PHOSPHORIC ACID LISTING BACKGROUND DOCUMENT FOR THE INORGANIC CHEMICAL LISTING DETERMINATION

This Document Contains No Confidential Business Information

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TABLE OF CONTENTS

1. SECTOR OVERVIEW 1
   - 1.1 SECTOR DEFINITION, FACILITY AND LOCATIONS 1
   - 1.2 PRODUCTS, PRODUCT USAGE AND MARKET 3
   - 1.3 PRODUCTION CAPACITY 3
   - 1.4 PRODUCTION, PRODUCT AND PROCESS TRENDS 4

2. DESCRIPTION OF MANUFACTURING PROCESS 4
   - 2.1 PRODUCTION PROCESS DESCRIPTION 4
   - 2.2 PRODUCTION TRENDS, CHANGES AND IMPROVEMENTS 5
   - 2.3 PROCESS FLOW DIAGRAM 5

3. WASTE GENERATION AND MANAGEMENT 7
   - 3.1 WASTES OUTSIDE THE SCOPE OF THE CONSENT DECREE 7
   - 3.2 SUMMARY OF WASTE GENERATION PROCESS 7
     - 3.2.1 Arsenic Filter Cake 11
     - 3.2.2 Caustic Scrubber Water 12
     - 3.2.3 Process Acid Leaks 13
     - 3.2.4 Phosphorous Acid Spills 14
     - 3.2.5 Clean-up Washdown Water 15
     - 3.2.6 Spent Mist Eliminator Packing (Filters) 15
     - 3.2.7 Combustion Chamber Slag 16
     - 3.2.8 Recycled Weak Phosphoric Acid 17
     - 3.2.9 Spent Filters (from purification) 18
     - 3.2.10 Rubber Liners of Product Storage Tanks 19
     - 3.2.11 Spent Filters for Product 20
     - 3.2.12 Off-Spec Phosphoric Acid 20
     - 3.2.13 Spent Activated Carbon 21
     - 3.2.14 Spent Filters for Off-spec Product 22
     - 3.2.15 Wastewater Treatment Sludge 23

Appendix A: Summary of Waste Generation and Management

LIST OF TABLES

Table 1.1 - Phosphoric Acid Producers 1
Table 3.1 - Wastes Generated from the Production of Phosphoric Acid by the Dry Process 9
Table 3.2 - Waste Management Summary for Arsenic Filter Cake 11
Table 3.3 - Waste Management Summary for Caustic Scrubber Water 12
Table 3.4 - Waste Management Summary for Process Acid Leaks 13
Table 3.5 - Waste Management Summary for Phosphorous Acid Spills 14
Table 3.6 - Waste Management Summary for Clean-up Washdown Water 15
Table 3.7 - Waste Management Summary for Spent Mist Eliminator Packing (Filters) 16
Table 3.8 - Waste Management Summary for Combustion Chamber Slag 17
Table 3.9 - Waste Management Summary for Recycled Weak Phosphoric Acid 17
Table 3.10 - Waste Management Summary for Spent Filters (from purification) 18
Table 3.11 - Waste Management Summary for Rubber Liners of Product Storage Tanks 19
Table 3.12 - Waste Management Summary for Spent Filters for Product 20
Table 3.13 - Waste Management Summary for Off-Spec Phosphoric Acid 21
Table 3.14 - Waste Management Statistics for Spent Activated Carbon 21
Table 3.15 - Waste Management Statistics for Spent Filters (for filtering off-spec product) 22
Table 3.16 - Waste Management Statistics for Wastewater Treatment Sludge 23

LIST OF FIGURES

Figure 1.1 - Geographical Distribution of Phosphoric Acid Producers 2
Figure 2.1 - Phosphoric Acid Process Flow Diagram 6

1. SECTOR OVERVIEW

1.1 SECTOR DEFINITION, FACILITY AND LOCATIONS

In this study, EPA examined the wastes from the production of Phosphoric Acid by the dry process.[1] Phosphoric Acid is produced in the United States by eight facilities utilizing this method. **Table 1.1** presents the name and location of the manufacturers.[2] **Figure 1.1** shows the geographical locations of the eight facilities presented in Table 1.1.*General Listing Background Document For the Inorganic Chemical Listing Determination*, August 2000.

Table 1.1 - Phosphoric Acid Producers

Facility Name	Facility Location
1. Albright & Wilson Company (Albright & Wilson)	2151 King Street Charleston, SC 29405
2. FMC Corp. (FMC, NJ)	500 Roosevelt Avenue Carteret, NJ 07008
3. FMC Corp. (FMC, KS)	440 North 9th Street Lawrence, KS 66044
4. Rhodia Inc. (Rhodia, PA)	2300 South Pennsylvania Avenue Morrisville, PA 19067
5. Rhodia Inc. (Rhodia, TN)	4600 Centennial Boulevard Nashville, TN 37209
6. Solutia Inc.* (Solutia, GA)	1610 Marvin Griffin Road PO Box 1473 Augusta, GA 30903
7. Solutia Inc. (Solutia, MI)	5045 West Jefferson Avenue Trenton, MI 48183
8. Solutia Inc. Carondelet Plant (Solutia, IL)	500 Monsanto Avenue East St. Louis, MO 62206

* The Solutia, GA facility stopped producing phosphoric acid in March, 1998.

[1]This was required by the consent decree as described in *General Listing Background Document For the Inorganic Chemical Listing Determination*, August 2000.

[2] EPA, RCRA §3007, Survey of Inorganic Chemicals Industry

Figure 1.1 - Geographical Distribution of Phosphoric Acid Producers[1]

[1] See **Table 1.1** for facility name and location.

1.2 PRODUCTS, PRODUCT USAGE AND MARKET

The chemical formula for phosphoric acid is H_3PO_4. As a product, phosphoric acid is produced as a concentrated liquid acid as opposed to crystalline form. Phosphoric acid has a molecular weight of 98.0 grams (g)/mol, and exists in a solid, unstable form that melts at 42.3 degrees Celsius (C). It readily solublizes in water to form an acidic solution.

Phosphoric acid is used in fertilizers, soaps and detergents, inorganic phosphates, pickling and rust-proofing of metals, in pharmaceuticals, sugar refining, gelatin manufacturing, water treatment, animal feeds, electropolishing, conversion coatings for metals, dental cements, acid catalysts, in foods and carbonated beverages, and as a laboratory reagent. It is also used in direct acid treatment of metal surfaces, manufacture of fire control agents, antifreeze, catalysts, drilling muds, phosphors, refractories, and dyeing textiles. Phosphoric acid is also registered as a bactericide and disinfectant. It is used to disinfect dairy farm milk handling facilities, equipment and dairy animals, and food processing water systems. It is also used to disinfect food processing/handling areas, kitchens, and bathrooms. It may also be used in eating establishments for sterilizing equipment and utensils. Agriculturally, phosphoric acid is registered as an adjuvant.[3]

The historical market for phosphoric acid has shown a negative growth of approximately minus 1.2 percent per year in the period spanning the years 1989-1998 thus accounting for the production reduction and consolidation moves made by several manufacturers of this product. Future growth of the market from the present time until the year 2003 is expected to reverse this decline at the rate of anywhere from 0 to 1 percent per year. Market demand for this product was approximately 350,000 tons in 1998. [4]

Published statistics for the production of phosphoric acid are lumped together with the production of elemental phosphorous. The reason for joining these statistics is that most of the elemental phosphorous that is mined is converted into phosphoric acid. The current breakdown of phosphorous usage (these figures include demand for elemental phosphorus and purified wet acid on a phosphorus-equivalent basis, as well as average annual exports of about 20,000 tons) is as follows: Phosphoric Acid, 65 percent (sodium phosphates, 55 percent; direct phosphoric acid sales, 25 percent; calcium, ammonium and potassium phosphates, 20 percent); direct reaction chemical production, including phosphorus trichloride, pentasulfide and pentoxide, 35 percent. [5]

1.3 PRODUCTION CAPACITY

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[3] Environmental Defense Fund Scorecard Home Page, www.scorecard.org/chemical-profiles/html/phosphoric_acid.html

[4] See www.chemexpo.com/news/newsframe.cfm?framebody=/news/profile.cfm.

[5] Id.

According to ChemExpo,[6] domestic capacity for elemental phosphorus or purified wet-process phosphoric acid (PWA) was 355,625 short tons in 1999. Commercial production of elemental phosphorus is from prepared phosphate rock, which is reacted with coke and silica in an electric furnace. Most of the phosphorus produced is converted to furnace phosphoric acid through reaction with air and water in burning towers.

1.4 PRODUCTION, PRODUCT AND PROCESS TRENDS

The shutdown of high-cost capacity during the past few years and a consolidation in the phosphorus and phosphates business are expected to firm up industrial phosphates and other segments of the market that have suffered long periods of losses. Phosphorus chemicals are growing at a modest pace, and phosphorus trichloride, a herbicide precursor, is increasing at a rate well above the overall trend line.

Traditional furnace-derived phosphoric acid is likely to continue to lose ground to cost-effective purified wet process acid, although at a lesser rate. Well over half of elemental phosphorus remains dependent on dry process phosphoric acid, a market that is projected to increase only slightly if at all.

Consolidation has long been expected in the U.S. market for phosphorus and derivatives, but the changes announced in May 1998 amount to a major shift in the industry. The new 50-50 company formed by FMC and Monsanto/Solutia includes the companies' phosphorus chemical operations in North America and Brazil. It will initially have 12 manufacturing sites and more than $600 million in sales. The takeover of Albright & Wilson by Rhodia makes the French company the global leader in phosphates and gives it a leading position in the European market for sodium tripolyphosphate. [7]

2. DESCRIPTION OF MANUFACTURING PROCESS

2.1 PRODUCTION PROCESS DESCRIPTION

This section provides the general process flow and typically generated residuals for dry process phosphoric acid production. Liquid phosphorous and pure oxygen are fed to a combustion furnace where the phosphorous and oxygen react to form phosphorous pentoxide. The high temperature in the combustion furnace causes slow erosion of the refractory brick which must be removed and replaced periodically. The phosphorous pentoxide vapor is then fed into a condenser where water is sprayed over the gas to create phosphoric acid. Escaping gas is collected in a scrubber with fresh water being the collection agent. The scrubber water, which is weak phosphoric acid, is returned to the condenser to recover a strong phosphoric acid. The excess scrubber air is vented and releases an airborne waste stream to the atmosphere, which contains trace phosphoric acid. The scrubber system contains filters,

[6] Id.

[7] Id.

which are changed periodically. The phosphoric acid from the condenser is sent to purification where sodium hydrosulfide is added to precipitate arsenic sulfide and calcium sulfide. The precipitates are then filtered with the help of a filter aid and the product is packaged. Escaping gas from filter waste solids are scrubbed to remove hydrogen sulfide (H_2S), and the remaining waste is a filter cake sludge typically sent to an off-site Subtitle C landfill. The spent filters from purification are changed periodically and are also sent to an off-site Subtitle C landfill. Any spills or leaks from phosphoric acid storage tanks are collected in contained areas and pumped to the on-site wastewater treatment system.

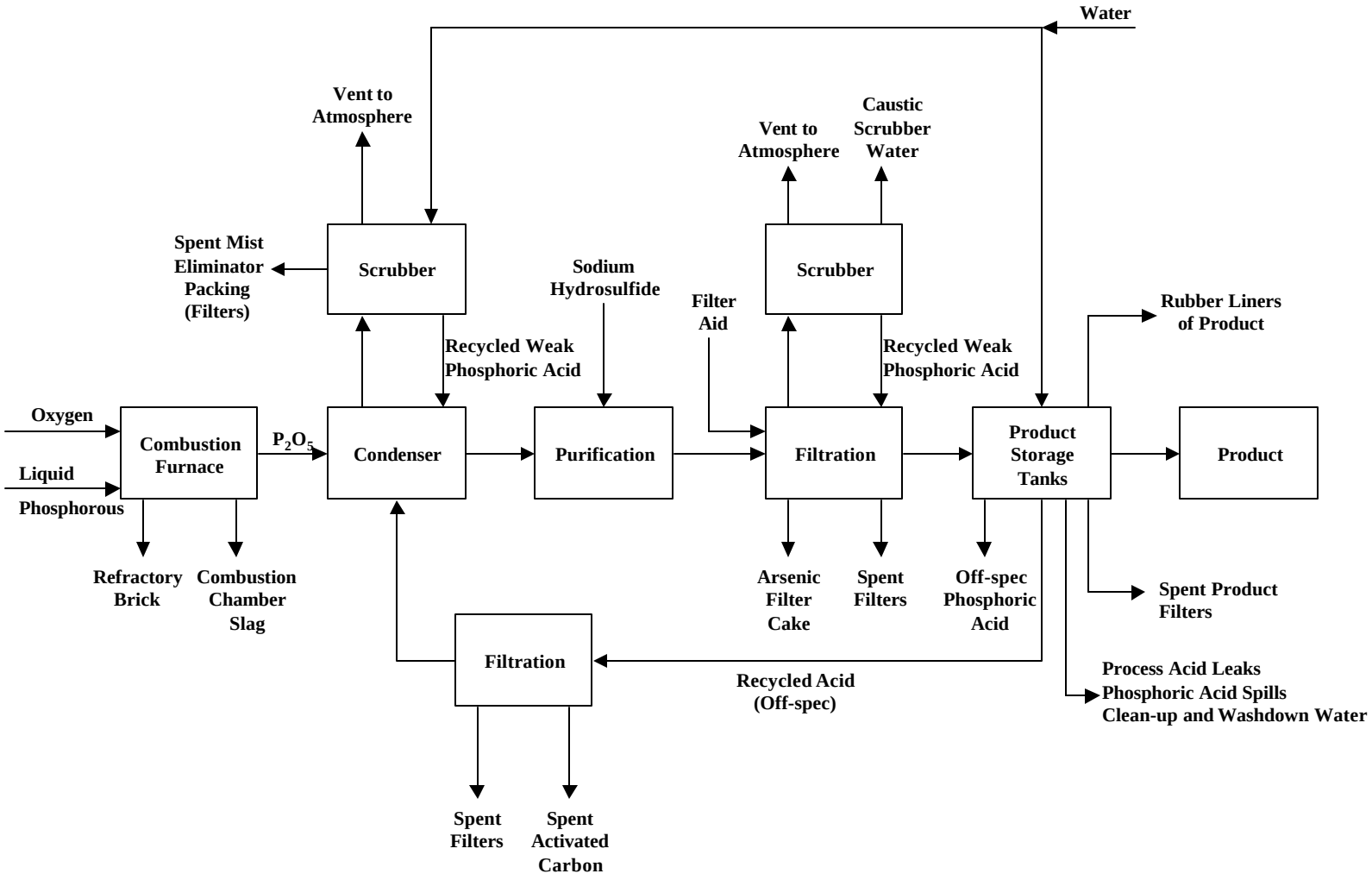
2.2 PRODUCTION TRENDS, CHANGES AND IMPROVEMENTS

There is no indication of upcoming production changes from current practices.

2.3 PROCESS FLOW DIAGRAM

The following process flow diagram (**Figure 2.1**) is general and may not account for specific process variations used by listed manufacturers of phosphoric acid. This flow diagram illustrates the major process steps described above and identifies wastestreams at their point of generation in the process.

Figure 2.1 - Phosphoric Acid Process Flow Diagram



3. WASTE GENERATION AND MANAGEMENT

Appendix A presents a complete summary of the wastestreams generated at each of the facilities in the phosphoric acid sector, the volume of the wastestreams generated in MT/yr, and the associated final management step. **Section 3.1** discusses wastes reported by the facilities, in the RCRA §3007 questionnaire, that are outside the scope of the consent decree. **Section 3.2** presents a discussion of each wastestream and identifies where in the process the waste is generated, the subsequent management steps employed at each facility, a characterization of the wastestream, the generated volume, and the result of initial risk screening analysis**.**

3.1 WASTES OUTSIDE THE SCOPE OF THE CONSENT DECREE

EPA does not consider some kinds of debris and plant component materials to fall within the scope of the consent decree, including refractory brick. This material is considered to be a structural component of the plant rather than a waste from the process production.

3.1.1 Refractory Brick

The refractory brick is generated infrequently (6-18 months) when a rebuild or repair of the combustion furnace is required. Only two facilities reported generating refractory brick in 1998. However, other facilities have generated this waste in the past. Rhodia, PA generated 180 MT in 1997 and Solutia, GA generated 90 MT in 1995. Some facilities are switching to steel towers and will cease generating this waste.

3.2 SUMMARY OF WASTE GENERATION PROCESS

Eight facilities manufacturing this chemical in 1998 generated approximately 850 MT of waste. According to the RCRA §3007 questionnaire the facilities that produced phosphoric acid via the dry process in 1998 reported generating varying numbers of wastestreams. Even through their processes are basically the same there are variations in the number of wastestreams at each facility. For example, Rhodia, PA reported generating two wastestreams and Solutia, MI reported generating ten wastestreams.

Together, the different manufacturing process units produced sixteen different wastestreams. The units and wastestreams are as follows:

Combustion Furnace:

- Refractory Brick
- Combustion Chamber Slag

Scrubber:

- Spent Mist Eliminator Packing (Filters)

- Recycled Weak Phosphoric Acid
- Caustic Scrubber Water

Purification and Filtration:

- Arsenic Filter Cake
- Spent Filters (from purification)
- Spent Filters for Off-spec Product
- Spent Activated Carbon for Off-spec Product

Product Storage and Maintenance:

- Rubber Liners of Product Storage Tanks
- Off-Spec Phosphoric Acid
- Process Acid Leaks
- Phosphoric Acid Spills
- Clean-up Washdown Water
- Spent Filters for Product
- Wastewater Treatment Sludge

Table 3.1 provides a summary of the identified wastestreams generated by facilities.

Table 3.1 - Wastes Generated from the Production of Phosphoric Acid by the Dry Process

Facility	Arsenic Filter Cake	Caustic Scrubber Water	Process Acid Leaks	Phosphoric Acid Spills	Clean-up and Washdown Water	Spent Mist Eliminator Packing (Filters)	Combustion Chamber Slag	Recycled Weak Phosphoric Acid
Albright & Wilson	x	x			x			
FMC, NJ	x	x				x		x
FMC, KS	x	x	x			x		x
Rhodia, PA	x							
Rhodia, TN	x		x			x		
Solutia, GA	x			x		x		x
Solutia, MI	x			x		x		x
Solutia, MO	x			x		x	x	x

Table 3.1 - Wastes Generated from the Production of Phosphoric Acid by the Dry Process (continued)

Facility	Spent Filters (from purification)	Rubber Liners of Product Storage Tanks	Spent Filters for Product	Off-spec Phosphoric Acid	Spent Activated Carbon	Spent Filters (for filtering off-spec product)	Wastewater Treatment Sludge	Refractory Brick
Albright & Wilson							x	
FMC, NJ								
FMC, KS								
Rhodia, PA								x
Rhodia, TN					x	x	x	
Solutia, GA	x	x	x					x
Solutia, MI	x	x	x	x			x	x
Solutia, MO	x	x						x

3.2.1 Arsenic Filter Cake

Waste Generation

The phosphoric acid from the condenser goes to a purification process, where filter aid and sodium sulfide solution or hydrogen sulfide gas are added to remove arsenic impurities that are present in the elemental phosphorous. The most significant solid waste generated weekly from the purification process of phosphoric acid is arsenic filter cake. All eight facilities reported generating filter cake. In 1998, seven facilities reported generating 613.94 MT of arsenic filter cake.

The arsenic filter cake is generated at various rates from 6.10 MT/yr to 248.0 MT/yr.

Waste Management

All facilities managed this waste the same way. The filter cake is stored in containers, sent off-site for stabilization and then sent to an off-site Subtitle C landfill as a hazardous waste**. Table 3.2** presents the generated volume and the final management step used by the facilities for this wastestream.

Table 3.2 - Waste Management Summary for Arsenic Filter Cake

Final Management	# of Wastestreams with Reported Volumes	# of Wastestreams with Unreported Volumes	Total Volume (MT/yr)
Disposal off-site Subtitle C landfill	7	1*	613.94

***** Solutia, GA reported generating 88.6 MT in 1997.

Waste Characterization

As part of the analytical phase of the listing determination, the Agency collected "familiarization" samples of arsenic filter cake from two facilities - Albright & Wilson and FMC, NJ. The following are results from this sampling and from data reported by the facilities in the RCRA §3007 Questionnaire.

This waste carries hazardous waste codes D002 (corrosive) and D004 (arsenic). One facility reported this wastestream to be a characteristic waste carrying hazardous waste code D007 (chromium). The chemical constituents that were detected include arsenic, barium, lead, zinc, chromium, nickel and phosphorous.

Results of Initial Risk Screening Analysis

This waste was not sampled and did not warrant a risk assessment for the following reasons:

1. The waste exhibits one or more hazardous waste characteristic.
2. The waste is characteristically hazardous waste that is managed as hazardous from the point of generation through disposal including meeting applicable land disposal restriction (LDR) standards.

3.2.2 Caustic Scrubber Water

Waste Generation

The filtered acid is free of arsenic but still contains a trace level of H_2S which needs to be removed by sparging air through the acid. The vent from the purification process is scrubbed in the hydrogen sulfide scrubber generating caustic scrubber water. Three facilities reported generating caustic scrubber wastewater.

The caustic scrubber water is generated at various rates from 36.0 MT/yr to 1,080 MT/yr.

Waste Management

The wastestream was listed by Albright & Wilson plant as non-hazardous waste and was discharged together with all the other facility wastewater to the facility's centralized tank-based wastewater pretreatment system before being discharged to a publically owned treatment works (POTW). Two facilities reported that it was returned as makeup solution to the purification process. **Table 3.3** presents the generated volume and the final management step used by the facilities for this wastestream.

Table 3.3 - Waste Management Summary for Caustic Scrubber Water

Final Management	# of Wastestreams with Reported Volumes	# of Wastestreams with Unreported Volumes	Total Volume (MT/yr)
POTW Discharge	1	0	36.0
Recycled back to process	2	0	1350.0

Waste Characterization

Facilities did not characterize this wastestream.

Results of Initial Risk Screening Analysis

This waste was not sampled and did not warrant a risk assessment for the following reasons:

1. The wastewater is managed in enclosed systems and, therefore, no exposure pathway exists.
2. Discharge to a POTW is exempt from RCRA regulations and regulated extensively under the Clean Water Act.
3. The recycled wastewater has no potential for release to the environment.

3.2.3 Process Acid Leaks

Waste Generation

This wastestream is generated at storage area as spills or leaks from storage tanks. Two facilities reported generating this wastestream.

Waste Management

Prior to discharge, both facilities collected this waste in tanks and neutralized it. After that, the Rhodia, TN plant discharged the waste under NPDES permit and FMC, KS facility recycled this wastestream in an acid furnace. **Table 3.4** presents the generated volume and the final management step used by the two facilities for this wastestream.

Table 3.4 - Waste Management Summary for Process Acid Leaks

Final Management	# of Wastestreams with Reported Volumes	# of Wastestreams with Unreported Volumes	Total Volume (MT/yr)
NPDES discharge	1	0	25.0*
Recycled	1	0	2.0

* Approximately 25.0 MT from all processes at Rhodia, TN. The waste volume from just the phosphoric acid process was not available.

Waste Characterization

The FMC, KS facility reported it as non hazardous waste.

Results of Initial Risk Screening Analysis

This waste was not sampled and did not warrant a risk assessment for the following reasons:

1. When recycled, no exposure pathway of concern exists.
2. Discharges to surface water under an NPDES permit are exempt from RCRA regulations and regulated extensively under the Clean Water Act.

3.2.4 Phosphorous Acid Spills

Waste Generation

This wastestream is generated occasionally in phosphoric acid production area during unloading process. Three facilities reported generating this wastewater.

Waste Management

Two facilities reported that prior to NPDES discharge, the waste is collected in tanks or roll-on/off bins, and neutralized in on-site wastewater treatment plants (WWTP). No phosphoric acid is discharged from the WWTP. At one facility (Solutia, MO) the spills of phosphoric acid to the ground are neutralized and sent off-site for disposal at a Subtitle D landfill. **Table 3.5** presents the generated volume and the final management step used by the facilities for this wastestream.

Table 3.5 - Waste Management Summary for Phosphorous Acid Spills

Final Management	# of Wastestreams with Reported Volumes	# of Wastestreams with Unreported Volumes	Total Volume (MT/yr)
NPDES discharge	2	0	6.25*
Disposal off-site Subtitle D landfill	1	0	0.5

* Includes 4.5 MT of waste generated by Solutia, GA which stopped producing phosphoric acid in March, 1998.

Waste Characterization

All three facilities reported this wastestream to be a characteristic waste carrying hazardous waste code D002 (corrosivity). Solutia, MI reported arsenic, barium, zinc, copper, lead, and mercury.

Results of Initial Risk Screening Analysis

This waste was not sampled and did not warrant a risk assessment for the following reasons:

1. Discharges to surface water under an NPDES permit are exempt from RCRA regulations and regulated extensively under the Clean Water Act.
2. The characteristically hazardous waste (D002) is managed as hazardous from the point of

generation through disposal including meeting applicable LDR standards.

3. Very small volumes are generated.

3.2.5 Clean-up Washdown Water

Waste Generation

This wastestream is generated at various points in the phosphoric acid generation process at one facility. This wastewater includes clean-up water and any spilled or leaked phosphoric acid from storage tanks.

Waste Management

Clean-up and washdown water from across the unit is collected in a sump and discharged to the wastewater treatment system (tanks) for neutralization before being discharged to POTW. **Table 3.6** presents the final management step used by the facility for this wastestream.

Table 3.6 - Waste Management Summary for Clean-up Washdown Water

Final Management	# of Wastestreams with Reported Volumes	# of Wastestreams with Unreported Volumes	Total Volume (MT/yr)
POTW	0	1	Not Reported

Waste Characterization

The facility did not characterize this wastestream.

Results of Initial Risk Screening Analysis

This waste was not sampled and did not warrant a risk assessment because discharges to POTW are exempt from RCRA regulations and regulated extensively under the Clean Water Act.

3.2.6 Spent Mist Eliminator Packing (Filters)

Waste Generation

The scrubber system contains filters, which when spent make up this wastestream. Six facilities reported generating this waste. Five facilities generated this wastestream in 1998 and Solutia, GA generated 15 MT in 1995.

Waste Management

The packing material from the mist eliminator is changed periodically every 6-18 months. Four facilities stored this waste in containers, neutralized it and sent it off-site to a Subtitle D landfill with liner and leachate collection. After rinsing, the spent filters are disposed by FMC, NJ as non-hazardous waste in a Subtitle C landfill and FMC, KS sent the filters off-site for metal recovery. **Table 3.7** presents the generated volume and the final management step used by the five facilities for this wastestream.

Table 3.7 - Waste Management Summary for Spent Mist Eliminator Packing (Filters)

Final Management	# of Wastestreams with Reported Volumes	# of Wastestreams with Unreported Volumes	Total Volume (MT/yr)
Disposal off-site Subtitle D landfill	3	1*	24.4
Disposal off-site Subtitle C landfill	1	0	2.0
Off-site Metal Recovery	1	0	2.0

***** Solutia, GA reported generating 15.0 MT in 1995.

Waste Characterization

Facilities did not characterize this wastestream.

Results of Initial Risk Screening Analysis

This waste was not sampled and did not warrant a risk assessment for the following reasons:

1. The filters are not expected to accumulate chemicals at concentration level of concern because they are for condensation, they are not designed to absorb constituents.
2. One facility manages the filters at a Subtitle C landfill.
3. One facility sends them for metal recovery, no exposure pathway exists**.**
4. The waste is treated to remove or immobilize any low levels of phosphoric acid or arsenic that may be presented in the wastes.

3.2.7 Combustion Chamber Slag

Waste Generation

The chamber slag is generated infrequently (6-18 months) when a rebuild or repair of the combustion furnace is required. Only Solutia, MO, reported generating a small amount of this solid waste.

Waste Management

This waste is placed in containers and sent off-site to a Subtitle C incineration facility. **Table 3.8** presents the generated volume and the final management step used by the facility for this wastestream.

Table 3.8 - Waste Management Summary for Combustion Chamber Slag

Final Management	# of Wastestreams with Reported Volumes	# of Wastestreams with Unreported Volumes	Total Volume (MT/yr)
Off-site Hazardous Waste Incineration	1	0	0.1

Waste Characterization

The facility reported this wastestream to be a characteristic waste carrying hazardous waste code D002 (corrosivity). The waste contains arsenic, barium, lead, nickel, chromium, zinc and traces of cadmium and silver.

Results of Initial Risk Screening Analysis

This waste was not sampled and did not warrant a risk assessment because the waste is characteristically hazardous waste that is managed as hazardous from the point of generation through disposal including meeting applicable LDR standards.

3.2.8 Recycled Weak Phosphoric Acid

Waste Generation

All eight facilities reported recycling weak phosphoric acid produced in the scrubber as a necessary part of production process in their process description submitted with their RCRA §3007 questionnaire. However, only five also reported it as a wastestream. FMC, NJ generated a similar wastestream after washing spent scrubber filters (8 MT/yr) and recycles this waste together with the scrubber water.

The recycled weak phosphoric acid is generated at various rates from 9,000 MT/yr to 5,374,202 MT/yr.

Waste Management

The scrubber water, which is weak phosphoric acid is continuously returned for recovery to the acid generation process. **Table 3.9** presents the generated volume and the final management step used by

the facilities for this wastestream.

Table 3.9 - Waste Management Summary for Recycled Weak Phosphoric Acid

Final Management	# of Wastestreams with Reported Volumes	# of Wastestreams with Unreported Volumes	Total Volume (MT/yr)
Recycled back to process	5*	1	5,467,843

* includes FMC, NJ spent filter wash water (8.0 MT).

Waste Characterization

Facilities did not characterize this wastestream.

Results of Initial Risk Screening Analysis

This waste was not sampled and did not warrant a risk assessment because there is no significant potential for release to the environment**.**

3.2.9 Spent Filters (from purification)

Waste Generation

The purification filters are designed to remove arsenic from phosphoric acid. The facilities changed them periodically (6-18 months) and it becomes a hazardous waste. Two facilities reported generating this waste in 1998 and Solutia, GA reported generating 7.15 MT in 1994.

Waste Management

Solutia, MI and Solutia, GA reported that spent filters are stored in containers, sent off-site for stabilization and then sent off-site to an Subtitle C landfill as hazardous waste. Solutia, MO incinerated this waste at a Subtitle C facility. **Table 3.10** presents the generated volume and the final management step used by the facilities for this wastestream.

Table 3.10 - Waste Management Summary for Spent Filters (from purification)

Final Management	# of Wastestreams with Reported Volumes	# of Wastestreams with Unreported Volumes	Total Volume (MT/yr)
Disposal off-site Subtitle C landfill	1	1*	1.63

Off-site Hazardous Waste Incineration	1	0	3.0

*Solutia, MO generated 7.15 MT in 1994

Waste Characterization

Two facilities reported this wastestream to be a characteristic waste carrying a hazardous waste code D004 (arsenic).

Results of Initial Risk Screening Analysis

This waste was not sampled and did not warrant a risk assessment because the waste is characteristically hazardous waste that is managed as hazardous from the point of generation through disposal including meeting applicable LDR standards.

3.2.10 Rubber Liners of Product Storage Tanks

Waste Generation

The rubber liners in the phosphoric acid storage tanks are changed periodically (6-18 months). Three facilities reported generating this wastestream.

Waste Management

The rubber liners was stored in containers, neutralized with soda ash and then sent to an off-site Subtitle D landfill with liner and leachate collection. At Solutia, MO this waste was incinerated at a Subtitle C facility. **Table 3.11** presents the generated volume and the final management step used by the facilities for this wastestream.

Table 3.11 - Waste Management Summary for Rubber Liners of Product Storage Tanks

Final Management	# of Wastestreams with Reported Volumes	# of Wastestreams with Unreported Volumes	Total Volume (MT/yr)
Disposal off-site Subtitle D landfill	2	0	36.14*
Off-site Hazardous Waste Incineration	1	0	1.75

* Includes 18.0 MT of waste generated by Solutia, GA which stopped producing phosphoric acid in March, 1998.

Waste Characterization

Facilities did not characterize this wastestream.

This waste was not sampled and did not warrant a risk assessment for the following reasons:

1. The wastestream is treated to remove or immobilize any low levels of phosphoric acid that may present in the waste.
2. The wastestream is generated in relatively small volumes.
3. Solutia, GA facility stopped generating this waste.
4. Solutia, MO manages this wastestream as hazardous from the point of generation through disposal.

3.2.11 Spent Filters for Product

Waste Generation

Solutia, MI and Solutia, GA filter the phosphoric acid product prior to loading tank cars and trucks to remove settled solids generating this wastestream.

Waste Management

The filters are changed periodically (6-18 months) and rinsed with water prior to being stored in containers. After that they are stabilized or neutralized they are disposed off-site in a Subtitle D landfill with liner and leachate collection. **Table 3.12** presents the generated volume and the final management step used by the facilities for this wastestream.

Table 3.12 - Waste Management Summary for Spent Filters for Product

Final Management	# of Wastestreams with Reported Volumes	# of Wastestreams with Unreported Volumes	Total Volume (MT/yr)
Disposal off-site Subtitle D landfill	2	0	1.04*

* Includes 0.5 MT of waste generated by Solutia, GA which stopped producing phosphoric acid in March, 1998.

Waste Characterization

The facilities did not characterize this wastestream.

This waste was not sampled and did not warrant a risk assessment for the following reasons:

1. The wastestream is treated to remove or immobilize any low levels of phosphoric acid that may present in the waste.
2. The wastestream is generated in relatively small volumes.
3. The filters are used late in the process where contaminants are expected to be low due to the required purity of the food-grade product.

3.2.12 Off-Spec Phosphoric Acid

Waste Generation

Off-spec phosphoric acid, a periodically generated waste was reported by Solutia, MI.

Waste Management

This waste was placed in drums, sent off-site for stabilization and sent off-site to a Subtitle C landfill. **Table 3.13** presents the generated volume and the final management step used by the facility for this wastestream.

Table 3.13 - Waste Management Summary for Off-Spec Phosphoric Acid

Final Management	# of Wastestreams with Reported Volumes	# of Wastestreams with Unreported Volumes	Total Volume (MT/yr)
Disposal off-site Subtitle C landfill	1	0	0.71

Waste Characterization

The facility reported this wastestream to be a characteristic waste carrying hazardous waste code D002 (corrosivity). The chemical constituents that were reported include arsenic, barium, cadmium, chromium, copper, lead and zinc.

Results of Initial Risk Screening Analysis

This waste was not sampled and did not warrant a risk assessment because the waste is characteristically hazardous waste that is managed as hazardous from the point of generation through disposal including meeting applicable LDR standards.

3.2.13 Spent Activated Carbon

Waste Generation

The carbon is used by Rhodia, TN to filter off-spec phosphoric acid. They reported generating spent activated carbon in 1996, as a non-hazardous waste.

Waste Management

The waste is stored in containers, sent off-site for stabilization and disposed off-site in a Subtitle D landfill with liner and leachate collection. **Table 3.14** presents the generated volume and the final management step used by the facility for this wastestream.

Table 3.14 - Waste Management Statistics for Spent Activated Carbon

Final Management	# of Wastestreams with Reported Volumes	# of Wastestreams with Unreported Volumes	Total Volume (MT in 1996)
Disposal off-site Subtitle D landfill	1	0	3.0

Waste Characterization

The facility reported this waste as non-hazardous.

Results of Initial Risk Screening Analysis

This waste was not sampled and did not warrant a risk assessment for the following reasons:

1. The waste is infrequently generated (last generated in 1996) and in relatively small volumes. If annualized over three years, would amount to 1.0 MT per year.
2. Contaminants are expected to be low due to the required purity of the food-grade product**.**

3.2.14 Spent Filters for Off-spec Product

Waste Generation

This residual is generated when filtering off-spec product. Only Rhodia, TN reported recycling off-spec product. Before the off-spec product is returned back to the process it is filtered generating this wastestream.

Waste Management

These filters are changed periodically (6-18 months) stored in roll-on/off bin and disposed in an off-site Subtitle D landfill with liner and leachate collection. **Table 3.15** presents the generated volume and the final management step used by the facility for this wastestream.

Table 3.15 - Waste Management Statistics for Spent Filters (for filtering off-spec product)

Final Management	# of Wastestreams with Reported Volumes	# of Wastestreams with Unreported Volumes	Total Volume (MT/yr)
Disposal off-site Subtitle D landfill	1	0	0.5

Waste Characterization

The facility did not characterize this wastestream.

Results of Initial Risk Screening Analysis

This waste was not sampled and did not warrant a risk assessment for the following reasons:

1. The waste is generated in relatively small volumes.
2. Contaminants are expected to be low due to the required purity of the food-grade product**.**

3.2.15 Wastewater Treatment Sludge

Waste Generation

Sediment gradually accumulates in the wastewater treatment system. Periodically the sediment is removed from the wastewater system generating this waste. Three facilities reported generating this wastestream.

Waste Management

The facilities stored this waste in containers and then sent it off-site for disposal at a Subtitle D landfill. **Table 3.16** presents the generated volume and the final management step used by the facilities for this wastestream.

Table 3.16 - Waste Management Statistics for Wastewater Treatment Sludge

Final Management	# of Wastestreams with Reported Volumes	# of Wastestreams with Unreported Volumes	Total Volume (MT/yr)
Disposal off-site Subtitle D landfill	0	3*	

* All three facilities reported that wastes from phosphoric acid production are a very minor contributor

to the particulate matter which accumulates in these systems. Two facilities did not report volumes due to very small input of phosphoric acid production wastes to the WWT system; one facility estimated that 0.0001% of 4,640 MT sludge generated (or 0.005 MT) was from phosphoric acid production.

Waste Characterization

The facilities reported this waste as nonhazardous.

Results of Initial Risk Screening Analysis

This waste was not sampled and did not warrant a risk assessment because the waste is generated in relatively small volumes.

APPENDIX A

Summary of Waste Generation and Management

Wastestream	Facility	Volume (MT/yr)	Hazardous Waste #	Final Management
Arsenic Filter Cake	Solutia Inc. 5045 West Jefferson Avenue Trenton, MI 48183	56.84	D002, D004 D007	Disposal off-site Subtitle C landfill
	Solutia Inc. 1610 Marvin Griffin Road PO Box 1473 Augusta, GA 30903	88.6 (1997)	D002, D004	
	Albright & Wilson Company 2151 King Street Charleston, SC 29405	6.1	D002, D004	
	FMC Corp. 500 Roosevelt Avenue Carteret, NJ 07008	62.0	D004	
	FMC Corp. 440 North 9th Street Lawrence, KS 66044	248.0	D004	
	Rhodia Inc. 4600 Centennial Boulevard Nashville, TN 37209	130.0	D004	
	Solutia Inc. Carondelet Plant 500 Monsanto Avenue East St. Louis, MO 62206	93.0	D002,D004	
	Rhodia Inc. 2300 South Pennsylvania Avenue Morrisville, PA 19067	18.0	D002, D004	
Caustic Scrubber Discharge	Albright & Wilson Company 2151 King Street Charleston, SC 29405	36.0	None	Discharged to POTW
	FMC Corp. 500 Roosevelt Avenue Carteret, NJ 07008	270	None	Recycled
	FMC Corp. 440 North 9th Street Lawrence, KS 66044	1,080	None	
Spent Activated Carbon (for filtering off-spec product)	Rhodia Inc. 4600 Centennial Boulevard Nashville, TN 37209	3.0 (1996)	none	Disposal off-site Subtitle D landfill

Wastestream	Facility	Volume (MT/yr)	Hazardous Waste #	Final Management
Spent Filters (for filtering off-spec product)	Rhodia Inc. 4600 Centennial Boulevard Nashville, TN 37209	0.5	None	Disposal off-site Subtitle D landfill
Refractory Brick	Solutia Inc. Carondelet Plant 500 Monsanto Avenue East St. Louis, MO 62206	0.2	None	Off-site Hazardous Waste Incineration
	Rhodia Inc. 2300 South Pennsylvania Avenue. Morrisville, PA 19067	180 (1997)	None	Disposal off-site Subtitle D landfill
	Solutia Inc. 5045 West Jefferson Avenue Trenton, MI 48183	90.72	None	
	Solutia Inc. 1610 Marvin Griffin Road PO Box 1473 Augusta, GA 30903	90 (1995)	None	
Clean-up and Washdown Water	Albright & Wilson Company 2151 King Street Charleston, SC 29405	Not Reported	None	Discharge to POTW
Process Acid Leaks	FMC Corp. 440 North 9th Street Lawrence, KS 66044	2.0	Non Hazardous	Recycled
	Rhodia Inc. 4600 Centennial Boulevard Nashville, TN 37209	25.0	None	NPDES permit discharge
Phosphoric Acid Spills	Solutia Inc. Carondelet Plant 500 Monsanto Avenue East St. Louis, MO 62206	0.5	D002	Disposal off-site Subtitle D landfill
	Solutia Inc. 5045 West Jefferson Avenue Trenton, MI 48183	1.72	D002	NPDES permit discharge
	Solutia Inc. 1610 Marvin Griffin Road PO Box 1473 Augusta, GA 30903	4.53	D002	

Wastestream	Facility	Volume (MT/yr)	Hazardous Waste #	Final Management
Waste Water Treatment Sludge	Rhodia Inc. 4600 Centennial Boulevard Nashville, TN 37209	NR	none	Disposal off-site Subtitle D landfill
	Solutia Inc. 5045 West Jefferson Avenue Trenton, MI 48183	NR	none	
	Albright & Wilson Company 2151 King Street Charleston, SC 29405	NR	none	
Spent Mist Eliminator Packing (Filters)	FMC Corp. 500 Roosevelt Avenue Carteret, NJ 07008	2.0	None	Disposal off-site Subtitle C landfill
	FMC Corp. 440 North 9th Street Lawrence, KS 66044	2.0	None	Off-site Metal Recovery
	Rhodia Inc. 4600 Centennial Boulevard Nashville, TN 37209	10.9	None	Disposal off-site Subtitle D landfill
	Solutia Inc. Carondelet Plant 500 Monsanto Avenue East St. Louis, MO 62206	0.5	None	
	Solutia Inc. 5045 West Jefferson Avenue Trenton, MI 48183	13	None	
	Solutia Inc. 1610 Marvin Griffin Road PO Box 1473 Augusta, GA 30903	15 (1995)	None	
Combustion Chamber Slag	Solutia Inc. Carondelet Plant 500 Monsanto Avenue East St. Louis, MO 62206	0.1	D002	Off-site Hazardous Waste Incineration
Weak Phosphoric Acid (Vent scrubber water)	Solutia Inc. Carondelet Plant 500 Monsanto Avenue East St. Louis, MO 62206	47,283	None	Recycling
	Solutia Inc. 5045 West Jefferson Avenue Trenton, MI 48183	5,374,202	None	

Wastestream	Facility	Volume (MT/yr)	Hazardous Waste #	Final Management
	Solutia Inc. 1610 Marvin Griffin Road PO Box 1473 Augusta, GA 30903	Not Reported	None	
	FMC Corp. 500 Roosevelt Avenue Carteret, NJ 07008	9,000	None	
		8.00		
	FMC Corp. 440 North 9th Street Lawrence, KS 66044	36,000	None	
Spent Filters (from purification)	Solutia Inc. Carondelet Plant 500 Monsanto Avenue East St. Louis, MO 62206	3.0	D004	Off-site Hazardous Waste Incineration
	Solutia Inc. 5045 West Jefferson Avenue Trenton, MI 48183	1.63	D004	Disposal off-site Subtitle C landfill
	Solutia Inc. 1610 Marvin Griffin Road PO Box 1473 Augusta, GA 30903	7.15 (1994)	None	
Rubber Liners of Product Storage Tanks	Solutia Inc. Carondelet Plant 500 Monsanto Avenue East St. Louis, MO 62206	1.75	None	Off-site Hazardous Waste Incineration
	Solutia Inc. 5045 West Jefferson Avenue Trenton, MI 48183	18.14	None	Disposal off-site Subtitle D landfill
	Solutia Inc. 1610 Marvin Griffin Road PO Box 1473 Augusta, GA 30903	18.0	None	
Spent Filters for Product	Solutia Inc. 5045 West Jefferson Avenue Trenton, MI 48183	0.54	None	Disposal off-site Subtitle D landfill
	Solutia Inc. 1610 Marvin Griffin Road PO Box 1473 Augusta, GA 30903	0.5	None	

Wastestream	Facility	Volume (MT/yr)	Hazardous Waste #	Final Management
Off-spec Phosphoric Acid	Solutia Inc. 5045 West Jefferson Avenue Trenton, MI 48183	0.71	D002	Disposal off-site Subtitle C landfill