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INNOVATIVE CLEAN COAL TECHNOLOGY (ICCT)

**DEMONSTRATION OF SELECTIVE CATALYTIC REDUCTION (SCR)
TECHNOLOGY FOR THE CONTROL OF NITROGEN OXIDE (NO_x)
EMISSIONS FROM HIGH-SULFUR COAL-FIRED BOILERS**

**Technical Progress Report
Third and Fourth Quarters 1995**

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Section 1

SUMMARY

The objective of this project is to demonstrate and evaluate commercially available Selective Catalytic Reduction (SCR) catalysts from U. S., Japanese, and European catalyst suppliers on a high-sulfur U. S. coal-fired boiler. SCR is a post-combustion nitrogen oxide (NO_x) control technology that involves injecting ammonia into the flue gas generated from coal combustion in an electric utility boiler. The flue gas containing ammonia is then passed through a reactor that contains a specialized catalyst. In the presence of the catalyst, the ammonia reacts with NO_x to convert it to nitrogen and water vapor.

Although SCR is widely practiced in Japan and Europe on gas-, oil-, and low-sulfur coal-fired boilers, there are several technical uncertainties associated with applying SCR to U. S. coals. These uncertainties include:

- (1) potential catalyst deactivation due to poisoning by trace metal species present in U. S. coals that are not present in other fuels.
- (2) performance of the technology and effects on the balance-of-plant equipment in the presence of high amounts of SO_2 and SO_3 .
- (3) performance of a wide variety of SCR catalyst compositions, geometries and methods of manufacture under typical high-sulfur coal-fired utility operating conditions.

These uncertainties were explored by operating a series of small-scale SCR reactors and simultaneously exposing different SCR catalysts to flue gas derived from the combustion of high sulfur U. S. coal.

The demonstration was performed at Gulf Power Company's Plant Crist Unit No. 5 (75 MW capacity) near Pensacola, Florida. The project is funded by the U. S. Department of Energy (DOE), Southern Company Services, Inc. (SCS on behalf of the entire Southern electric system),

the Electric Power Research Institute (EPRI), and Ontario Hydro. SCS is the participant responsible for managing all aspects of this project.

The project is being conducted in the following three phases:

- Phase I - Permitting, Environmental Monitoring Plan and Preliminary Engineering
- Phase II - Detailed Design Engineering and Construction
- Phase III - Operation, Testing, Disposition and Final Report

The operational/testing phase of the project has been completed and the facility is in shut-down during this reporting period. However, dismantling and reporting activities are ongoing.

Section 2

INTRODUCTION

The Innovative Clean Coal Technology (ICCT) Program is designed to demonstrate clean coal technologies that are capable of retrofitting or repowering existing facilities to achieve significant reduction in sulfur dioxide (SO_2) and/or nitrogen oxides (NO_x) emissions. The technologies selected for demonstration are capable of being commercialized in the 1990s and are expected to be more cost effective than current technologies.

This ICCT project is jointly funded by the U. S. Department of Energy, the Electric Power Research Institute (EPRI), Ontario Hydro, and by Southern Company Services (SCS) on behalf of the entire Southern electric system. The project's objective is to demonstrate the selective catalytic reduction (SCR) process that removes nitrogen oxides (NO_x) from the flue gas of boilers that burn U.S. high-sulfur coal. The SCR technology involves the injection of NH_3 into the flue gas and the subsequent catalytic reduction of NO_x by NH_3 to produce molecular nitrogen (N_2) and water vapor.

A simplified SCR process flow diagram with major equipment is shown in Figure 1. Specifically, hot flue gas leaving the economizer section of the boiler is ducted to the SCR reactor. Prior to entering the reactor, NH_3 is injected into the flue gas at a sufficient distance upstream of the reactor to provide for complete mixing of the NH_3 and flue gas. The quantity of NH_3 can be adjusted to obtain various levels of NO_x reduction as it reacts with the NO_x from the flue gas. The flue gas leaving the catalytic reactor enters the air preheater where it transfers heat to the incoming combustion air. Provisions are made for ash removal from the bottom of the reactor since some fallout of fly ash is expected. Ductwork is also provided to bypass some flue gas around the economizer during periods when the boiler is operating at reduced load. This is done to maintain the temperature of the flue gas entering the catalytic reactor at the optimum reaction temperature of about 700°F. The flue gas leaving the air preheater goes to the electrostatic precipitator (ESP) where fly ash is removed. The ESP is part of the existing plant and is generally

unaffected by the SCR system except as higher SO_3 content affects the electrical resistivity of the fly ash or if ammonium bisulfate (NH_4HSO_4) co-precipitates with the fly ash.

The SCR technology is in commercial use in Japan and western Europe on gas-, oil-, and on low-sulfur, coal-fired power plants. The first utility applications of SCR catalyst technology started in Japan in 1977 for oil- and gas-fired boilers and subsequently in 1979 for coal-fired boilers. As of 1986, ninety utility boilers in Japan had been equipped with SCR catalyst technology including twenty-two coal-fired boilers. These coal-fired boilers represent a combined capacity in excess of 6500 MWe and are typically fired with a low-ash, low-sulfur coal.

In addition to Japanese experience, several countries in western Europe (most notably Germany and Austria) have passed stringent NO_x emission regulations that have all but mandated the installation of SCR. Prior to commercial SCR installations in Germany, utility companies demonstrated several types of SCR facilities in prototype demonstration programs similar to this ICCT project. Over 50 SCR pilot plants were built and operated in western Europe. These pilot plants ranged from 19 to 6200 SCFM and provided the data base that led to commercialization of the SCR technology in western Europe.

Previously completed U. S. work with the SCR process on utility boilers consists of three projects which were carried out in the late 1970s and early 1980s. One of these was conducted on a natural gas fired boiler by Southern California Edison. Another project consisted of a pilot test conducted for the EPA at Georgia Power's Plant Mitchell. This pilot plant treated a 1000 ACFM (0.5 MWe) slip stream of flue gas resulting from the combustion of low- to medium-sulfur coal. A third pilot-scale project, carried out at the Public Service Company of Colorado's Arapaho Station treated a 5000 ACFM (2.5 MWe) slip stream of flue gas resulting from the combustion of U. S. low-sulfur coal.

Although SCR is widely practiced in Japan and Europe, there are numerous technical uncertainties associated with applying SCR to U. S. coals. These uncertainties include:

- (1) potential catalyst deactivation due to poisoning by trace metal species present in U. S. coals that are not present in other fuels.
- (2) performance of the technology and effects on the balance-of-plant equipment in the presence of high amounts of SO_2 and SO_3 .
- (3) performance of a wide variety of SCR catalyst compositions, geometries and methods of manufacture under typical high-sulfur coal-fired utility operating conditions.

These uncertainties were explored by operating a series of small-scale SCR reactors and simultaneously exposing different SCR catalysts to flue gas derived from the combustion of high sulfur U. S. coal.

The first uncertainty above was handled by evaluating SCR catalyst performance for two years under realistic operating conditions found in U. S. pulverized coal utility boilers. The deactivation rates for the catalysts exposed to flue gas from high sulfur U. S. coal was documented to determine accurate catalyst life, and thus, accurate process economics.

The second uncertainty above was explored by performing parametric testing and through the installation/operation of air preheaters downstream of the larger reactors. During parametric testing, operating conditions were adjusted above and below design values to observe deNO_x performance and ammonia slip as functions of the change in operating conditions. Air preheater performance was observed to evaluate effects from SCR operation upon heat transfer, and therefore, upon boiler efficiency.

The third uncertainty was handled by using honeycomb- and plate-type SCR catalysts from U. S., Japan and Europe of various commercial composition. Results from the tests with these catalysts

expanded our knowledge of performance on a variety of SCR catalysts under U. S. utility operating conditions with high-sulfur coal.

The intent of the operational phase of the project was to demonstrate commercial catalyst performance, proper operating conditions, and catalyst life for the SCR process. This project also demonstrated the technical and economic viability of SCR while reducing NO_x emissions by at least 80%.

The project was conducted at Gulf Power Company's Plant Crist Unit 5, a commercially operating 75 MW unit, located in Pensacola, Florida, on U. S. coals with a sulfur content near 3.0%. Unit 5 is a tangentially-fired, dry bottom boiler, with hot and cold side ESPs for particulate control. The SCR process used in this demonstration was designed to treat a slip-stream of flue gas and featured multiple reactors installed in parallel. With all reactors in operation, the maximum amount of combustion flue gas that could be treated was 17,400 standard cubic feet per minute (SCFM) which is roughly equivalent to 8.7 MWe.

The facility was a slip-stream SCR test facility consisting of three 2.5 MWe (5000 SCFM) SCR reactors and six 0.20 MWe (400 SCFM) reactors that operated in parallel for side-by-side comparisons of commercially available SCR catalyst technologies obtained from vendors throughout the world. Figure 2 presents a simplified process flow diagram for the SCR test facility. The large (2.5 MWe) SCR reactors contained commercially available SCR catalysts as offered by SCR catalyst suppliers. These reactors were coupled with small-scale air preheaters to evaluate the long-term effects of SCR reaction chemistry on air preheater deposit formation and the deposits' effects on an air preheater. The small reactors were used to test additional commercially available catalysts. The demonstration facility size was adequate to develop performance data to evaluate SCR capabilities and costs that are applicable to boilers using high-sulfur U. S. coals.

The demonstration project is organized into three phases: (1) Phase I - Permitting, Environmental Monitoring Plan and Preliminary Engineering; (2) Phase II - Detail Design Engineering and Construction; and (3) Phase III - Operation, Testing, Disposition, and Final Report. The cooperative agreement was signed June 14, 1990, and the project completion date is now projected to be mid-1996. The original total estimated project costs were \$15.6 million but project growth increased the expected total cost to \$23 million. The co-funders are SCS (\$10 million), DOE (\$9.4 million), EPRI (\$2.9 million) and Ontario Hydro (\$0.75 million).

Figure 1. Flow Diagram of Typical SCR Installation.

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Figure 2. Prototype SCR Demonstration Facility-Process Flow Diagram

Section 3

PROJECT DESCRIPTION

Within the three phases of the project, the following tasks were conducted to effectively demonstrate the SCR process:

Phase I - Permitting, Environmental Monitoring Plan and Preliminary Engineering

- Task 1.1.1 - Prototype Plant Permitting Activities
- Task 1.1.2 - Develop Environmental Monitoring Program
- Task 1.1.3 - Preliminary Engineering
- Task 1.1.4 - Engineering and Construction Contracts Scope Development
- Task 1.1.5 - Project Management and Reporting

Phase II - Detail Design Engineering and Construction

- Task 1.2.1 - Detailed Design Engineering
- Task 1.2.2 - Construction
- Task 1.2.3 - Operation Staff Training
- Task 1.2.4 - Planning for Detailed Testing
- Task 1.2.5 - Start-Up/Shakedown
- Task 1.2.6 - Project Management and Reporting

Phase III - Operations, Testing, Disposition and Final Report

- Task 1.3.1 - SCR Demonstration Facility Operations and Maintenance
- Task 1.3.2 - Process Evaluation
- Task 1.3.3 - Environmental Data Management and Reporting
- Task 1.3.4 - Economic Evaluation
- Task 1.3.5 - Dismantling/Disposition
- Task 1.3.6 - Project Management and Reporting

Section 4

PROJECT STATUS

Progress during July - December, 1995 is summarized below for each of the on-going tasks in the Scope of Work.

PHASE III - OPERATIONS, TESTING, DISPOSITION, AND FINAL REPORT

Task 1.3.3 - Environmental Data Management and Reporting

Preparation by the subcontractor of the final report of the project Environmental Monitoring Plan continued throughout this reporting period. All required project data was transmitted to the subcontractor for compilation into this report.

Task 1.3.4 - Economic Evaluation

The economic analysis of full-scale SCR continued throughout this reporting period. This work mainly involved the determination of the design premises for the evaluation.

Task 1.3.5 - SCR Demonstration Facility Dismantling/Disposition

Dismantling Operations

Final operational shut-down of the test facility was completed on July 14, 1995. Operational results prior to shut-down were reported previously in the First and Second quarter, 1995 Combined Quarterly Progress Report.

Bids for dismantling of the SCR facility were received and evaluated and an award was made for subcontractor selection in late July, 1995. The contract was awarded on a fixed-cost basis at a total figure of \$433,700.00. Dismantling operations were tentatively set to begin in mid-August

and be completed before the end of November. Catalysts were removed from the various reactors during the latter half of July and photographed, cleaned, and boxed for shipment. These were temporarily stored in the Plant Crist warehouse.

Preparation of the site preceded the arrival of Hurricane Erin on August 3, 1995. Major damage to project equipment and data was prevented. The temporarily stored catalysts were shipped to their respective owners in early August.

The subcontractor for dismantling the SCR facility mobilized and began dismantling efforts the week of August 14. Work began initially with the removal of the insulation panels covering the reactor doors. Insulation was removed from portions of the hot air fan inlet and outlet piping prior to piping removal. Insulation continued to be removed throughout August including material on the top floor of the structure in preparation for cutting and removing of piping. A large crane was erected during the week of August 21. Dismantling plans called for working from top to bottom (lifting from the top floor as cuts were made) except for work ongoing at grade level (lifting from the grade level as fans and ductwork were cut). The estimated time to reach the air preheater level was one month from start of dismantling operations.

The design and economic premises for performing an economic evaluation for commercial-scale SCR systems were released to project participants for review. Initial work on the economic evaluation was begun. Also, format guidelines for reporting the results of laboratory testing on the catalyst samples collected during the project were sent to the catalyst suppliers for their use in submitting final laboratory testing reports to SCS. A proposed outline for the final report was submitted to project participants for review and final report writing was underway by the end of August.

By the end of September, 1995, all of the steel structure above the building housing the gas sampling and analysis equipment was removed. Some delays were experienced during the removal of the gas house due to the reinforced concrete and roofing material. All equipment was

removed down to this level which included reactor inlets, venturis, small reactor electric heaters, ductwork, and instrument racks. The electric heater of Reactor A was also removed by the end of September. At ground level, the leased ammonia storage tank was removed and returned to the vendor. Some of the ductwork and cable trays supporting the reactor fans was also dismantled. Two boiler penetrations were restored to "pre-project" conditions, the main scoop penetration (take-off for the SCR test facility high-dust flue gas to the reactors) and the gas return penetration. (The three remaining penetrations included the air return, low-dust extraction, and economizer by-pass). Despite the delays with the gas house, the dismantling effort proceeded toward meeting the original forecasted completion date in late November.

Also in September, test baskets from the two rotary air preheaters were sent to ABB Air Preheater, Inc. (ABB) for analysis. Testing for the Q-pipe air preheater was performed on site at a later date, due to the difficulty in removing a test section from this piece of equipment. Data were transmitted to ABB for use in completing the air preheater evaluation.

No major comments were received on either the premises for the economic evaluation or the final report outline, which were submitted during August. Initial work on both the economic evaluation and the final report continued during this reporting period. A technical paper on the project results was presented at DOE's Fourth Annual Clean Coal Technology Conference in Denver Colorado, on September 5-8, 1995.

All of the steel structure and equipment above elevation 152' (last reactor level prior to outlet) was removed by the end of October. This included such items as all inlet ductwork, bypass ductwork, reactor inlet electric heaters, reactors with associated sootblowing equipment, and piping and instrumentation. Two more boiler penetrations were restored to "pre-project" condition during October. These included the air return and low-dust extraction penetrations. The only remaining penetration to be restored was the economizer by-pass. The facility elevator was dismantled down to elevation 161' during October. Some delays were experienced due to

Hurricane Opal. No equipment was lost due to the storm, but scheduling required updating to insure that the original forecasted completion date of late November was met.

The final SCR project review meeting was held October 11 and 12 at Gulf Power Company's Plant Crist in Pensacola, Florida. The meeting was held to discuss the results of the fourth and fifth (final) parametric test sequences, laboratory test results from the catalyst suppliers, and the format of the project final report. The meeting was attended by representatives from all project participants, except for representatives from Siemens who submitted a report for presentation by SCS personnel. ABB representatives also presented their analysis of the air preheater performance as determined from long term test data. Specific plans for the economic evaluation were discussed in detail.

Preparation of the project quarterly technical progress reports and the final report continued. The majority of the background information for the final report was completed and work was focusing on actual data presentation. Hurricane Opal caused some delays in process evaluation and reporting. Preparations to secure data and equipment were made prior to the storm's arrival. Test facility mobile offices were dismantled and computer/electronic administration equipment was stored temporarily in plant warehouse space to prevent damage. Site personnel and equipment were relocated to other facilities for the remainder of the project.

Dismantling of the test facility progressed rapidly during the month of November. Steel structure and equipment removal from the facility site was over 90% complete by the end of the month. Major equipment removal included the removal of the three air preheaters, removal of the equipment/personnel hoist, removal of all facility fans, removal of the control room equipment, and the start of foundation removal and removal of electrical room equipment. By late November dismantling activities concentrated on the removal of foundations and remaining electrical equipment and the disposal of scrap material that was placed in lay-down areas.

Inspections were performed by SCS and ABB personnel on the heat pipe air preheater after its removal to the lay-down area. Samples of the heat pipe were taken for further analysis.

The majority of the background information for the final report was drafted and work continued to focus on actual data incorporation and presentation. An amendment was made to the Cooperative Agreement between DOE and SCS to extend the project and current budget period from October 31, 1995, to June 30, 1996. This no cost extension allowed for completion of the final project reporting and close-out activities.

Dismantling of the SCR test facility was completed early in December. The remaining steel structure and process equipment were removed from the facility site. Removal of foundations and electrical equipment, and the disposal of scrap materials that were placed in lay-down areas, were completed. Foundation and host unit penetrations were all restored to their condition existing prior to project construction. Preparation of quarterly and final reports continued during the month of December. Work on the economic evaluation for the project final report continued.

The following chronological synopsis offers a brief history of project activities conducted during this reporting period on a monthly basis.

July, 1995

- Final shut-down of the SCR test facility on July 14, 1995
- Bids for dismantling received
- Dismantling contract awarded
- Catalysts removed from reactors and packed for shipping

August, 1995

- Mobilization of dismantling subcontractor and start of dismantling operations
- Removal of insulation begun
- Design and economic premises for economic evaluation released
- Work begun on economic analysis for project final report
- Guidelines for catalyst supplier laboratory reports issued
- Proposed final report outline issued
- Catalysts shipped to their respective suppliers

September, 1995

- Removal of steel and equipment above gas analysis house
- Removal of ammonia storage tanks
- Two boiler penetrations restored to original condition
- Test baskets for rotary air preheaters sent to ABB for analysis
- Technical paper presented at Clean Coal Technology Conference, September 5-8, 1995

October, 1995

- All steel structure and equipment removed above elevation 152'
- Two boiler penetrations restored to original condition
- Final project review meeting held October 11 and 12 at Plant Crist

November, 1995

- 90% of steel structure and equipment removal completed
- Inspection of the heat pipe air preheater performed
- Cooperative agreement extended (no cost)

December, 1995

- Completion of dismantling
- Final boiler penetration restored
- All foundations restored to original condition

Equipment Disposition

Certain equipment was retained by the Southern Company as set forth in the Cooperative Agreement between SCS and DOE. First preference was given to the DOE funded Power Systems Development Facility (PSDF) at Wilsonville, Alabama. The majority of retained equipment was transferred to either PSDF or Gulf Power Company. The remaining non-retained equipment/steel was salvaged as scrap by the dismantling subcontractor as set forth in the dismantling contract. Appendix A contains a detailed listing of project equipment and denotes the retaining party or designates the material as scrap.

Task 1.3.6 - Project Management and Reporting

The Management Information System, developed for tracking overall budget and schedule information, was used to monitor budget and schedule and to help fulfill DOE reporting requirements. Monthly progress reports were submitted to DOE.

A final project review meeting was held for all involved parties on October 11 and 12 at Plant Crist in which the final two parametric sequences were discussed. Specific vendor data were discussed in separate meetings with each vendor. The final report outline and catalyst supplier laboratory report format were also discussed in this final project review meeting.

Project information was presented at DOE's Fourth Annual Clean Coal Technology Conference in Denver Colorado, September 5-8, 1995

The Cooperative Agreement was amended to include a no cost continuation extending the project and current budget period from October 31, 1995, to June 30, 1996. This no cost extension allows for completion of final project reporting and close-out activities.

Section 5
PLANNED ACTIVITIES

During the first two quarters of 1996, the following activities are planned:

- Complete economic analysis of full-scale SCR technology installations
- Complete and submit project Final Report
- Begin project final close-out

APPENDIX A

SCR Project Equipment Disposition List

SCR EQUIPMENT INVENTORY LIST

CATEGORY: Dampers

<u>Equipment Description</u>	<u>Manufacturer</u>	<u>Qty.</u>	<u>Destination</u>
62" x 26" x 8" louvered damper with 4 opposed blades. Bailey positioner, matryx actuator	Precision Engineered Products	1	Scrap
14" x 14" x 8" louvered damper with 2 opposed blades. Bailey positioner, matryx actuator	Precision Engineered Products	1	Scrap
63" x 42" x 8" louvered damper with 3 opposed blades, matryx actuator	Precision Engineered Products	3	Scrap
32" x 16" x 8" louvered damper with single blade, matryx actuator	Precision Engineered Products	3	Scrap
12" dia. butterfly damper with Bailey positioner, matryx actuator	Precision Engineered Products	6	Scrap
24" dia. butterfly damper with matryx actuator	Precision Engineered Products	18	Scrap
12" dia. butterfly damper with matryx actuator	Precision Engineered Products	2	Scrap
8" dia. butterfly damper with matryx actuator	Precision Engineered Products	6	Scrap
18" dia. louvered damper with Bailey positioner matryx actuator 2 opposed blades	Precision Engineered Products	3	Scrap
24" dia. louvered damper with 2 opposed blades. Bailey positioner, matryx actuator	Precision Engineered Products	2	Scrap

CATEGORY: Dampers (continued)

<u>Equipment Description</u>	<u>Manufacturer</u>	<u>Qty.</u>	<u>Destination</u>
30" dia. louvered damper with 2 opposed blades. Bailey positioner, matryx actuator	Precision Engineered Products	1	Scrap
24" x 36" x 8" louvered damper with matryx actuator	Precision Engineered Products	1	Scrap

CATEGORY: Instrumentation

<u>Equipment Description</u>	<u>Manufacturer</u>	<u>Qty.</u>	<u>Destination</u>
Infi 90 digital control system (see Attachment "A")	Bailey	1	SCS Engr.
Ammonia gas mass flow controller with integral control valves 4-20 MA DC in and out (0-5.0 kg/hr) 8400	Sierra	3	Scrap
Ammonia gas mass flow controller with integral control valve 4-20 MA DC in and out (0-5.0 kg/hr) 8400	Sierra	6	Scrap
1-20 in. WC LD 300D1	SMAR	90	Gulf*
Diff. press. 10-200 in. WC LD300D2	SMAR	1	Gulf*
Gage press. 180-3,600 PSI LD300M5	SMAR	1	Gulf*
Gage press. 10-200 in. WC LD300M2	SMAR	12	Gulf*
Gage press 1-20 in. WC LD300M1	SMAR	1	Gulf*
Gage press. 18-360 PSI LD300M4	SMAR	2	Gulf*

CATEGORY: Instrumentation (continued)

<u>Equipment Description</u>	<u>Manufacturer</u>	<u>Qty.</u>	<u>Destination</u>
Valve/Manifolds Y345	Oliver	91	Gulf*
Valve/Manifolds G12FFS	Oliver	16	Gulf*
Pressure switches - 30 to +30 in. WC B4-61-V-XNH	Ashcroft	3	Scrap
Air mass flow meters with 3 point avg. probe 4-20 MA output Model 650 0-7500 SCFM (1) 18" probe	Sierra	3	Gulf
Pressure transmitter diff. press. 1.5-30 in. WC PTSSSDDA	Bailey	1	Gulf*
Hand held transmitter calibrator STT02E	Bailey	1	SCS Engr.
Pressure transmitter diff. press. 0-75 PSI PTSDDF	Bailey	1	SCS Engr.
Ammonia gas mass flow controller with integral control valve 4-20MA DC in and out (0-5.0 kg/hr) 585li	Brooks	4	Scrap
Ammonia gas mass flow controller with integral control valve 4-20MA DC in and out (0-.5 kg/hr) 585li	Brooks	2	Scrap
Position transmitter 4-20MA DC loop powered RIK50A	Kytronics	1	Gulf*
Position transmitter 0-1000 OHM in. 4-20 MA DC out FSIA	Yokogawa	3	Gulf*
Solenoid valves 120 volt AC, single coil MKO1CEA75ALJC	Norgren	6	Scrap

CATEGORY: Instrumentation (continued)

<u>Equipment Description</u>	<u>Manufacturer</u>	<u>Qty.</u>	<u>Destination</u>
Isolated 2 wire transmitter loop powered 4-20 MA DC in and out X54-225-420-B	Ronan	3	Gulf*
Pressure transmitter diff. press. 0-30" wc 1151DP	Rosemount	1	SCS Engr.
Glass purge meters 3EA- 110SCFH air 5EA-12SCFH air	Wallace Tiernan	9	Gulf*
Pressure transmitter diff. press. 0-30 in. wc UA11F	Yokogawa	1	SCS Engr.
Hand held terminal BT100	Yokogawa	1	SCS Engr.
Flanged ASME type venturi 10" wc at 7,500 SCFM 24" dia. 150# 105" long	Flow-Lin	3	Scrap
Flanged ASME type venturi 10" wc at 600 SCFM 6" dia. 150# 30" long	Flow-Lin	6	Scrap
7 range clamp on AC volt- ammeter	Micronta	1	R&EA
Dangerous gas leak locator with telescoping extension 501NK	Leak-Tee Tracer	1	Gulf*
Rotary electric actuator 600 ft/lbs 110V AC with 4-20 MA DC in/out SM5220	Jordan	3	Gulf*
Rotary electric actuator 150 ft/lbs 110V AC with 4-20 MA DC in/out SM5110	Jordan	2	Gulf*
Rotary electric actuator 200 ft/lbs. 110V AC with 4-20 MA DC in/out SM5110	Jordan	1	Gulf

CATEGORY: Instrumentation (continued)

<u>Equipment Description</u>	<u>Manufacturer</u>	<u>Qty.</u>	<u>Destination</u>
Integral flow orifice assembly 1/2" line, 40 SCFM air, 31" H2O diff. IFOA	Foxboro	3	Scrap
Integral flow orifice assembly 1/2" line, 3 SCFM air, 5" H2O diff. IFOA	Foxboro	6	Scrap
Orifice union set 2" line with 1/2" taps -12,700,000 PPH-36 PSI diff.	Foxboro	1	Scrap
CEMS System	Lear Siegler	1	Gulf*
AV8G Converters	Yokogawa	3	Gulf*
Analyzers with flanges	Yokogawa	24	Gulf*
Additional channels	Yokogawa	18	Gulf*
Additional power packs	Yokogawa	3	Gulf*
Cable/tubing	Yokogawa	2300 ft	Scrap

CATEGORY: Valves

<u>Equipment Description</u>	<u>Manufacturer</u>	<u>Qty.</u>	<u>Destination</u>
8" 150 # flanged cast steel gate valve with linear actuator	Stockham	6	Gulf
14" 150# flanged cast steel gate valve linear actuator	Stockham - located in Const. Warehouse	3	Gulf
4" 150# flanged cast steel ball valve	?	24	Scrap
1/2" threaded ball valve (NH3) with solenoid 76-103-01	Apollo	9	Gulf*

CATEGORY: Valves (continued)

<u>Equipment Description</u>	<u>Manufacturer</u>	<u>Qty.</u>	<u>Destination</u>
2" threaded ball valve (water) solenoid 71-148-01	Apollo	1	Gulf*
1-1/4" threaded ball valve (NH3) with solenoid 76-106-01	Apollo	1	Gulf*
Pressure relief valve 2 x 3 1912HT set at 600 PSIG steam	?	1	Scrap
4" globe valve, 4-20MA DC in. 1000 OHM out 88U-25125	Masoneilan	3	Scrap
1-1/4" press. reg. globe valve (water) 17-22	Masoneilan	1	Gulf*
2" press. reg. globe valve (steam) with controller BB-21211	Masoneilan	3	Gulf
1" press. reg. globe valve (NH3) with controller 28 28240-1	Masoneilan	1	Gulf
1/2" press. reg. globe valve (air) 17-22	Masoneilan	3	Scrap
2" press. reg. globe valve (steam) with controller 88-2111	Masoneilan	1	Scrap
2" globe valves (steam) with solenoid	Masoneilan	15	Gulf
4", 150# flanged ball valve (ASH) with solenoid	Neles Jamesbury	2	Gulf*
6" water check valve	Marlin	1	Scrap
8" knife gate valve (ASH)	Dezurik	5	Scrap
10" knife gate valve (ASH)	Dezurik	3	Scrap

CATEGORY: Valves (continued)

<u>Equipment Description</u>	<u>Manufacturer</u>	<u>Qty.</u>	<u>Destination</u>
8" knife gate valve (ASH) with solenoid	Dezurik	5	Scrap
10" knife gate valve (ASH) with solenoid	Dezurik	3	Scrap
10" rotary air locks (ASH) with 1 HP motor starters	Rotolok	3	Scrap
4" slide gate (ASH) with solenoid	Allen Sherman Hoff	1	Scrap
6" slide gate (ASH) with solenoid	Allen Sherman Hoff	2	Scrap

CATEGORY: Fan/Motors

<u>Equipment Description</u>	<u>Manufacturer</u>	<u>Qty.</u>	<u>Destination</u>
Hot air fan - 31,784 CFM, 19" wc out press. 600 °F, 1775 RPM motor-200 HP, variable speed, 1800RPM, 3 phase 460 volts	Howden Sirocco	1	Fan - Scrap
		1	Motor - PSDF
Large reactor fan - 15,072 CFM 40" WC press. 400 °F, 1775 RPM motor 100 HP variable speed 460 volts	Howden Sirocco	2	Fan/Motor - Scrap
		1	Motor - PSDF
		1 2ea. - inlet & outlet transition pieces	Fan - Scrap Scrap
Small reactor fan - 3,683 CFM, 24.0" wc in press. , 750 °F, 2400 RPM motor - 25 HP, variable speed, 3 phase 460 volts	Howden Sirocco	2	Fans - Scrap
		2	Motors - PSDF

CATEGORY: Fans/Motors (continued)

<u>Equipment Description</u>	<u>Manufacturer</u>	<u>Qty.</u>	<u>Destination</u>
Dilution air fan - 159 CFM, 43.0" wc out press., 70 °F, 3600 RPM motor 7-1/2 HP, 3600 RPM, 3 phase 460 volts	Howden Sirocco	2 2	Fans - Scrap Motors - PSDF
Variable speed motor controllers 460 volt, 3 phase, 25 HP, 2EC4025 APH	Reliance	2	PSDF
Variable speed motor controllers 460 volt, 3 phase, 1 HP, 2EC40150 APH	Reliance	2 1	PSDF Scrap
Variable speed motor controllers 460 volt, 3 phase, 100 HP, 2GU41001 APH	Reliance	2	PSDF
Motor, 460 volts, 3 phase, 1.5 HP, 1730 RPM	Reliance	2	Gulf*
Motor, 460 volt, 3 phase, 3/4 HP, 1730 RPM	Reliance	2	Gulf*

CATEGORY: Cyclones

<u>Equipment Description</u>	<u>Manufacturer</u>	<u>Qty.</u>	<u>Destination</u>
XO340-15-4 Quad Cyclones, 3/8" PL. SA516 GR, 70 const. with common inlet/inlet manifolds - 8 hour storage	Fisher-Klosterman	2	Scrap
NMFC 60160, Sub 1 class 70 dust collector	Fisher-Klosterman	5	Scrap

CATEGORY: Sootblowers

<u>Equipment Description</u>	<u>Manufacturer</u>	<u>Qty.</u>	<u>Destination</u>
Model T-20E TEH single motor operated long retractable rake ARM	Copes-Vulcan	12	Gulf
Model D5E 460 volt, 3-phase rotary	Copes-Vulcan	10	Gulf

CATEGORY: Miscellaneous

<u>Equipment Description</u>	<u>Manufacturer</u>	<u>Qty.</u>	<u>Destination</u>
Electric heaters 480 volt, 3 phase, 375 KW with control cabinet for each total = 3	Watlow	3	Scrap
Electric heaters 480 volt, 3 phase, 35 KW with 2 control cabinets, total = 2	Watlow	7	Scrap
Steam traps - 5/64" dia. outlet orifice, 3/4" dia. socket weld, 500 psig at 710 °F	Armstrong	4	Scrap
1/2 ton capacity trolley for hook type chain hoist, made for S8 x 18.4 monorail beam	Columbus McKinnon	3	PSDF
10" model 50 duplex strainer 125 lb. flanges, 2.3 PSI press. drop clean	Hayward	1	Gulf*
Lift truck, 3,000 lb. capacity 103" lift height - 54" fork length - with charger SP30	Clarklift	1	PSDF

CATEGORY: Tool Box

<u>Equipment Description</u>	<u>Manufacturer</u>	<u>Qty.</u>	<u>Destination</u>
Misc. tools	Varies	1 Lot	PSDF

CATEGORY: Office Furniture

<u>Equipment Description</u>	<u>Manufacturer</u>	<u>Qty.</u>	<u>Destination</u>
Misc. furniture	Varies	1 Lot	PSDF

CATEGORY: Gas Analysis Office

<u>Equipment Description</u>	<u>Manufacturer</u>	<u>Qty.</u>	<u>Destination</u>
Zenith 386 SN913AE003845 SCS# 78708	Zenith	1	PSDF
Zenith Monitor SCS# 81442	Zenith	1	PSDF
Zenith Key Board 918ZE085570T	Zenith	1	PSDF
Realistic TRC-225 40 Ch. Citizens Band Transceiver	Realistic	1	Gulf
Archer AC Adapter 120ACTO12VDC1A out	Radio Shack	1	PSDF
Power strip Woods #425 full protective surge suppresser, six input	Woods	2	Gulf*
2 Ch. transceiver Ch. 1 freq. (456.075) Ch. 2 freq. (451.250) SN20356 JBC400 (sent to PSDF)	Ritron	1	PSDF
2 Ch. transceiver Ch. 1 freq. (456.075) Ch. 2 freq. (451.250) SN20355 (sent to PSDF)	Ritron	1	PSDF

CATEGORY: Gas Analysis Office (continued)

<u>Equipment Description</u>	<u>Manufacturer</u>	<u>Qty.</u>	<u>Destination</u>
Battery charger DV-1010L for JBC-400 transceiver (sent to PSDF)	Ritron	2	PSDF
3-drawer desk Gulf Power #00889		1	Gulf*
Toshiba Printer P321 SCS# 66925	Toshiba	1	PSDF
Cork Board 2 x 3		1	PSDF
Dry Erase Board 2 x 3		1	Gulf*
Gas bottle hand truck (holds 1 bottle)	Air Products	1	Gulf*
Workmate 200	Black and Decker	1	Gulf*
Table 23" x 46", folding		1	Gulf*
Table 30" x 70", folding		1	Gulf*
Regulator Ammonia 330SS fitting E12-C-C445OR62112	Air Products	1	Gulf
Regulator Scott Specialty Oxygen OGA350 brass fitting, MOD 18A	Scott Specialty	1	Gulf
Regulator Scott Specialty Oxygen CGA590 brass fitting gages glass broken MOD 18A	Scott Specialty	1	Gulf
Regulator Scott Specialty Oxygen CGA350 brass fitting, missing one gage low press. MOD 18A	Scott Specialty	1	Gulf

CATEGORY: Gas Analysis Office (continued)

<u>Equipment Description</u>	<u>Manufacturer</u>	<u>Qty.</u>	<u>Destination</u>
Regulator Scott Specialty Oxygen CGA 590 brass fitting MOD #51 SCR500099	Scott Specialty	1	Gulf
Regulator Scott Specialty Nitric Oxide MOD 51 15B SCR#393059 CGA660 SS	Scott Specialty	1	Gulf
Flourescent trouble lamp for heavy duty service, catalog #1015-3 for indoor use 30 watt	Daniel Woodhead	1	Gulf
Regulator Scott Specialty CGA580 N2 usage brass MOD #51 600A SN#50005	Scott Specialty	1	Gulf
Regulator CGA 350 SS CO usage SN#390189 MOD #61-13A	Scott Specialty	1	Gulf
Regulator CGA 580 grass CO2 usage SN#51 600A	Scott Specialty	1	Gulf
Regulator CGA 660SS NO2 usage MOD #51-158	Scott Specialty	1	Gulf
Regulator CGA 660SS MOD #51-158 usage SO2 & NO	Scott Specialty	1	Gulf
Regulator CGA 660SS MOD #51-158 usage NO	Scott Specialty	1	Gulf
Regulator CGA 660SS 140D #51-158 usage NO	Scott Specialty	1	Gulf
Regulator CGA 660SS MOD #51-158 usage NO	Scott Specialty	1	Gulf
Regulator CGA02 usage brass Code #E11-C-N515A	Air Products	1	Gulf

CATEGORY: Gas Analysis Office (continued)

<u>Equipment Description</u>	<u>Manufacturer</u>	<u>Qty.</u>	<u>Destination</u>
Regulator CGA 590, 02 usage brass MOD #18A	Scott Specialty	1	Gulf
Weather King AC unit MOD #RH-064-4E-30-CO, SN#921004401001	Weather King	1	Scrap
Roller & Swivel chair		1	Scrap
2 step, step stool		1	Gulf

CATEGORY: Miscellaneous

<u>Equipment Description</u>	<u>Manufacturer</u>	<u>Qty.</u>	<u>Destination</u>
Control Room Building		1 Lot	Gulf
Floor Plate		1 Lot	Gulf
Grating		1 Lot	Gulf
Cable Trays		1 Lot	Scrap
Spring Hangers		1 Lot	Scrap
NH3 Spray System		1 Lot	Gulf
Air Compressor		1 Lot	Gulf
Light Fixtures, H.P. Sodium		1 Lot	Gulf
Elevator	USA Hoist	1	Gulf
Structural Steel	ASTM A36	1 Lot	Scrap
Steel Ladders	ASTM A36	1 Lot	Scrap
Handrail	Pipe	1 Lot	Scrap

CATEGORY: Miscellaneous (continued)

<u>Equipment Description</u>	<u>Manufacturer</u>	<u>Qty.</u>	<u>Destination</u>
Piping		1 Lot	Scrap
Ductwork	Steel	1 Lot	Scrap
Expansion Joints	Flexonics	1 Lot	Scrap
Ammonia Tank	Leased	1	L A Roach
Fire Extinguishers		1 Lot	Gulf
CO2 Analyzer	Siemens Ultramat 5 (CEMS)	1	PSDF
Interactive Operator Interface		5	PSDF
Air Compressor with filter, dryer, surge cylinder & pressure regulator		1	Gulf
Service Water Pump w/motor		1	PSDF
4160V Switchgear Frame #1		1	Gulf
4160V Switchgear Frame #6, #9		4	Gulf
4160V Switchgear PT Compartment		1	Gulf
Cyclone hopper vibrators (8 reactors)		1	Scrap
LSMCC System Controller		1	PSDF