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How have the emissions from hazardous waste combustors changed over time?

Prior to 1999, air emissions from hazardous waste combustors were regulated under RCRA, either as part of Part 264, subpart O (incinerators) or Part 266, subpart H (boilers and industrial furnaces). In 1999, EPA promulgated Maximum Achievable Control Technology (MACT) standards for hazardous waste incinerators, cement kilns that burned hazardous waste, and lightweight aggregate kilns (LWAK) that burn hazardous waste. As a part of this rulemaking, EPA estimated the emissions from hazardous waste combustors prior to the rulemaking (1997 baseline) and estimated the reductions in emissions that would result from the revised emissions standards. These standards were vacated by the court and interim standards were negotiated. In 2005, EPA promulgated replacement standards for incinerators, cement kilns and LWAKs. In addition, they promulgated initial emission standards for solid fuel-fired boilers that burn hazardous waste, liquid fuel-fired boilers that burn hazardous waste, and hydrochloric acid production furnaces that burn hazardous waste. In the 2005 rulemaking, EPA recalculated a baseline (2003) for those units meeting the interim standards (incinerators, cement kilns, and LWAKs) and estimated emissions from all six source categories for the emissions that would result from the revised standards. The 2005 HWC MACT rule regulates emissions for six hazardous air pollutants (or groups of pollutants): total chlorine (sum of CL2 and HCl, TCL); particulate matter (PM), semi-volatile metals (lead and cadmium, SVM); mercury (Hg); low-volatile metals (arsenic, beryllium, and chromium, LVM), and dioxin/furans (D/F).

The data presented in this paper are from three EPA sources. The baseline data for 1997 came from the 1999 Technical Support Document for HWC MACT Standards. Volume V. Emissions Estimations and Engineering Costs. Table 2-5, (PDF page 47 of 77, part 2 of 6). The same data can be found in the "Assessment of the Potential Costs, Benefits, & Other Impacts of the Hazardous Waste Combustion MACT Standards: Final Rule." Final Draft: July 1999. The 2003 baseline and projected 2008 data were obtained from Table 3.2 of the Technical Support Document for the 2005 permanent replacement rule, Volume 5, page 3-12.

With this data, we can address the question of how hazardous air pollutant emissions from hazardous waste combustors have changed over time. Table 1 shows the estimated mass emissions from all hazardous waste combustors for 1997, 2003, and 2008.

Table 1. The estimated mass emissions from all hazardous waste combustors for 1997, 2003, and 2008.

Pollutant	1997	2003	2008
TCl (t/yr)	14,628	7,613	1,219
PM (t/yr)	8,118	4,307	2,138
SVM (t/yr)	101	7	3
Hg (t/yr)	7	3	0.3
LVM (t/yr)	21	12	7
D/F (g TEQ/yr)	42.9	8.0	0.7

Table 2 shows the percentage reduction for each pollutant between the three years. One should note that the comparison of reductions between 1997 and 2003 to the reduction from 2003 to 2008 is complicated by the fact that the 1997 numbers are based on three source categories (cement kilns, lightweight aggregate kilns, and incinerators) whereas the 2003 and 2008 numbers are based on all six source categories.

Table 2. The percentage reduction from the 1997 level of emissions for 2003 and 2008.

Pollutant	Percent Reduction 1997-2003	Percent Reduction 1997-2008
TCl (t/yr)	48	92
PM (t/yr)	47	74
SVM (t/yr)	93	97
Hg (t/yr)	55	95
LVM (t/yr)	44	68
D/F (g TEQ/yr)	81	98

As one can see, the reduction in mass emissions of these six pollutants for the hazardous waste combustor industry source ranged from 68% for LVMs to 97% for SVMs. The percent reduction for PM and TCl (the two largest amounts of pollutants) were 74% and 92%, respectively.

CRWI members own and operate facilities in four of these source categories. The emissions from each of these four source categories will be further broken down.

Table 3 shows the mass emissions from hazardous waste incinerators and the percentage reduction of hazardous air pollutant emissions over the same time period.

As one can see, the reduction in emissions for each pollutant is greater than 95 percent with some levels approaching complete elimination of the emissions for that pollutant.

Table 3. The estimated mass emissions from hazardous waste incinerators for 1997, 2003, and 2008 and the percentage reduction from the 1997 level of emissions for 2003 and 2008.

Pollutant	1997	2003	% red 97-03	2008	% red 97-08
TCl (t/yr)	3,757	425	89	195	95
PM (t/yr)	2,004	110	95	11	99
SVM (t/yr)	64	1.1	98	0.12	99.8
Hg (t/yr)	5	0.5	90	0.04	99
LVM (t/yr)	9	0.4	95	0.001	99.9
D/F (g TEQ/yr)	25	1.5	94	0.5	98

Table 4 shows the estimated mass emissions from solid fuel-fired boilers for 2003 and 2008 with the associated reduction in emissions. There were no reductions in mercury emissions since there was virtually no mercury emitted from this source category prior to the 2005 standards. The reduction in emissions for SVMs was also a small percentage but still only emitted 0.66 tons per year.

Table 4. The estimated mass emissions from solid fuel-fired boilers that burn hazardous waste for 2003 and 2008 and the percentage reduction from the 2003 level of emissions for 2008.

Pollutant	2003	2008	Reduction
TCl (t/yr)	1,981	424	79
PM (t/yr)	887	507	43
SVM (t/yr)	1.1	0.66	40
Hg (t/yr)	0.1	0.1	0
LVM (t/yr)	1.4	0.88	37
D/F (g/yr)	0.9	0	100

Table 5 shows the estimated mass emissions from hydrochloric production furnaces. These sources burn mostly chlorinated solvent with the goal of recovering the chlorine as hydrochloric acid. Most of which is reused in the local manufacturing process. While the percent reduction in TCl is relatively low, the purpose of these units is to recover chlorine so their emissions prior to regulation were not high to start with. The majority of the economically recoverable chlorine was already being recovered.

Table 5. The estimated mass emissions from hydrochloric acid production furnaces that burn hazardous waste for 2003 and 2008 and the percentage reduction from the 2003 level of emissions for 2008.

Pollutant	2003	2008	Reduction
TCl (t/yr)	150	107	29
PM (t/yr)	28	0	100
SVM (t/yr)	0	0	
Hg (t/yr)	0	0	
LVM (t/yr)	0	0	
D/F (g/yr)	0.2	0	100

Finally, Table 6 shows the mass emissions from liquid fuel-fired boilers. Because these units also burn a relatively clean fuel (low in metals and mercury), the percent reduction for some of these pollutants is also low. The percent reduction for total chlorine and dioxin/furans is much higher.

Table 6. The estimated mass emissions from liquid-fired boilers that burn hazardous waste for 2003 and 2008 and the percentage reduction from the 2003 level of emissions for 2008.

Pollutant	2003	2008	Reduction
TCl (t/yr)	3,110	484	84
PM (t/yr)	2,540	1,582	38
SVM (t/yr)	1.9	1.64	14
Hg (t/yr)	0.2	0.11	45
LVM (t/yr)	9.4	5.52	41
D/F (g/yr)	1.4	0.2	86

Summary

Hazardous waste combustors have significantly reduced their mass emissions for all of their hazardous air pollutants since the HWC MACT rules were promulgated. These reductions range from 68% for LVMs to 98% for dioxins/furans.