

# **RADIAN** **CORPORATION**

EXECUTIVE SUMMARY  
AN AIR POLLUTION COMPLIANCE  
ANALYSIS REPORT ON NINE  
INDUSTRIES

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AN AIR POLLUTION COMPLIANCE  
ANALYSIS REPORT ON NINE  
INDUSTRIES

PRIMARY ALUMINUM	NITRIC ACID
FERROALLOY	PHOSPHATE FERTILIZER
PORTLAND CEMENT	COAL CLEANING
SULFURIC ACID	GRAY IRON
ASPHALT CONCRETE	

Presented to:

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This Executive Summary presents a review of an extensive compliance analysis study of nine major industries performed for the U.S. Environmental Protection Agency in fulfillment of contracts 68-02-1319, Task 16 and 68-02-1383, Task 11. Reports for each of the nine industries are presented in individual volumes. EPA Project Officer was Mr. Robert C. Marshall. Radian Program Manager was Mr. C. P. Bartosh. Mr. B. P. Cerepaka was Task Director. The contents herein do not necessarily represent the views or policies of the Agency.

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1.0        BACKGROUND

Under Section 113 of the Clean Air Act, as amended, the Administrator of the Environmental Protection Agency (EPA) may initiate federal enforcement against any "person" responsible for the violation of an applicable requirement set forth in the State Implementation Plans (SIP), the New Source Performance Standards (NSPS), or the National Emissions Standards for Hazardous Air Pollutants (NESHAPS).

Although each of the ten EPA regional offices has primary responsibility for implementation of the Administrator's federal enforcement authority, the Division of Stationary Source Enforcement in EPA headquarters is responsible for overall enforcement policy development. By maintaining a national overview of the compliance status of air pollution sources, as well as the mitigating factors which have produced this status, DSSE is able to provide uniform guidance to the regional offices involved in federal enforcement activities.

2.0        SCOPE

Radian Corporation has performed an extensive compliance analysis study of nine major industries: primary aluminum, ferroalloy, portland cement, sulfuric acid, nitric acid, phosphate fertilizer, coal cleaning, gray iron, and asphalt concrete. The initial goal of the study was to locate all facilities with production capabilities. In addition, individual plant processes and size (capacity and production) were located for calculation of potential (uncontrolled) emissions from EPA emission factors and for calculation of allowable emissions based on state air quality implementation plans (SIP). Actual emissions for individual plants were extracted from the National Emissions Data System (NEDS) and were supplemented by industry wide estimates made in other studies. Individual plant compliance status was obtained from the Compliance Data System (CDS) and was supplemented by manual file data from the regional offices.

The following section presents the definition of each industry for this study including the pollutants and processes that were considered.

Primary Aluminum - the scope of this industry was restricted to all primary aluminum smelters. Bauxite plants were not considered. The reduction process including anode baking was the operation considered. Total particulates and total fluorides were the pollutants studied from reduction operations. This industry is classified by the Standard Industrial Classification Manual as SIC 3334.

Ferroalloy - the scope of this industry is defined by the products. In this study the definition is the same as given by the Bureau of Mines Minerals Yearbook and includes such products as ferromanganese, silicomanganese, ferrosilicon (including silicon metal), chromium alloys, ferrotitanium, ferrophosphorus, and miscellaneous others. The industry is classified by SIC 3313, except for plants which produce ferroalloys primarily in blast furnaces which are under SIC 3312. The major process considered is the electric smelting furnace, although other types of production processes are considered. Paritculates are the only pollutant considered.

Portland Cement - this industry was defined to include all plants which produce clinker and also those which only finish grind clinker produced elsewhere. The industry is classified by SIC code 3241. The operations considered were grouped into dryers, grinders and kiln, cooler. Particulates were the only pollutant considered.

Sulfuric Acid - plants producing sulfuric acid by two types of processes were considered: contact and chamber processes. The absorption column is the major emission process point. Sulfur dioxide and acid mist (particulate) were the pollutants studied. The industry is classified by SIC code 2819.

Nitric Acid - nitric acid production including concentrated acid production was the scope of this industry. The absorption column is the major emission process point. Nitrogen oxides is the pollutant considered. The industry is classified by SIC code 2873.

Phosphate Fertilizer - the scope of this industry is defined as those plants which chemically manufacture the three fertilizers: normal superphosphate, triple (concentrated) superphosphate, and ammonium phosphates. The industry is classified by SIC code 2874. Normal superphosphate production emissions are particulate and fluoride from the main stack and dryers, grinders. Triple superphosphate production emissions are fluorides from the alternative types: run-of-pile and granular. Ammonium phosphate production emissions are particulates and fluorides from the dryer, cooler and ammoniator - granulator.

Coal Cleaning - the scope of this industry is defined to include all plants which mechanically clean, wash, and prepare coal by wet or dry methods. Also included are all plants which thermally dry cleaned coal. Coal tippie plants are not included in this study. The thermal dryer is the major emission-producing operation at coal preparation plants. Particulate emissions are the most important air pollution problem. The coal cleaning industry is classified by SIC code 1211 for bituminous coal and 1311 for anthracite coal.

Gray Iron - this industry is defined to include all those iron foundries which produce gray or ductile iron castings. Foundries which produce only malleable iron are excluded. The gray iron industry is classified by SIC code 3321. Metal melting is the operation producing the most emissions at gray iron foundries. Three types of furnaces and two pollutants are considered: cupolas, particulate and carbon monoxide emissions; reverberatory furnaces, particulate emissions; and induction furnaces, also particulate emissions.



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Asphalt Concrete - the scope of this industry is defined to include all "hotmix" asphalt concrete plants, both stationary and portable. The industry is classified by SIC code 2951. The rotary dryer is the major emission-producing operation at asphalt concrete plants. Particulates are the major pollutant.

Table 2.0-1 is a summary of the products, operations, and pollutants considered for each industry in this study.

TABLE 2.0-1  
SUMMARY OF PRODUCTS, OPERATIONS, AND POLLUTANTS

<u>INDUSTRY</u>	<u>PRODUCT(S)</u>	<u>OPERATION(S)</u>	<u>POLLUTANT(S)</u>
Primary Aluminum	aluminum ingot	reduction cells anode bake furnace	particulates, fluorides <sup>1</sup> particulates
Ferroalloy	ferrosilicon silicomanganese chromium alloys ferrotitanium ferrophosphorus others	electric smelting furnace	particulates
Portland Cement	Portland Cement	dryers, grinders kiln, cooler	particulates particulates
Sulfuric Acid	sulfuric acid	absorber	particulates, sulfur dioxide <sup>1</sup>
Nitric Acid	nitric acid	absorber	nitrogen oxides
Phosphate Fertilizer	normal superphosphate triple superphosphate ammonium phosphates	grinding, drying, main stack run-of-pile, granular dryer, cooler, ammoniator- granulator	particulates, fluorides <sup>1</sup> particulates particulates
Coal Cleaning	cleaned coal	thermal dryers	particulates
Gray Iron	gray and ductile iron	cupola reverberatory furnace induction furnace	particulates, carbon monoxide particulates particulates
Asphalt Concrete	asphalt concrete	rotary dryer	particulates

<sup>1</sup>Emissions summarized in specific industry report

### 3.0      APPROACH

Radian was supplied plant summaries as of August, 1974 from NEDS and CDS selected by SIC code appropriate to each industry. The first step was to obtain as much data as possible from non-EPA sources. Industry surveys, trade journals, association membership lists, Bureau of Mines, and others provided plant locations, sizes, and processes. The Bureau of Census provided industry-wide totals of production and numbers of operational plants. Radian was unable to confirm operational status of the individual plants located because the Bureau of Census does not divulge name and location of individual plants. All plants were then grouped into EPA regions, states, AQCR's, counties, and cities. Each plant located from non-EPA sources was assigned coding numbers for state, county, and city from the SAROAD Station Coding Manual. Pollutant priorities for each AQCR were located in 40 CFR 52 (revised as of July 1, 1974)

The next task was to record the actual compliance status and compliance schedules, if any, for each plant on the lists. This task was broken down into two areas; those plants in CDS, and those not.

Those sources in CDS were evaluated for overall plant compliance by using a "Quick Look" Report summary of the entire source (plant) created in May, 1975. Schedules were obtained from Source Data Reports selected by the applicable SIC code for each industry. Schedules for plants not identified in the SIC code search were obtained by selecting a "Quick Look" Report for all increments of progress which were scheduled on January 1, 1975 or later. Schedules for plants in CDS which did not appear in the Source Data Reports selected on SIC code or in the "Quick Look" Report for increments of progress due beyond 1974 were not obtained. In many cases, these plants were listed in CDS with an incorrect

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entire plant status code. Therefore, many of the plants actually having unknown compliance with increments of progress of a schedule appeared in CDS with a code for unknown compliance with emission limitations. Radian's report for each industry reflects this error.

Status of those plants not in CDS was obtained from regional offices, if known. The Regional Offices were also queried about any manual file data available to update CDS. In some cases, data was in the process of being added to CDS and was unavailable for this study. The following is a summary of the supplemental Region Office data which was available and used in this study.

Region I - None

Region II - CDS Source Data Reports for all sources as of 23 April 1975. Data was obtained by a visit to Regional Office on 23 April 1975.

Region III - None

Region IV - CDS Source Data Reports for all sources and Semi-annual and Quarterly Reports from the states in Region IV. This data was available to Radian as a result of an on-going contract with Region IV to update CDS

Region V - None

Region VI - CDS Source Data Reports for Louisiana and Oklahoma and data from Texas Air Control Board on compliance status of all sources in the EMS system as of 30 April 1975.

Region VII - Status of all sources was obtained by visit to Regional Office on 21-23 April 1975.

Region VIII - Status of all sources as of 21 May 1975 was obtained by mail contact.

Region IX - The status of nine sources in neither NEDS nor CDS was obtained over the phone. Status was as of 23 May 1975.

Region X - None

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Radian attempted to perform calculations of potential and allowable emissions on individual plant data collected from non-EPA data sources. The purpose was to make state, regional, and national comparative summaries of the emission levels allowed by SIP's relative to potential emissions. Calculations of potential and allowable emissions for each plant could not uniformly be made for all industries. However, for those industries for which individual plant data was insufficient to choose the proper emission factor, an average factor was applied to national production to estimate total industry potential emissions. For those industries in which allowable emissions could not be accurately calculated on a plant-by-plant basis, Radian used estimates made in other studies to determine approximate nationwide average control efficiencies required by the SIP's. Also consulted was 40 CFR 51 - Appendix B - Examples of Emission Limitations Attainable with Reasonably Available Technology.

4.0      RESULTS

National total of potential (uncontrolled) emissions for each industry using EPA emission factors and production from the latest year in which data was available were calculated. Total potential particulate emissions were about 21,578,000 tons for the eight industries with particulate emission factors (nitric acid is the exception). Potential SO<sub>2</sub> emissions from the sulfuric acid industry vary substantially according to the percent conversion of SO<sub>2</sub> to SO<sub>3</sub> in the process. An average conversion percentage for the industry could not be obtained so potential emissions were not estimated. Potential NO<sub>x</sub> emissions from nitric acid production were calculated to be 271,000 tons. Potential carbon monoxide emissions from the gray iron industry were calculated to be 1,300,000,000 tons. Refer to Table 4.0-1 for an industry by industry summary of number of plants, production, and potential particulate emissions.

The number of plants located for each industry in this study relative to the number of operating plants as reported by Bureau of Mines and Bureau of the Census differ for some industries. The number of plant locations found in this study for each industry are presented in Table 4.0-2. The number of sulfuric acid plants located by Radian is about 100 greater than the number reported operating in 1974. Radian included many small chamber sulfuric acid plants which are probably closed. These plants were preserved in this study because the Census Bureau does not report names and addresses of producing plants, only numbers. So Radian could not determine which of the plants were operating. The case for the phosphate fertilizer industry is similar in that over 150 more plants were found by Radian than were reported to be operating in 1973. Many of these are small normal superphosphate plants which have closed. For two industries,

TABLE 4.0-1

## SUMMARY OF INDUSTRY PRODUCTION AND POTENTIAL PARTICULATE EMISSIONS

INDUSTRY	YEAR	OPERATING PLANTS	PRODUCTION (TONS)	SOURCE OF PRODUCTION DATA	OPERATIONS CONSIDERED	POTENTIAL PARTICULATE EMISSIONS
Primary Aluminum ✓	1973	31	4,529,000	Bureau of Mines	Reduction cells, anode furnaces	201,000 tons
Ferroalloy	1972	47	2,526,000	Bureau of Mines	Electric furnaces	138,000 tons <sup>1</sup>
Portland Cement	1973	173	83,476,000	Bureau of Mines	Dryers, Grinders, Kiln, Cooler	12,400,000 tons
Sulfuric Acid	1974	150	32,234,000 (100% acid)	Bureau of Census	Absorber	66,000 tons
Nitric Acid	1973	85	9,872,000 (100% acid)	Bureau of Census	Absorber	---
Phosphate Fertilizer	1973	92	5,231,000 (P <sub>2</sub> O <sub>5</sub> )	Bureau of Census	Normal Super, Triple Super, and Ammonium Phosphate Manufacturing	275,000 tons <sup>2</sup>
Coal Cleaning	1972	408 <sup>4</sup>	292,829,000 (Mechanically cleaned)	Bureau of Mines	Thermal Dryer	532,000 tons <sup>3</sup>
Gray Iron	1972	~1500	18,024,000	Bureau of Census	Cupola	154,000 tons
Asphalt Concrete	1972	~4800	325,000,000	National Asphalt Pavement Association	Rotary Dryer	7,312,000 tons
						<hr/> 21,578,000 tons

<sup>1</sup> Emission factors applicable to 71% of production<sup>2</sup> Emission factors applicable to 68% of P<sub>2</sub>O<sub>5</sub> production<sup>3</sup> Emission factors applicable to thermally dried coal, which was 18% of cleaned coal<sup>4</sup> Of these, 112 plants operated 155 thermal drying units.

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gray iron and asphalt concrete, Radian was unable to locate all the plants. The number of gray iron plants located was about 56% of total thought to be operating. The number of asphalt plants located number about 35% of the estimated number operational. For the remaining industries, Radian's total is very near the number reported to be operating.

Compliance status data for the sources in each industry was compiled into three categories: in compliance, out of compliance, and unknown. These categories were subdivided into six subcategories: in compliance with SIP emission limitations as determined by source test, inspection or state certification; in compliance with the increments of progress of a compliance schedule; out of compliance with emission limitations; out of compliance with the increments of progress of a compliance schedule; unknown compliance with emission limitations; and unknown compliance with the increments of progress of a compliance schedule.

Table 4.0-2 presents an industry by industry summary of the number of plants and percentages reported to be in, out, and unknown compliance as of May, 1975.



TABLE 4.0-2

## CATEGORICAL SUMMARY OF PLANT COMPLIANCE STATUS BY INDUSTRY

	IN COMPLIANCE EMISSION LIMITATION	IN COMPLIANCE WITH SCHEDULE	TOTAL IN COMPLIANCE	OUT OF COMPLIANCE EMISSION LIMITATION	OUT OF COMPLIANCE WITH SCHEDULE	TOTAL OUT OF COMPLIANCE	UNKNOWN COMPLIANCE EMISSION LIMITATION	UNKNOWN COMPLIANCE WITH SCHEDULE	TOTAL UNKNOWN COMPLIANCE	TOTAL
Primary Aluminum	9 (29%)	2 (6%)	11 (35%)	1 (3%)	3 (10%)	4 (13%)	12 (39%)	4 (13%)	16 (52%)	31
Ferroalloy	3 (5%)	2 (4%)	5 (9%)	3 (5%)	6 (11%)	9 (16%)	24 (42%)	19 (33%)	43 (75%)	57
Portland Cement	40 (21%)	21 (11%)	61 (32%)	9 (5%)	10 (5%)	19 (10%)	82 (43%)	30 (15%)	112 (58%)	192
Sulfuric Acid	41 (16%)	15 (5%)	56 (21%)	10 (4%)	8 (3%)	18 (7%)	146 (56%)	41 (16%)	187 (72%)	261
Nitric Acid	11 (10%)	12 (11%)	23 (21%)	10 (9%)	4 (4%)	14 (13%)	54 (51%)	16 (15%)	70 (66%)	107
Phosphate Fertilizer	14 (5%)	4 (2%)	18 (7%)	6 (2%)	4 (2%)	10 (4%)	197 (75%)	36 (14%)	233 (89%)	261
Coal Cleaning	61 (13%)	0 (0%)	61 (13%)	1 (0%)	3 (1%)	4 (1%)	380 (81%)	26 (5%)	406 (86%)	471
Gray Iron	167 (20%)	47 (6%)	214 (26%)	12 (1%)	13 (1%)	25 (2%)	457 (55%)	145 (17%)	602 (72%)	841
Asphalt Concrete	326 (20%)	20 (1%)	346 (21%)	23 (1%)	10 (1%)	33 (2%)	1,032 (62%)	255 (15%)	1,287 (77%)	1,666
TOTAL	672 (17%)	123 (4%)	795 (21%)	75 (2%)	61 (1%)	133 (3%)	2,384 (61%)	572 (15%)	2,956 (76%)	3,887