

Notes

- ¹ EPA's current regulations distinguish between cement kilns that burn hazardous wastes as a fuel source and those that do not. This report addresses EPA's failure to regulate mercury emissions from non-hazardous waste burning cement kilns. EPA's own Toxic Release Inventory (TRI) does not distinguish between hazardous and non-hazardous waste burning cement kilns. The 2006 figure of 11,995 pounds includes both types of kilns, making the new finding on non-hazardous waste burning kilns at nearly 23,000 pounds all the more significant.
- ² See Appendix A, for this industry-wide emission estimate. As reflected in the appendices, this number is based on a mix of data from TRI, source tests and input data. While the input data numbers are probably skewed to a high-end, assuming 100 percent pass through of the mercury contained in the kiln fuels and feedstock, it is also likely that emission data reported to TRI and through source tests are in some instances underreported.
- ³ Janet Raloff, *Mercurial Risks from Acid's Rain*, 139 SCI. NEWS 152, 153 (1991).
- ⁴ Centers for Disease Control and Prevention, 2003. *Second National Report on Human Exposure to Environmental Chemicals*. Available at <http://www.cdc.gov/nceh/dls/ner.htm>. EPA used the CDC data to estimate number of newborns at risk. See Mahaffey, K., et al., 2004. "Blood organic mercury and dietary mercury intake: National Health and Nutrition Examination Survey, 1999 and 2000," *Environ Health Perspect*, 112:562-570. <http://ehp.niehs.nih.gov/docs/2003/6587/abstract.html>.
- ⁵ Cement kilns are sources of air pollution for mercury and many other toxic air pollutants. Cement kiln systems release numerous hazardous air pollutants into the environment, including acetaldehyde, arsenic, benzene, cadmium, chromium, chlorobenzene, dibenzofurans, formaldehyde, hexane, hydrogen chloride, lead, manganese, mercury, naphthalene, nickel, phenol, polycyclic organic matter, selenium, styrene, 2,3,7,8-tetrachlorodibenzo-p-dioxin, toluene, and xylenes. In addition, the hazardous air pollutants released from other components of the kiln, such as the clinker coolers, raw mills, finish mills, storage bins, conveying system transfer points, bagging systems and bulk loading and unloading systems include arsenic, cadmium, chromium, lead, manganese, mercury, nickel, and selenium. See National Emission Standards for Hazardous Air Pollutants: Proposed Standards for Hazardous Air Pollutants Emissions from the Portland Cement Manufacturing Industry, 63 Fed. Reg. 14,182, 14,183 (Mar. 24, 1998).
- ⁶ See Appendix C, July 2008 EPA data summary. Please note that this reflects non-hazardous waste burning kilns only.
- ⁷ U.S. and Canadian Portland Cement Industry Plant Information Summary, December 31, 2006, pages 2-3. These industry wide numbers reflect both hazardous and non-hazardous waste burning kilns.
- ⁸ See February, 2008 Declaration of Peter Tsirigotis, Director of the Sector Policies and Programs Division of EPA, filed before the D.C. Circuit Court of Appeals in pending Cause No. 07-1046, Consolidated with Nos. 07-1048, 07-1049 and 07-1052.
- ⁹ All production capacity numbers come from the U.S. and Canadian Portland Cement Industry, Plant Information Summary, December 31, 2006, Portland Cement Association Economic Research Department, Table 13. See also, Appendix A.
- ¹⁰ Hansen Permanete Cement is listed in Appendix A as Lehigh-Hanson Permanete Cement. Lehigh purchased this plant in 2007. See, U.S. and Canadian Portland Cement Industry, Plant Information Summary, December 31, 2006, Portland Cement Association Economic Research Department, Table 3.
- ¹¹ According to the Portland Cement Association, in 2006, this plant ranked 42 out of 112 U.S. cement kilns for capacity to produce clinker. This rank includes hazardous waste-burning kilns. See, U.S. and Canadian Portland Cement Industry, Plant Information Summary, December 31, 2006, Portland Cement Association Economic Research Department, Table 13.
- ¹² For a discussion of the planned expansion, see U.S. and Canadian Portland Cement Industry Plant Information Summary, December 31, 2006, page 4. Information on South Carolina mercury advisories can be found at: <http://www.scdhec.net/environment/water/fish/downloads.htm>.
- ¹³ U.S. and Canadian Portland Cement Industry, Plant Information Summary, December 31, 2006, Portland Cement Association Economic Research Department, page 1.
- ¹⁴ See U.S. and Canadian Portland Cement Industry, Plant Information Summary, December 31, 2006, Portland Cement Association Economic Research Department, page 1.
- ¹⁵ U.S. and Canadian Portland Cement Industry, Plant Information Summary, December 31, 2006, Portland Cement Association Economic Research Department, Tables 2 and 3.
- ¹⁶ See, Appendix A for the following values: 19 lbs. from one TXI kiln, 31 lbs. from three Ash Grove kilns, and 146 lbs. from two Holcim kilns.
- ¹⁷ Non-hazardous waste burning kiln sites in California include: CEMEX's kilns in Victorville and Davenport, Lehigh's kilns in Tehachapi and Redding, California Portland Cement's kilns in Colton, Rillito and Mojave and the Hanson Permanete Cement kiln in Cupertino.

- ¹⁸ With regard to clinker capacity, this is one of the largest plants in the country. See, U.S. and Canadian Portland Cement Industry, Plant Information Summary, December 31, 2006, Portland Cement Association Economic Research Department, Table 13. Note that the capacity ranking includes hazardous waste burning kilns.
- ¹⁹ http://www.swrcb.ca.gov/sanfranciscobay/water_issues/programs/tmdls/sfbaymercurytml.shtml.
- ²⁰ Texas Aggregates and Concrete Association, "Frequently Asked Questions" at <http://tx-taca.org/uploads/files/Concrete%20and%20cement%20faq.pdf>.
- ²¹ Portland Cement Association, "Cement and Concrete Basics" at <http://www.cement.org/basics/cementindustry.asp>.
- ²² Portland Cement Association, "Cement and Concrete Basics" at <http://www.cement.org/basics/cementindustry.asp>.
- ²³ Portland Cement Association, "Cement and Concrete Basics" at <http://www.cement.org/basics/cementindustry.asp>.
- ²⁴ 70 Fed. Reg. 72330, 72333 (Dec. 2, 2005).
- ²⁵ See Docket A-92-53, Item II-A-46 at App. A.
- ²⁶ 70 Fed. Reg. 72330, 72333 (Dec. 2, 2005).
- ²⁷ Glenn Rice & James K. Hammitt, Northeast States for Coordinated Air Use Management, Economic Valuation of Human Health Benefits of Controlling Mercury Emission from U.S. Coal-Fired Power plants (2005) [hereinafter "Harvard/NESCAUM study"] at 5.
- ²⁸ Washington Department of Health, Statewide Bass Advisory, September 2003, citing EPA. 1999. The National Survey of Mercury Concentrations in Fish. Data Base Summary 1990-1995. U.S. Environmental Protection Agency. Office of Water. September 1999. EPA-823-R-99-014.
- ²⁹ Washington Department of Health, Statewide Bass Advisory, September 2003.
- ³⁰ <http://www.nrdc.org/health/effects/mercury/effects.asp>.
- ³¹ Centers for Disease Control and Prevention, 2003. Second National Report on Human Exposure to Environmental Chemicals. Available at <http://www.cdc.gov/nceh/dls/ner.htm>. EPA used the CDC data to estimate number of newborns at risk. See Mahaffey, K., et al., 2004. "Blood organic mercury and dietary mercury intake: National Health and Nutrition Examination Survey, 1999 and 2000," *Environ Health Perspect*, 112:562-570. <http://ehp.niehs.nih.gov/docs/2003/6587/abstract.html>.
- ³² Palmer, R.F., et al., Proximity to point sources of environmental mercury release as a predictor of autism prevalence. *Health & Place* 2008), doi:10.1016/j.healthplace.2008.02.001, citing National Academy of Sciences, 2000. Toxicological Effects of Methyl-mercury. National Academy Press, Washington D.C.
- ³³ "Harvard/NESCAUM study" at 37-48 (citing Salonen et al., Mercury accumulation and accelerated progression of carotid atherosclerosis: A population-based prospective 4-year follow-up study in men in Eastern Finland, 148 *Atherosclerosis* 265 (2000)).
- ³⁴ U.S. EPA Fact Sheet, 2005/2006 National Listing of Fish Advisories (July 2007). Also at, <http://www.epa.gov/waterscience/fish/advisories/2006/tech.pdf>.
- ³⁵ Florida Department of Environmental Protection, Integrating Atmosphere Mercury Deposition with Aquatic Cycling in South Florida: An approach for conducting a Total Maximum Daily Load Analysis for an atmospherically derived pollutant (2003), pages 56-57.
- ³⁶ U.S. and Canadian Portland Cement Industry, Plant Information Summary, December 31, 2006, Portland Cement Association Economic Research Department, Table 11. Note that these capacity numbers reflect kilns that also burn hazardous wastes.
- ³⁷ U.S. and Canadian Portland Cement Industry, Plant Information Summary, December 31, 2006, Portland Cement Association Economic Research Department, Table 2.
- ³⁸ U.S. and Canadian Portland Cement Industry, Plant Information Summary, December 31, 2006, Portland Cement Association Economic Research Department, page 1.
- ³⁹ See the list of hazardous air pollutants at Clean Air Act § 112(b).
- ⁴⁰ When the EPA sets MACT standards for pollutants at particular sources, these standards are referred to as National Emissions Standards for Hazardous Air Pollutants, or NESHAPs. State and local environmental agencies may obtain approval from the EPA to run programs that administer MACT standards. For a state or locality to run a MACT program, it must demonstrate that the state or local MACT requirements are just as stringent as the federal MACT requirements.
- ⁴¹ For hazardous air pollutants, the Clean Air Act defines a major source as any stationary source of emissions that has the potential to emit at least 10 tons per year of any single hazardous air pollutant or at least 25 tons per year or more of any combination of hazardous air pollutants. Clean Air Act § 112(a)(1). In 1992, EPA published an initial list of major source categories that includes Portland Cement Manufacturing. 57 Fed. Reg. 31576 (July 16, 1992). For the requirement that the EPA set standards for each source category see, Clean Air Act § 112(d)(1) and *Nat'l Lime Ass'n v. EPA*, 233 F.3d 625, 628 (D.C. Cir. 2000), amended on den. of reh'g 2/14/2001.
- ⁴² Clean Air Act § 112(d)(1). See also, *Nat'l Lime Ass'n v. EPA*, 233 F.3d 625, 628 (D.C. Cir. 2000), amended on den. of reh'g 2/14/2001.
- ⁴³ Clean Air Act § 112(d)(2).

- ⁴⁴ Clean Air Act § 112(d)(3).
- ⁴⁵ Clean Air Act § 112(d)(3)(A). Note that in source categories where there are fewer than 30 sources, the limit may not be less stringent than the average achieved by the best 5 performing sources. Clean Air Act § 112(d)(3)(B).
- ⁴⁶ Clean Air Act § 112(d)(3).
- ⁴⁷ EPA published its final rule that failed to set any limits on kilns' emissions of mercury, hydrochloric acid, and toxic hydrocarbons. See, 64 Fed. Reg. 31,898 (June 14, 1999).
- ⁴⁸ *Nat'l Lime Ass'n v. EPA*, 233 F.3d 625 (D.C. Cir. 2000), amended on den. of reh'g 2/14/2001.
- ⁴⁹ 70 Fed. Reg. 72330 (Dec. 2, 2005). The 2006 final rule did contain mercury standards for "new" cement kilns, those for which construction or reconstruction begins after December 2, 2005, but EPA immediately commenced reconsideration proceedings on this aspect of the rule. 71 Fed. Reg. 76518, 76524 (December 20, 2006). Those proceedings are still pending.
- ⁵⁰ See EPA's February 20, 2008 *Motion to Govern* before the D.C. Circuit Court of Appeals in Cause No. 07-1046, Consolidated with Nos. 07-1048, 07-1049 and 07-1052.
- ⁵¹ See February, 2008 Declaration of Peter Tsirigotis, Director of the Sector Policies and Programs Division of EPA, filed before the D.C. Circuit Court of Appeals in pending Cause No. 07-1046, Consolidated with Nos. 07-1048, 07-1049 and 07-1052.

Appendix A

KILN DATA ANALYSIS

Company	Kiln Location	ST	ZIP	Kiln #	Dry/ Wet	Type	Capacity (’000 MT tons/yr clinker)	2006 TRI Hg (lb/yr)	Capacity (’000 MT tons/yr clinker for Kilns with Data	Study Range- Low Hg (lb/yr)	Study Range- High Hg (lb/yr)	High Basis	Scrubber	EPA Resp?	
Armstrong Cement	Cabot	PA		1+2	Wet		132	16	-					No	
Ash Grove	Durkee	OR	97905	1	Dry	PC	894	2581	894	2581	3788	Test		Yes	
Ash Grove	Inkom	ID	83245	1	Wet		114	6	114	0.5	6	TRI		Yes	
Ash Grove	Inkom	ID	83245	2	Wet		144		144	0.5					
Ash Grove	Louisville	NE	68037	1	Dry	PH/PC	319	24	319	1.27	24	TRI	Dry Scrub- bing	Yes	
Ash Grove	Louisville	NE	68037	2	Dry	PC	551		551	7.06				Yes	
Ash Grove	Clancy (Montana City)	MT	59634	1	Wet		299	No TRI	299	2	2	Input		Yes	
Ash Grove	Nephel (Leamington)	UT	84638	1	Dry	PC	833	153	833	153	167	Input		Yes	
Ash Grove	Seattle	WA	98134	1	Dry	PC	675	12	675	12	52	Input		Yes	
Ash Grove	Midlothian	TX	76065	1	Wet		291	31	291	1.5	31	TRI		Yes	
Ash Grove	Midlothian	TX	76065	2	Wet		291		291	1.2			Yes		
Ash Grove	Midlothian	TX	76065	3	Wet		291		291	1.7			Yes		
Buzzi - Alamo Cement Company	San Antonio	TX		1	Dry	PC	852	25	-					??	
Buzzi	Chattanooga	TN		1	Dry	PC	816	No TRI	-					??	
Buzzi	Fustus	MO		1	Dry		537	145	-					??	
Buzzi	Fustus	MO		2	Dry		537		-						??
Buzzi	Independence	KS		1	Dry		81	14	-					??	
Buzzi	Independence	KS		2	Dry		81		-						??
Buzzi	Independence	KS		3	Dry		81		-						??
Buzzi	Independence	KS		4	Dry		81		-						??
Buzzi	Oglesby	IL	61348	1	Dry		593	No TRI	-					No	
Buzzi	Pryor	OK	74362	1	Dry		190	2	-					No	
Buzzi	Pryor	OK	74362	2	Dry		189		-						No
Buzzi	Pryor	OK	74362	3	Dry		274		-						No
Buzzi	Stockertown	PA		1	Dry	PH/PC	328	9	-					??	
Buzzi	Stockertown	PA		2	Dry	PC	558		-						??
Buzzi	Maryneal	TX	79535	1	Dry	PH/PC	150	23	-					No	
Buzzi	Maryneal	TX	79535	2	Dry	PH/PC	150		-						No
Buzzi	Maryneal	TX	79535	3	Dry	PH/PC	163		-						No
California Portland Cement	Mojave	CA	93502	1	Dry	PC	1375	13	1375	13	20	Test		Yes	

Company	Kiln Location	ST	ZIP	Kiln #	Dry/ Wet	Type	Capacity (⁰⁰⁰ MT tons/yr clinker)	2006 TRI Hg (lb/yr)	Capacity (⁰⁰⁰ MT tons/yr clinker for Kilns with Data	Study Range- Low Hg (lb/yr)	Study Range- High Hg (lb/yr)	High Basis	Scrubber	EPA Resp?	
California Portland Cement	Rillito	AZ	85654	1	Dry		121	0	121	0	58	Test		Yes	
California Portland Cement	Rillito	AZ	85654	2	Dry		121		121	0	41	Test		Yes	
California Portland Cement	Rillito	AZ		3	Dry		121		121						Yes
California Portland Cement	Rillito	AZ		4	Dry	PC	969		969						Yes
Capitol Aggregates	San Antonio	TX		1	Wet		254	12	-					No	
Capitol Aggregates	San Antonio	TX		2	Dry	PC	604		-						No
Cemex	Brooksville	FL		1	Dry	PH/PC	629	0	-					No	
Cemex	Brooksville	FL		2	Dry	PH/PC	629		-						No
Cemex - Rinker Materials	Brooksville	FL		1	Dry	PH/PC	605	No TRI	-					No	
Cemex	Clinchfield	GA		1	Dry	PH/PC	755	38	-					No	
Cemex	Davenport	CA		1	Dry	PC	823	172	-					No	
Cemex	Demopolis	AL		1	Dry	PH/PC	853	No TRI	-					No	
Cemex	Knoxville	TN		1	Dry	PC	701	0	-					No	
Cemex	Louisville	KY		1	Dry	PC	1407	36	-					No	
Cemex	Lyons	CO		1	Dry	PC	470	53	-					No	
Cemex - Rinker Materials	Miami	FL		1	Dry	PC	985	25	-					No	
Cemex	Odessa	TX		1	Dry	PC	257	13	-					No	
Cemex	Odessa	TX		2	Dry	PC	287		-						No
Cemex	Victorville	CA		1	Dry	PH/PC	1049	271	-					No	
Cemex	Victorville	CA		2	Dry	PC	1668		-						No
Cemex	Wampum	PA		1	Dry		251	70	-					No	
Cemex	Wampum	PA		2	Dry		251		-						No
Cemex	Wampum	PA		3	Dry		269		-						No
Cemex	Xenia	OH		1	Dry	PH/PC	692	24	-					No	
Dragon Products Company	Thomaston	ME		1	Dry	PC	776	14	-					No	
Eagle Materials	Fernley	NV		1	Dry		226	12	-					No	
Eagle Materials	Fernley	NV		2	Dry	PH/PC	226		-						No
Eagle Materials	La Salle	IL		1	Dry	PH/PC	602	10	-					No	
Eagle Materials	Laramie	WY		1	Dry		172	31	-					No	
Eagle Materials	Laramie	WY		2	Dry	PH/PC	401		-						No
Essroc	Bessemer	PA	16112	1	Wet		237	151	237	45	151	TRI		Yes	
Essroc	Bessemer	PA	16112	2	Wet		368		368	91					Yes

Company	Kiln Location	ST	ZIP	Kiln #	Dry/ Wet	Type	Capacity (^{'000} MT clinker)	2006 TRI Hg (lb/yr)	Capacity (^{'000} MT tons/yr clinker for Kilns with Data	Study Range- Low Hg (lb/yr)	Study Range- High Hg (lb/yr)	High Basis	Scrubber	EPA Resp?	
Essroc	Frederick	MD	21703	1	Wet		154	31	154	31	31	TRI		Yes	
Essroc	Frederick	MD	21703	2	Wet		154		154					Yes	
Essroc	Martinsburg	WV	25401	1	Wet		208	149	208	2	149	TRI		Yes	
Essroc	Martinsburg	WV	25401	2	Wet		208		208			2		Yes	
Essroc	Martinsburg	WV	25401	3	Wet		314		314			3		Yes	
Essroc	Nazareth	PA	18064	1	Dry	PH/PC	1280	163	-					No	
Essroc	Speed	IN	47172	1	Dry		298	149	298	27	149	TRI		Yes	
Essroc	Speed	IN	47172	2	Dry	PH/PC	621		621	56			Yes		
Florida Rock Industries	Newberry	FL		1	Dry	PC	708	28	-					No	
GCC of America	Rapid City	SD		1	Wet		148	18	-					No	
GCC of America	Rapid City	SD		2	Wet		148		-						No
GCC of America	Rapid City	SD		3	Dry	PC	602		-						No
GCC of America	Tijeras	NM		1	Dry	PH/PC	216	11	-					No	
GCC of America	Tijeras	NM		2	Dry	PH/PC	216		-						No
Giant Cement Holdings	Harleyville	SC		1	Dry	PC	848	33	-					No	
Holcim	Ada	OK		1	Wet		252	65	-					No	
Holcim	Ada	OK		2	Wet		262		-						No
Holcim - St. Lawrence Cement Company	Catskill	NY		1	Wet		580	51	-					No	
Holcim	Dundee	MI		1	Wet		419	113	-					No	
Holcim	Dundee	MI		1	Wet		411		-						No
Holcim	Florence	CO		1	Dry	PC	1542	8	1542	8	49	Test	Wet Lime Scrubber	Yes	
Holcim - St. Lawrence Cement Company	Hagerstown	MD		1	Dry		548	48	-					No	
Holcim	Mason City	IA		1	Dry		546	96	-					No	
Holcim	Mason City	IA		2	Dry		350		-						No
Holcim	Midlothian	TX		1	Dry	PC	987	12	987	12	34	Test		Yes	
Holcim	Midlothian	TX		2	Dry	PC	1028		1028		112	Test		Yes	
Holcim	Morgan	UT		1	Dry	PC	712	11	-					No	
Holcim	Theodore	AL		1	Dry	PC	1447	73	-					No	
Holcim	Three Forks	MT		1	Wet		277	7	-					No	
Lafarge	Alpena	MI	49707	1	Dry		390	360	390	360	54	Test		Yes	
Lafarge	Alpena	MI	49707	2	Dry		390		390		37	Test		Yes	
Lafarge	Alpena	MI	49707	3	Dry		387		387		50	Test		Yes	
Lafarge	Alpena	MI	49707	4	Dry		554		554		129	Test		Yes	
Lafarge	Alpena	MI	49707	5	Dry		544		544		108	Test		Yes	
Lafarge	Buffalo	IA	52728	1	Dry	PC	975	22	975	22	129	Input		Yes	
Lafarge	Calera	AL	35040	1	Dry	PC	1467	36	1467	78	258	Input		Yes	

Company	Kiln Location	ST	ZIP	Kiln #	Dry/ Wet	Type	Capacity (^{'000} MT tons/yr clinker)	2006 TRI Hg (lb/yr)	Capacity (^{'000} MT tons/yr clinker for Kilns with Data	Study Range- Low Hg (lb/yr)	Study Range- High Hg (lb/yr)	High Basis	Scrubber	EPA Resp?	
Lafarge	Grand Chain (Joppa)	IL	62941	1	Dry		418		418			Input		Yes	
Lafarge	Grand Chain (Joppa)	IL	62941	2	Dry		549	1	549	1	77			Yes	
Lafarge	Harleyville	SC	29448	1	Dry	PC	978	78	978	78	206	Input		Yes	
Lafarge	Ravena	NY	12143	1	Wet		847	400	-					No	
Lafarge	Ravena	NY	12143	2	Wet		848		-					No	
Lafarge	Seattle	WA	96106	1	Wet		387	30	387	30	39	Test		Yes	
Lafarge	Sugar Creek	MO	64050	1	Dry	PC	924	24	924	24	36	Test		Yes	
Lafarge	Tulsa	OK	74116	1	Dry		295	2	-					No	
Lafarge	Tulsa	OK	74116	2	Dry		313		-					No	
Lafarge	Whitehall	PA	18052	1	Dry	PH/PC	419	61	419	24	61	TRI		Yes	
Lafarge	Whitehall	PA	18052	2	Dry	PH/PC	283		283	36					Yes
Lehigh - Texas-Lehigh	Buda	TX		1	Dry		1134	16	-					No	
Lehigh - Hanson Permanente Cement	Cupertino	CA		1	Dry	PC	1497	494	-					No	
Lehigh	Fleetwood	PA	19522	1	Dry	PH/PC	533	86	533	86	66	Test	Lime Injection in BH	Yes	
Lehigh	Fleetwood	PA	19522	2	Dry	PH/PC	533		533		29	Test			Yes
Lehigh	Glen Falls	NY	12801	1	Dry	PH/PC	586	12	586	12	12	Test/ TRI	Lime Slurry Injection	Yes	
Lehigh	Leeds	AL	35094	1	Dry	PH/PC	716	16	716	16	42	Test		Yes	
Lehigh	Mason City	IA	50401	1	Dry	PC	731	184	731	148	184	Test	FGD	Yes	
Lehigh	Mitchell	IN	47446	1	Dry	PH/PC	251	159	251	33	159	TRI		Yes	
Lehigh	Mitchell	IN	47446	2	Dry	PH/PC	251		251	33					Yes
Lehigh	Mitchell	IN	47446	3	Dry	PH/PC	274		274	36					Yes
Lehigh	Union Bridge	MD	21791	1	Dry	PC	1996	35	1996	35	1539	Input		Yes	
Lehigh	Waco	TX	76712	1	Wet		100	No TRI	100	2	2	Test		Yes	
Lehigh	Redding	CA	96003	1	Dry	PC	592	92	-					No	
Lehigh	Tehachapi	CA	93561	1	Dry	PC	958	586	958	586	1748	Input		Yes	
Mitsubishi Cement Corp.	Lucerne Valley	CA		1	Dry	PC	1543	160	-					No	
Monarch Cement Company	Humboldt	KS		1	Dry	PC	433	23	-					No	
Monarch Cement Company	Humboldt	KS		2	Dry	PC	449		-						No
National Cement Co. Alabama	Ragland	AL		1	Dry	PC	907	208	-					No	
National Cement Co. California	Encino Lebec	CA		1	Dry	PC	1033	59	-					No	

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Phoenix Cement Company	Clarkdale	AZ		1	Dry	PH/PC	187	41	-					No
Phoenix Cement Company	Clarkdale	AZ		2	Dry	PH/PC	187		-					No
Phoenix Cement Company	Clarkdale	AZ		3	Dry	PH/PC	187		-					No
Phoenix Cement Company	Clarkdale	AZ		4	Dry	PC	912		-					No
St. Marys Cement	Charlevoix	MI		1	Dry	PC	1234	55	-					No
St. Marys Cement	Dixon	IL		1	Dry	PH/PC	161	15	-					No
St. Marys Cement	Dixon	IL		2	Dry	PH/PC	161		-					No
St. Marys Cement	Dixon	IL		3	Dry	PH/PC	161		-					No
St. Marys Cement	Dixon	IL		4	Dry		161		-					No
Suwanee American Cement	Branford	FL		1	Dry	PC	820	55	-					No
TXI	Midlothian	TX	76065	5	Dry	PC	1964	19	-				Wet Lime Scrubber	No
TXI	New Braunfels	TX	78132	1	Dry	PC	780	87	-					No
TXI	Oro Grande	CA		1	Dry		161	No TRI	-					No
TXI	Oro Grande	CA		2	Dry		161		-					No
TXI	Oro Grande	CA		3	Dry		161		-					No
TXI	Oro Grande	CA		4	Dry		161		-					No
TXI	Oro Grande	CA		5	Dry		161		-					No
TXI	Oro Grande	CA		6	Dry		161		-					No
TXI	Oro Grande	CA		7	Dry		155		-					No
TXI	Riverside	CA		1	Dry		43	12	-					No
TXI	Riverside	CA		2	Dry		43		-					No
Titan America	Troutville	VA		1	Dry		1138	6	-					No
Titan America	Medley	FL		1	Dry		1634	90	-					No
Totals				151			81512		29122	4692	9829			
									SCALED	13132	27511			

Notes

- Two plants in Puerto Rico not included. Total number of kilns = 151. Total clinker capacity = 81,512,000 metric tons/yr.
- Data other than TRI was available for kilns with roughly 35 percent of the clinker capacity of non-hazardous waste kilns.
- TRI data do not appear to be reliable.
- Current best estimate for national (48-state) mercury emissions from non-hazardous waste kilns is between 6–13 tons/year.
- Analysis is based on best available data; however, significant data gaps exist.

Appendix B

Kiln Data Analysis Methodology

Data Sources Considered and Methodology

Data on mercury emissions were assembled and estimated from a review of the following sources:

- a. Portland Cement Association Report 2006, which provided lists of US cement plants and kilns, including clinker production capacities. This report also identified certain kilns as burning only waste and these were excluded from the analysis;
- b. List of hazardous waste burning kilns from EPA (2005). These kilns were excluded from the analysis.
- c. Data obtained from the EPA on several large cement company kilns in response to EPA's information collection request. This data generally included:
 - (i) source test reports including mercury tests. However, in many cases, source test data were over five years old. Only source tests that were five years or more recent were considered. In the vast majority of cases, clinker production during source test time periods were not provided and mercury emissions were reported on a direct mass rate basis (i.e., lb/hr, etc.). The methods used to test for mercury also varied. Older tests generally used EPA Method 29 while some of the more recent tests used the Ontario Hydro or similar methods. Representativeness of test data, extrapolated to annual operating periods is often questionable. All of these issues notwithstanding, source test data, where available, were used to estimate annual emissions, assuming that kilns operated for 90 percent of all hours in the year. If separate emissions rates were measured with raw mills on and off, these were accounted for in the calculation.
 - (ii) data on mercury content in input (raw) materials to kilns for an approximate 30-day period during 2007. Although the mercury speciation data for 30 days was provided in several cases, in many cases, actual mercury values were noted as Non-Detect. These data often could not be used since corresponding detection limits were often not noted. Also, in most cases, the mercury speciation of the clinker or baghouse dust was not available.
- d. Data on mercury air emissions submitted to the EPA as part of the TRI Form R reporting. TRI data were used only if additional (i.e., mass input or source test) data were also available. The calculation methodology for TRI air emissions data are not readily apparent. In some cases, there were obvious problems with the TRI data (such as air emissions reported as zero, while source test data indicated non-zero values).
- e. Title V air operating permits for various operating kilns. These were reviewed to determine if there were specific mercury limits for particular kilns. With almost no exceptions, current Title V permits for kilns considered in this study do not contain limits on mercury emissions.

Uncertainties

Data from these various sources, wherever comparable were not generally consistent. Therefore, to provide an

idea of the uncertainties in emissions estimates, low and high ranges for expected annual mercury emissions are provided. While, in some cases, the spread between the high and low values is not significant, in a few notable cases, this spread is exceptionally large, reflecting large uncertainties as to underlying data or kiln operational details. All emissions data are reported as total mercury emissions; however, it should be noted that based on the test methods used, it is not clear if all mercury species were completely measured. Thus, one area of possible uncertainty is the fraction of mercury emissions emitted that are actually measured.

Separate from emissions uncertainty, a couple of additional areas of uncertainty include:

- Kiln size (clinker capacity) was not always consistent considering similar data in the PCA report and that submitted to EPA (even accounting for the fact that PCA report capacities are in metric tons and data reported to EPA was in either metric or US customary (short) tons.
- Whether or not a particular kiln burns hazardous waste was, in some cases ambiguous. To the extent possible, the analysis attempts to conservatively exclude any kiln that may burn hazardous waste from this analysis.

Overall, mercury emissions data, subject to the caveat relating to speciation were estimated for roughly 35 percent of kilns (based on clinker capacity). The emissions for the universe of kilns in the US (excluding two kilns in Puerto Rico) were then extrapolated using clinker capacity. While this extrapolation or scaling is admittedly a rough attempt to estimate the US kiln mercury emissions,

at this time, there does not appear to be a more reliable method to prepare this estimate, other than relying on TRI data which has some clear flaws and therefore seems unreliable.

Recommendations

Recommendations for improving the mercury emissions estimates include the following:

- a. Clear identification of kilns that burn hazardous versus non-hazardous wastes
- b. Completion of source tests under documented representative conditions, using standard methods that account for all species of mercury likely to be emitted; such source tests should also document the underlying production levels at the time of the test(s);
- c. Obtaining the data above from all kilns in the US. EPA's attempt to focus on the larger, national cement companies, while a good start, left out many companies that may be smaller or regional but still operate very large kilns;
- d. Inclusion of requirements to conduct source tests in facility operating permits such as Title V permits;
- e. Increase standardization and transparency of TRI data submittals;
- f. Improve the ability to conduct mass balance calculations by (i) inclusion of mercury data in all input and output streams from the pyro-processing system, over time periods that reflects representative relatively steady-state operations of the system. If mercury is not detected in a particular stream, the appropriate detection limit should also be reported.

Appendix C

NORMALIZED MERCURY EMISSIONS FOR EXISTING AND NEW CEMENT KILNS*

FacID	KilnID	Hg Emissions (lb/1,000,000 tons total feed)	Kiln Capacity (tpy)	Kiln Type	Alkali Bypass	CKD Wasted
5	3	2.02	323,847	wet		
6	2	2.35	156,236	wet		
6	1	2.37	128,694	wet		
26	1	2.43	340,956	preheater		
5	2	2.50	318,485	wet		
5	1	2.65	334,161	wet		
29	1	3.78	301,206	wet		
26	2	7.55	602,434	preheater/calcliner		
25	K1	7.76	633,282	long dry		X
36	Kiln 1	12.36	652,568	preheater		
39	Kiln 1	23.87	420,480	long dry		X
39	Kiln 2	23.87	420,480	long dry		X
32	Kiln 1	24.02	169,756	wet		X
32	Kiln 2	24.71	169,756	wet		X
14	White Cement Kiln	29.72	148,811	wet		X
18	3	34.37	1,028,570	preheater/calcliner	X	X
16	2	37.66	321,875	preheater		X
34	Kiln 7	37.78	229,281	wet		X
34	Kiln 9	40.54	346,126	wet		X
22	2	43.74	1,125,746	wet long	X	X
2	Kiln1	47.59	600,000	preheater		
2	Kiln2	47.59	600,000	preheater		
30	1	47.97	670,863	precalcliner		
34	Kiln 8	48.01	229,281	wet		X
22	1	48.21	1,093,961	wet long	X	X
37	Kiln 1	51.16	328,489	long dry		
12	39	52.22	132,276	wet		
35	Kiln 1	53.29	1,410,958	preheater		
38	19	54.16	425,853	long dry		X
38	22	54.16	768,048	long dry		X
38	23	54.16	766,202	long dry		X
38	20	54.16	440,857	long dry		X
38	21	54.16	451,509	long dry		X
37	Kiln 2	58.79	684,535	preheater	X	
25	K2	62.80	757,605	long dry		X
10	1	66.39	600,000	preheater		
24	Kiln 3	66.50	381,016	preheater		
24	Kiln 2	66.59	540,744	preheater		

* Consist of data for 54 kilns where no claim of confidentiality was made by the submitting company.

FacID	KilnID	Hg Emissions (lb/1,000,000 tons total feed)	Kiln Capacity (tpy)	Kiln Type	Alkali Bypass	CKD Wasted
20	K1	69.48	1,273,120	preheater/calcliner	X	X
31	Kiln 1	76.92	218,258	wet		X
16	3	78.56	376,680	preheater		X
31	Kiln 2	82.00	218,258	wet		X
16	1	83.12	321,875	preheater		X
19	1	83.83	1,095,000	preheater/calcliner		
11	1	88.20	661,521	preheater		
21	5	88.33	1,560,000	preheater/calcliner		
33	Kiln 4	98.63	261,248	wet		X
23	Kiln 1	108.15	511,374	wet		
27	1	120.50	962,265	preheater/calcliner		
13	Eo2-001	120.88	2,220,914	preheater/calcliner		
33	Kiln 5	135.68	405,650	wet		X
9	8	220.44	985,732	preheater/calcliner	X	X
15	Kiln	1289.19	992,080	preheater/calcliner		
28	1	1982.01	966,692	precalcliner		
Total Capacity (tpy clinker)			32,085,614			
Total Mercury Emissions (lb/yr)			7770.00			
Mercury Emission Factor (lb/tpy capacity)			0.000			
Estimated Nationwide Mercury Emissions (lb/yr)			22,918			



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