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FINAL REPORT

Air

Economic Impact Analysis of the Proposed Hydrochloric Acid (HCl) Production NESHAP

Final Report



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Introduction

This regulatory action proposes national emission standards for hazardous air pollutants (NESHAP) for hydrochloric acid (HCl) production facilities, including HCl production at fumed silica facilities. The EPA has identified these facilities as major sources of hazardous air pollutant (HAP) emissions, primarily HCl. Hydrochloric acid is associated with a variety of adverse health effects. These adverse health effects include chronic health disorders (for example, effects on the central nervous system, blood, and heart) and acute health disorders (for example, irritation of eyes, throat, and mucous membranes and damage to the liver and kidneys).

These proposed NESHAP would implement section 112(d) of the Clean Air Act (CAA) by requiring all HCl production facilities that are major sources to meet HAP emission standards reflecting the application of the maximum achievable control technology (MACT). The EPA estimates that these proposed NESHAP would reduce nationwide emissions of HAP from HCl production by approximately 1,790 tons per year (tpy). This amount of reduction is 52 percent of the baseline HAP emissions estimate of 3,450 tpy. Of these emissions, 72 percent (2,490 tpy) is hydrochloric acid, and the remaining 960 tpy is chlorine.

There are 64 HCl facilities that will have to install controls, according to the estimates prepared by the Agency.¹ The production processes that this proposed NESHAP will affect are processes that route a gaseous stream that contains HCl to an absorber, thereby creating a liquid HCl product. Among these various processes are:

- organic and inorganic chemical manufacturing processes that produce HCl as a by-product;
- the reaction of salts and sulfuric acid (Mannheim process);
- the reaction of a salt, sulfur dioxide, oxygen, and water (Hargreaves process);
- the combustion of chlorinated organic compounds;
- the direct synthesis of HCl through the burning of chlorine in the presence of hydrogen; and
- fumed silica production, including combustion of silicon tetrachloride in hydrogen-oxygen furnaces.

¹ Memorandum Maxwell, B. U.S. Environmental Protection Agency, to Hydrochloric Acid Production NESHAP Docket List of Facilities in the Hydrochloric Acid Production Source Category March 21, 2001

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It is important to note that most HCl production is as a by-product of other processes such as aliphatic and aromatic hydrocarbon chlorinations, the phosgenation of amines for isocyanates, and halogenations for making chlorofluorocarbons. Only about 5 percent of HCl is produced as primary product.

The fumed silica sources affected by this proposed rule include any facility engaged in the production of fumed silica. Fumed silica is a fine white powder used as a thickener or reinforcing agent in inks, resins, rubber, paints, and cosmetics. HCl and chlorine emissions are the primary HAPs released from fumed silica production facilities and result from the HCl recovery/production system. Because the largest HAP emission source at fumed silica facilities is related to the HCl recovery/production system, we decided to combine fumed silica sources and HCl production sources under this proposed rule.

Background for Economic Impact Analysis

The Agency has prepared an economic impact analysis in support of this proposed NESHAP. The legal authority for this analysis is Section 317 of the CAA. As part of this analysis, the Agency has prepared a small business analysis in order to comply with the Regulatory Flexibility Act (RFA), as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA). This economic impact analysis presents a short profile of the industries affected by this proposed rule, a short look at the firms that will be affected by this rule, and the impacts to these firms and their consumers from implementation of the proposed rule.

Table 1 lists the 3 industries that will be affected by the requirements of this proposal.

Table 1. Affected Industries

Category	SIC ^a	NAICS ^b	Name of Industry
Industry	2819	325188	All Other Basic Inorganic Manufacturing
	2821	325211	Plastic Materials, and Resin Manufacturing
	2869	325199	All Other Basic Organic Manufacturing

a Standard Industrial Classification

b North American Information Classification System

These industries are all large with a substantial number of firms and employees that make up their operations. Table 2 contains estimates of employees and the value of shipments for these industries as a whole.²

Table 2
Value of Shipments and Employment Data on Affected Industries
(Millions of 1997 Dollars)

Industry	Value of Shipments			Percentage Change from 1997 to 1999	Total Employment (thousands)			Percentage Change from 1997 to 1999
	1997	1998	1999		1997	1998	1999	
NAICS 325188	17.275	22.760	23.279	34.7	53.4	56.2	53.8	1.2
NAICS 325199	52.405	48.989	47.151	-10.0	88.2	86.9	81.2	7.9
NAICS 325211	45.226	49.176	48.024	6.2	61.6	62.8	58.5	5.0

HCl production is but a small portion of output and activity in these industries. While the production of output reaches many millions of tons for each of these industries, the total production from the U.S. HCl industry is roughly 4.2 million tons year as of 1997. Most of the production is captive capacity: that is: the HCl is produced as an intermediate product to be used in final output. Given that about 5 percent of HCl produced in the U.S. is as primary product, this means that only about 200,000 tons of primary HCl output is generated in a typical year.

The use of HCl in the production of other chemicals is the major way in which HCl is used in the U.S. Thirty percent of HCl produced in the U.S. goes into production of other chemicals. The next most common uses of HCl are steel pickling (20 percent), oil well acidizing (19 percent), and food processing (17 percent). Other uses for HCl include semiconductor production and regeneration of ion-exchange resins for water treatment.

The U.S. imports and exports very little HCl. In 1997, the U.S. imported 85,000 tons of HCl, or

²U.S. Department of the Commerce: Bureau of the Census, International Trade Association. Found on the Internet at www.ita.doc.gov/td/industry/otea/usit098/tables/naics. Downloaded on September 7, 2001.

only 2 percent of U.S. capacity. During that same year, the U.S. exported 60,000 tons of HCl, or only 1.5 percent of U.S. production capacity.³ Hence, the U.S. imports as much or more HCl as to exports, but the trade balance is negligible compared to the output consumed within the U.S. Most of this trade is with Canada.

The growth in U.S. HCl production averaged about 4.2 percent per year from 1993 to 1998. Growth has averaged roughly 3 percent per year from 1985 through 1998, so there has been some increase in production growth in the decade of the 1990's.⁴ Prices for HCl have increased considerably from 1992 to 1998. These prices generally ranged from \$40/ton to \$57/ton in 1992 and 1993, but rose to over \$90/ton in 1998 due to railroad disruptions that occurred late in 1997 and continuing into 1998. Projected growth is expected to be about 2.5 percent per year through 2003, though this amount could be an underestimate if continued strength in oil drilling leads to additional demand for HCl.

Costs of the Proposed Rule

The estimated annual costs of the proposed rule are \$4.05 million in 1999 dollars. These costs include not only the costs of control but also those associated with monitoring, recordkeeping and reporting. The capital costs are estimated at \$12.87 million. The costs are estimated using six model plants that are considered representative of the sources they are applied to. The data taken to develop the linkage between the model plants and the actual facilities are based on facility information taken from EPA permit files and assumptions of the applicability of control equipment. Estimates of what each of these plants must do to meet the proposed alternative, which is the MACT floor, is listed in Table 4. The costs for each of the six model plants is in Table 5. The annual costs associated with each of these model facilities includes annualized capital costs for control and monitoring equipment, annual operation and maintenance (O&M) costs for control and monitoring equipment, and labor and O&M costs associated with reporting and recordkeeping (R&R) requirements associated with the MACT floor regulatory alternative.

³U.S. Department of Commerce, Bureau of the Census. Current Industrial Reports, Series MA28A(97) September, 1998.

⁴Chemical News and Intelligence, ChemExpo Chemical Profile: Hydrochloric Acid November 22, 1999, www.chemexpo.com/news/PROFILE991122.cfm.

Table 3. Model Facility Actions Needed To Comply With MACT Floor Alternative

Model Facility #	Equipment Needed to Comply with MACT Floor Alternative						# of Facilities
	Process Vents (PV)		Storage Tanks (ST)		Transfer Operations (TO)		
	Control Equipment	Monitoring Equipment?	Control Equipment	Monitoring Equipment?	Control Equipment	Monitoring Equipment?	
1	none	Yes	none	Yes	none	Yes	5
2	none	Yes	none	Yes	duct-work	No	5
3	none	Yes	duct-work	No	no TO	No	10
4	none	Yes	no ST	No	no TO	No	20
5	scrubber	Yes	no ST	No	no TO	No	12
6	no PV	No	scrubber	Yes	no TO	No	9

Table 4. Annual Costs For Each Model Facility.

Model Facility #	Annual Costs per Facility(1999\$)				
	PV Equipment	ST Equipment	TO Equipment	R&R Labor and O&M	Total
1	\$1,212	\$1,212	\$1,212	\$65,055	\$68,691
2	\$1,212	\$1,212	\$691	\$65,055	\$68,170
3	\$1,212	\$691	\$0	\$65,055	\$66,958
4	\$1,212	\$0	\$0	\$65,055	\$66,267
5	\$105,357	\$0	\$0	\$65,055	\$170,412
6	\$0	\$7,167	\$0	\$65,055	\$72,222

The equipment costs include annualized capital as well as O&M and were obtained from calculations performed to estimate regulatory alternative impacts. The annual R&R costs were calculated using the template used to calculate annual R&R burden in the Information Collection

Request for HCl Production. The costs for the 4th year after promulgation, which is the first year after the compliance date for existing sources, were calculated for a single facility.⁵

In summary, the annual cost per facility for complying with the draft MACT for HCl Production ranges from \$66,267 to \$170,412. The weighted (by number of plants) average annual cost per facility is \$83,971 and the unweighted average is \$73,246.

As can be seen in Table 3, sources at most of the affected facilities will only have R&R requirements and/or some additional ductwork. At 21 facilities, however, a new waste or caustic scrubber is likely to be required for these facilities to meet the MACT floor requirements for either process vents or storage tank emissions. As seen above, the costs for any one facility should be no higher than \$170,412 (in 1999 dollars).

The annual costs shown in Table 4 can be considered reasonable representations of potential facility-level cost impacts associated with the MACT floor level of control. However, there is one particular anomaly with this analysis that should be discussed. The nationwide cost impacts analysis extrapolates the model emission point costs to the assumed number of affected sources in the United States, which is 64.⁵ Certain assumptions were made in the cost impacts analysis regarding the use of common control devices to reduce emissions from different types of emission sources. Specifically, it was assumed that 20 of the 29 facilities with storage tanks also had process vents at the site, and a single scrubber could be used to control emissions from both sources. It was also assumed that all 10 facilities with transfer operations also had process vents (so a scrubber could be shared). These assumptions from the impacts analysis were considered in the facility-level combination of the individual emission sources. But since all previous analyses were conducted on an emission source basis, it was not possible to develop combinations to represent 64 HCl production facilities while remaining consistent with the assumptions of shared control devices cited above. It is likely, however, that this anomaly will not lead to a substantial mischaracterization of the costs nationally. The above extrapolation takes into account the impacts to fumed silica facilities. Appendix A provides more specific information on the representation of facilities in the HCl cost analysis.

Cost and Economic Impact Results

Table 5 lists the compliance (control, monitoring, and R&R) costs of the MACT floor regulatory alternative per affected parent company, and these costs as a percentage of the parent companies' revenues. All data below is based on 1999 statistics, unless more recent data is available.

⁵ Memorandum Maxwell, B., U.S. Environmental Protection Agency, to Hydrochloric Acid Production NESHAP Docket. List of Facilities in the Hydrochloric Acid Production Source Category. March 21, 2001

Table 5.
Economic Impacts for Parent Companies Affected by
the Proposed HCl/Fumed Silica MACT*

Parent Company	Number of Employees	Large or Small Business?	Revenues(1999 unless stated differently)	Annual Compliance Costs (1999\$)	Compliance Costs/Revenues (%)
Arch Chemicals	3.500	Large	\$900 million	66.958	0.0007
Ausimont USA (subsidiary of Montedison Group)	33.049	Large	11.266 million (2000)	\$171.794	0.00152
Aventis CropScience	92.500	Large	20.021 million	171.794	0.00086
BASF Corp.	100.000	Large	32.226 million (2000)	171.794	0.00053
CIBA-GEIGY Corp (subsidiary of Novartis)	69.000	Large	17.200 million	171.794	0.001
Crompton Corp	8.300	Large	3.038 million	171.794	0.00566
Detrex Corp	350	Small	100 million	171.794	0.1996
Dover Chemical Corp (subsidiary of ICC Industries Corp.)	3.200	Large	1.500 million	171.794	0.0115
Dow Chemical	41.943	Large	23.008 million	171.794	0.0001
DuPont	93.000	Large	28.268 million	171.103	0.0001

Elf Atochem (subsidiary of TotalFinaElf)	127,252	Large	67,352 million	171.794	0.00026
Ferro Corp.	6,700	Large	1,360 million	171.794	0.0126
FMC Corp.	15,000	Large	3,900 million	171.794	0.0044
General Electric Co.	313,000	Large	129,500 million	343,588	0.00027
Honeywell Corp.	125,000	Large	23,735 million	66,958	0.003
Huntsman Corp.	14,000	Large	7,000 million	171.794	0.00245
ICI Americas (part of ICI Corp.)	45,130	Large	8,592 million	171.794	0.00180
Jones- Hamilton Co.	91	Small	10 to 25 million (no precise estimate available)	171.794	1.718 (worst-case); 0.981 (best estimate)**
Louisiana Pigment Co. (owned by NL Industries)	2,500	Large	908 million	72,222	0.0008
MDA Manufacturing (owned by Daitkin Products, Inc.)	14,000	Large	3,799 million	171.794	0.00452
Metachem Products	110	Small	30 million	171.794	0.573
Miles Bayer (owned by the Bayer Group)	120,400	Large	27,320 million	171.794	0.00062
Monsanto Co.	14,700	Large	5,500 million	171.794	0.00312
Occidental Chemical Co. (owned by Occidental Petroleum Co.)	8,800	Large	13,574 million	171.794	0.00047

Oxymar (owned by Occidental Petroleum Co. and Marubeni Co.)	13.851	Large	73 billion	171,794	0.00047
Oxyvinyls	(a joint venture of Occidental Petroleum Co. and Polyone Internation al) - 18.800	Large	17,074 billion (combined revenue of Occidental Petroleum and Polyone International)	171,794	0.0010
PPG Industries	33.000	Large	8.370 million	170.412	0.002
Shell	95.000	Large	149.146 million	171,794	0.0002
Velsicol Chemical Corp	515	Small	160 million	171,794	0.172
Vulcan Materials	9.315	Large	2,492 million	171.794	0.007
Chao Group (of Thailand, owner of Westlake Monomers)	25.000	Large	3.000 million	171,794	0.00571
Fumed Silica					
GE Silicones (owned by GE)	313.000	Large	128.543 million	171.794	0.00027
Cabot	4.200	Large	1.517 million	171.794	0.0101
Degussa	63.000	Large	12.567 million	171.794	0.00137

* Employee and revenue data taken from the companies's Web sites, www.business.com, or Hoover's Online.

**The "best estimate" impact shown for Jones-Hamilton is based on a revenue estimate that is the midpoint of the given revenue range - \$17.5 million

The economic impact analysis, which is essentially a comparison of compliance costs for the affected parent firms with their revenues, shows that the estimated costs associated with the

MACT floor option are no more than 1.0 percent of the revenues for any of the 33 affected firms. It is important to note that most of the companies and facilities affected by this standard are large U.S. companies or subsidiaries of large multinational companies. It is likely that the expected reduction in affected HCl and fumed silica output is no more than 0.0015 percent or less from that industry, since the overall compliance costs is less than 0.001 percent of the revenues for the affected parent firms, and a demand elasticity of -1.5 that is applicable to NAICS 325199 and 325211 as prepared for another economic analysis done for a proposed MACT standard affecting these NAICS codes.⁶ In addition, it is likely that the impacts to individual firms should not be substantial, since the cost to sales estimates per firm are much less than the average profit margin (i.e., profit per unit of sales by firm) enjoyed by firms in these industries (about 5 percent).⁷ It should be noted that these results are based on the application of costs from a subset of the affected facilities to the remaining facilities. This is necessary due to incomplete facility-level cost data, as explained in the previous section on costs.

Small Business Impacts

The RFA generally requires an agency to conduct a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of today's rule on small entities, small entity is defined as a small business according to Small Business Administration size standards⁸ by the North American Industry Classification System (NAICS) category of the owning parent entity. The small business size standard for the affected industries (NAICS 325188, All Other Basic Inorganic Chemical Manufacturing, NAICS 325199, All Other Basic Organic Manufacturing, and NAICS 325211, Plastics Materials, and Resins Manufacturing) is a maximum of 1,000 employees for an entity.

After considering the economic impact of today's proposed rule on small entities, I certify that this action will not have a significant impact on a substantial number of small entities. In accordance with the RFA, as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA), 5 U.S.C. 601, *et. seq.*, EPA conducted an assessment of the proposed standard on small businesses within the industries affected by the rule. Based on SBA size definitions for

⁶ U.S. Environmental Protection Agency. Economic Impact Analysis of Air Pollution Regulations: Organic Liquid Distribution. Produced by the Research Triangle Institute. September 2001.

⁷ Reference 5.

⁸ Small Business Administration, Washington, D.C. Found on the Internet at www.sba.gov/size.

the affected industries and reported sales and employment data, the Agency identified four affected small businesses out of 32 affected parent businesses (or 13 percent of the total number). In order to estimate impacts to affected small businesses, the Agency conducted a screening analysis that consists of estimates of the annual compliance costs these businesses are expected to occur as compared to their revenues. Since the data are such that costs can only be estimated for a subset of the affected facilities, the available data was used to determine the costs to the facilities outside of this subset. The results of this screening analysis show that none of the small businesses is expected to have annual compliance costs of 1 percent or more. Therefore, this analysis allows us to certify that there will not be a significant impact on a substantial number of small entities from the implementation of this proposed rule.

A summary of the small business impacts, with a comparison to the impacts to the large companies, is in Table 6. The median compliance cost as a percent of sales for the affected small companies affected is 0.39 percent, which is larger than that for the affected large companies (0.001 percent).

Table 6
Summary of Small Business Impacts for HCl Production and Fumed Silica
MACT Floor Option

Total Number of Companies	33
Total Number of Small Companies	4
Total Number of Large Companies	29
Average Annual Compliance Cost per Small Company (in 1999 dollars)	\$171,194
Average Annual Compliance Cost per Large Company (in 1999 dollars)	166,811
Comparison of Compliance Costs to Sales	
Compliance Costs of <1% of Sales	Small: 4 Share: 100% Large: 29 Share: 100%
Compliance Costs of >1% of Sales	Small: 0 Share: 0% Large: 0 Share: 0%

Compliance Cost to Sales: Statistics	Average: 0.061 For Small: 0.481 For Large: 0.003
	Median: 0.0019 For Small: 0.386 For Large: 0.0012
	Maximum: 0.981 For Small: 0.981 For Large: 0.0126
	Minimum: 0.0001 For Small: 0.172 For Large: 0.0001

Appendix A

Summary of Representation of Actual Facilities in
HCl Production NESHAP Cost Analysis

Summary of Representation of Actual Facilities in the HCI Production Impacts Analysis

	Number of Facilities in Permit Database	Assumed controls needed	"Real" plants from list of 64 represented	Number of non-64 plants represented
No Process Vents	5		DuPont, KY, PPG, WV	3
Process Vents	21			
99+ ^a	16	none	Allied Signal, Baton Rouge, Bayer, WV, Degussa, NY, Dow, LA, ^a DuPont, LA, DuPont, WV, Louisiana Pigment, PPG, LA (x3) ^b	6
95%	5	new scrubber	Dow, LA, ^a DuPont, Dow, LA, PPG, OH, Shell, LA	1
No Storage Tanks	14		Bayer, WV, Degussa, NY, DuPont, LA; PPG, OH, Shell, LA, PPG, LA (x3) ^c	6
Storage Tanks	12			
99+%	4	none	Dow, LA, ^a DuPont, KY; PPG, WV; DuPont, WV	0
95%	5	ductwork/ new scrubber ^d	Allied Signal, Baton Rouge; DuPont, Dow, LA	3
0%	3	new scrubber ^d	Louisiana Pigment; Dow, LA ^a	1
No Transfer Operations	22		Allied Signal, Baton Rouge; Bayer, WV; Degussa, NY; Dow, LA, ^a DuPont, LA; DuPont, Dow, LA; DuPont, WV, Louisiana Pigment; PPG, OH; PPG, WV; PPG, LA (x3) ^c	9
Transfer Operations	4			
99+%	2	none	DuPont, KY	1
95%	1	ductwork ^d	Dow, LA ^a	0
0%	1	ductwork ^d	Shell, LA	0

^a There are two facilities at this plant site. For process vents and storage tanks, the two facilities control at different levels. Only one of the two facilities has a transfer operation.

^b There are three facilities at this plant site that control process vent emissions at 99+%. One of these three is a chlor-alkali facility that would not be subject to the rule. But, we included it in the "64" column because the plant site is on the list of 64 facilities in the source category.

^c There are three facilities at this plant site that do not have storage tanks emissions or transfer operation emissions.

^d It was assumed that four storage tanks controlled at 95% are located at facilities with process vents, so the process vent scrubber could be used for the storage

tank (and a new scrubber would not be needed). It was also assumed that the transfer operation at 95% and the one with no control were also at facilities where the process vent scrubber could be shared. It was also assumed that one storage tank at 95% and the three with no control are at facilities without process vents, so a new scrubber will be needed. These assumptions are not based on any real facility.

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