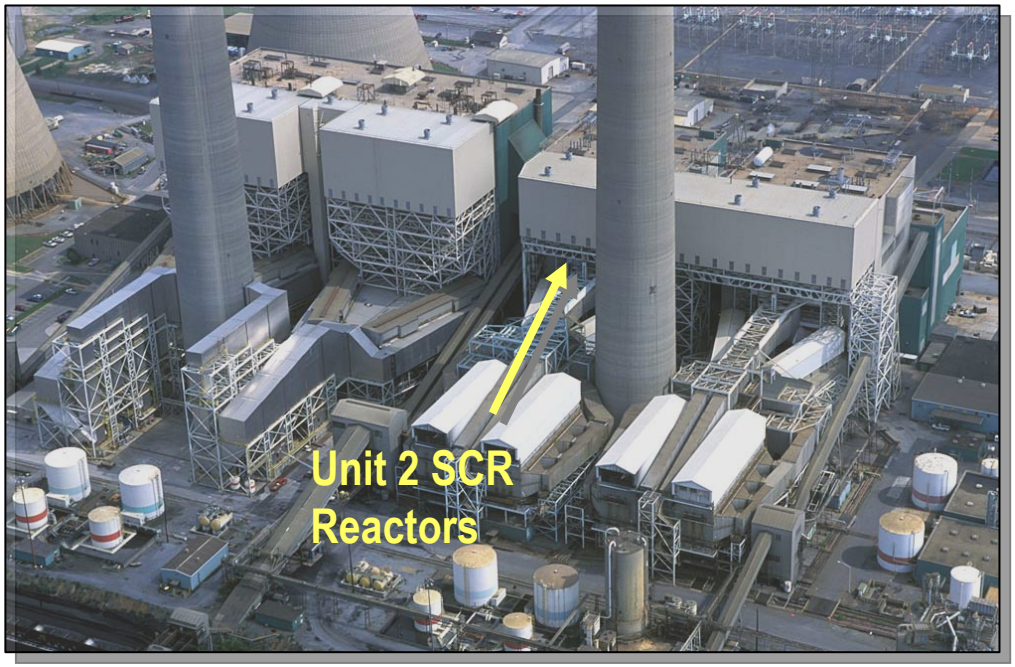
SCR TECH



Bowen 2 SCR

- SCR was commissioned in June 2001
- High dust application
- 885 m^3 catalyst
- 2 reactors (A/B)
- 3 + 1 reactor design
- Design NOx removal – 90%
- Design NH_3 slip – 2 ppm

SOUTHERN COMPANY
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Deactivated catalyst as removed

New fresh catalyst

SCR Catalyst

- Honeycomb type catalyst
- Manufactured by Cormetech
- Design conversion rate with initial charge – 1%
- Deactivated catalyst:
  - Catalyst from Unit 2 SCR Layer 2, Row 2 (boiler side)
  - ~12,000 hours of exposure
  - Catalyst removed after ozone season 2003 due to LPA pluggage
- Fresh catalyst:
  - Reference sample from Southern Company inventory

Bench Scale Regeneration Equipment for SO_2 Conversion Study

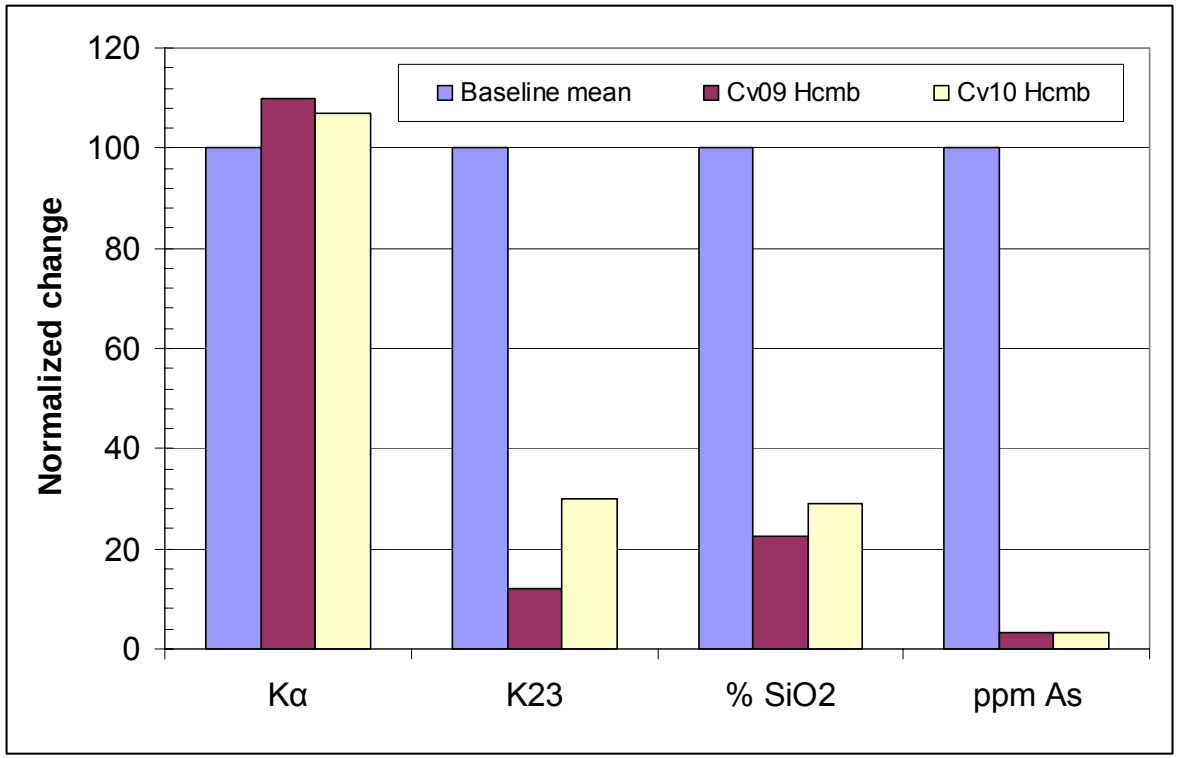
Program Status: January 2005

Sample ID	Catalyst Type	Sample function	Regeneration complete?	Testing complete?
Cv1	Honeycomb	Honeycomb baseline performance	Y	Y
Cv2	Honeycomb		Y	Y
Cv3	Honeycomb		Y	Y
Cv4	Honeycomb		Y	Y
Cv5.2	Plate	Plate baseline performance	Y	Y
Cv6.2	Plate		Y	Y
Cv7.2	Plate		Y	Y
Cv8.2	Plate		Y	Y
Cv9	Honeycomb	Matrix test samples	Y	Y
Cv10	Honeycomb		Y	Y
Cv11	Plate		Y	Y
Cv12	Plate		Y	Y
Cv13	Plate		Y	Y
Cv14	Plate		Y	Y
Cv15	Honeycomb		Y	Y
Cv16	Honeycomb		Y	Y
Cv17	Plate		Y	Y
Cv18	Plate		Y	Y
Cv19	Honeycomb		Y	Y
Cv20	Honeycomb		Y	Y
Cv21	Honeycomb		Y	Y
Cv22	Honeycomb		Y	Y
Cv23	Plate		Y	Y
Cv24	Plate		Y	Y
Cv25	Honeycomb	Center points	Y	Y
Cv26	Plate		Y	Y
Cv27	Honeycomb (fresh)	Ko check and control samples	N	Y
Cv28	Honeycomb (fresh)		N/A	N
Cv29	Plate (fresh)		N	N
Cv30	Plate (fresh)		N	N

- Testing further along
- Model to be developed.
- Regeneration of fresh catalyst will be done using the final optimized process.
- Substantiation of Final Results

Preliminary Conclusions from Study Data?

- **Insufficient data available to draw any conclusions from this study**
- **Early results are consistent with expectations**



Thank you - Discussion

January 23, 2006