RESEARCH TRIANGLE INSTITUTE

RTI

Center for Environmental Analysis

MEMORANDUM June 28, 1995

TO: Jim Maysilles - EPA

FROM: Jim Turner - RTI J. K. T.

SUBJECT: Enhanced Monitoring Options for Steel Pickling
Steel Pickling - NESHAP
EPA Contract 68-D1-118, WA 115
ESD Project 91/08B
RTI Project 5846-115

Attached is information on enhanced monitoring for steel pickling. It is written in the form of a draft portion of Section 6 for the pickling BID. This draft is based on the use of EPA's EMTIC model for continuous monitoring and for periodic testing. Costs for monitoring of scrubber operating parameters are based on the EMTIC program, but with reductions for absence of the continuous monitor and its peripherals.

Four options are proposed: continuous monitoring of HCl, continuous monitoring of scrubber parameters (pressure drop, water flows, and pH), periodic testing (every 6 months), and a combination of continuous monitoring of HCl for plants greater than 500,000 tpy capacity and continuous monitoring of scrubber parameters for the remaining plants. The scrubber parameters and plant size are intended as targets and can be changed easily.

If you have comments or questions, please call me at 990-8617.

Jim:

I've made a few comments and have a few questions.

Jim M.

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Reviewed by J. H. Margolles 9/18/95

6.5 ENHANCED MONITORING OPTIONS

Enhanced monitoring options are presented for continuous pickling, batch pickling, acid regeneration, and storage tanks. In each case, the pollutant to be monitored is HCl and the control system to be monitored is a scrubber. The options are based on review of a range of existing capabilities from continuous monitoring of HCl through continuous monitoring of a surrogate compound, continuous monitoring of control device parameters, continuous monitoring of process parameters, and periodic testing of control device emissions. Table 6-1 provides an overview of the enhanced monitoring methods than can reasonably be applied technically. The table shows that for steel pickling, the options selected for review include continuous monitoring of HCl, continuous monitoring of control device parameters, and periodic testing. The remaining options do not lend themselves to reliable monitoring of HCl emissions. For example, monitoring process variables is not expected to provide accurate emission results because of the poor correlation between production rate and emission rate. Monitoring of surrogate compounds is not feasible because no surrogate compound usable for monitoring exists in the scrubber offgas. Table 6-2 provides options for each pickling process, acid regeneration, and storage tanks. The options are described individually below.

Table 6-1. Overview of available enhanced monitoring methods for scrubbers on steel pickling.

Process	Continuous monitoring for HCl	Continuous monitoring for surrogate compound[a]	Continuous monitoring for control system parameters	Continuous monitoring for process parameters[b]	Periodic testing by Method 26A
Continuous coil pickling	X		X		X
Push-pull coil pickling	X		X		X
Continuous rod and wire pickling	X		X		X
Continuous tube pickling	X		X		X
Batch pickling	X		X		X
Acid regeneration	X		X		X
Storage tanks	X[c]		X[c]		X[c]

[a]No suitable surrogate compounds exist in the gas stream to the scrubber.
[b]Intermittant operation for all pickling processes precludes reasonable correlation between process parameters and emissions.
[c]Storage tanks are expected to be vented to the pickling line scrubber in most cases and would not require separate monitoring.

Table 6-2. Enhanced monitoring options for steel pickling processes.

Option No.	Description	Rationale
I	Continuous HCl monitors on all scrubbers.	Commercial continuous monitors for HCl exist [but are not demonstrated for pickling scrubbers.] Costs are high.
II	Continuous monitoring of scrubber parameters on all scrubbers.	Measurements of pressure drop, scrubber water flow rates (including recycle), and pH are good indicators of scrubber performance and are relatively easy to obtain. Costs are moderate.
III	Semi-annual testing of all scrubbers.	Does not require continuous monitoring. Moderate cost.
IV	Continuous HCl monitors for plants with pickling capacity more than 500,000 t/yr or acid regeneration capacity more than 10 million gal/yr, continuous monitoring of scrubber parameters for all others.	Removes disproportionate cost burden from smaller plants.

Option I requires the use of a continuous HCl monitor for each scrubber. The monitor is self-calibrating and records HCl concentration in ppm. Option II requires that each scrubber have continuous monitoring of pressure drop across the body of the scrubber, water flow rates into the scrubber (including separate measurement of recycle), and pH of the scrubber effluent. Option III requires semi-annual testing at the outlet of each scrubber by Method 26A. Option IV requires the use of a continuous HCl monitor for each scrubber outlet at facilities capable of pickling more than 500,000 tons per year of steel, or of regenerating more than 10 million gallons per year of spent acid. All other facilities are required to monitor continuously the pressure drop, flow rates, and pH of each scrubber as described above in Option II.

Record keeping and reporting of monitoring data are as required in the general provisions for compliance with MACT standards.

6.6 COSTS OF ENHANCED MONITORING OPTIONS

Costs for each of the enhanced monitoring options are shown in Table 6-3. Costs for continuous monitoring of HCl are based on procedures and software (EMTIC CEM COST MODEL, version 2.0) developed by EPA that include estimates for planning and selection of equipment, support facilities, purchase price for

Does the continuous HCl monitor measure HCl emissions in b.m gas and dry at stack?

the monitor and peripherals, installation, performance test, and quality assurance/quality control plans and procedures. Recurring costs include operation and maintenance, annual and supplemental relative accuracy test audits (RATAs), quarterly reports, recordkeeping and reporting and annual review and update.

Costs of equipment and operation for continuous monitoring of scrubber parameters include all of the elements for HCl monitors, but equipment purchase, installation, and maintenance costs are lower.

This statement may require explanation

Costs for semi-annual testing by Method 26A are based on costs collected by EPA in its test programs. Costs assume the use of a test contractor and include time for participation by plant personnel.

The costs in Table 6-3 include capital and annual costs for a typical model plant and estimates of nationwide costs based on the distribution and sizes of existing plants. No credit is taken for existing equipment and fixtures, but test ports are assumed to exist for periodic testing. The estimated nationwide capital and annual costs for Option I are $22.0 million and $11 million, respectively. Estimated nationwide costs for Option II are $12.6 million and $7.29 million, respectively; for Option III are $0 (no capital expenditures) and $4.35 million, respectively;

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Why so high? This seems surprising?

and for Option IV are $15.2 million and $8.30 million, respectively.

Table 6-3. Costs of enhanced monitoring options for steel pickling.

Process	Option	Capital cost for medium model plant, $	Annual cost for medium model plant, $/yr	Nationwide capital cost, millions of $	Nationwide annual cost, millions of $/yr
Continuous coil	I	131,600	65,500	8.03	4.00
	II	75,600	43,600	4.60	2.66
	III	0	26,000	0	1.59
	IV[a]	131,600	65,500	6.24	3.30
Push-pull coil	I	131,600	65,500	2.90	1.44
	II	75,600	43,600	1.66	0.96
	III	0	26,000	0	0.57
	IV[b]	75,600	65,500	2.20	1.18
Continuous rod and wire	I	131,600	65,500	3.49	1.74
	II	75,600	43,600	2.00	1.20
	III	0	26,000	0	0.69
	IV[c]	75,600	43,600	2.00	1.20
Continuous tube	I	131,600	65,500	0.99	0.05
	II	75,600	43,600	0.57	0.33
	III	0	26,000	0	0.20
	IV[c]	75,600	43,600	0.57	0.33
Batch	I	131,600	65,500	4.89	2.43
	II	75,600	43,600	2.81	1.62
	III	0	26,000	0	0.97
	IV[c]	75,600	43,600	2.81	1.62
Acid regeneration	I	131,600	65,500	1.71	0.85
	II	75,600	43,600	0.98	0.57
	III	0	26,000	0	0.34
	IV[d]	131,600	65,500	1.37	0.72

Process	Option	Capital cost for medium model plant, $	Annual cost for medium model plant, $/yr	Nationwide capital cost, millions of $	Nationwide annual cost, millions of $/yr
Storage tanks[c]	All options	(e)	(e)	(e)	(c)
Totals	I II III IV	Not applicable	Not applicable	22.0 12.6 0 15.2	11.0 7.29 4.35 8.30

[a]Four of 35 plants have pickling capacities lower than 500,000 t/yr and would have lower model plant costs than indicated.
[b]Six of 19 plants have pickling capacities higher than 500,000 t/yr and would have higher model plant costs than indicated.
[c]All plants have capacities smaller than 500,000 t/yr.
[d]Four of 10 plants have capacities less than 10 million gal/yr and would have lower model plant costs than indicated.
[e]All storage tanks are assumed to be vented to pickling line or acid regeneration scrubbers.

CEMPIKL1

5/31/95

Type of Model	Type of Site
Extractive	Existing

Unit	Monitor Locations Before	After	Stack	Cost
CO Analyzer	0	0	0	10,000.00
CO2/O2 Analyzer	0	0	0	5,000.00
Flow Monitor	0	0	0	20,000.00
HCl Analyzer	0	0	1	15,000.00
NOx Analyzer	0	0	0	15,000.00
Opacity Monitor	0	0	0	20,000.00
SO2 Analyzer	0	0	0	10,000.00
# of Gas Monitors	0	1	1	
Total # of Monitors	0	0	1	

Sampling Lines After Control Unit 1
Sampling Lines Before Control Unit

Estimated First-Costs

	Labor	Test w/OH	Other Ctr	Total DCs	
Planning		4,000	0	600	4,600
Select Type of Equipment		10,400	0	100	10,500
Provide Support Facilities		0	0	13,100	13,100
Purchase CEMS		0	0	40,500	40,500
Install & Check CEMS		9,200	0	1,900	11,100
Performance Spec Tests		3,200	10,100	1,000	14,300
Prepare QA/QC Plan		2,400	8,800	600	11,800
Totals		29,200	18,900	57,800	105,900

Operation and Maintenance	8,400	0	100	8,500
Annual RATA*	2,000	7,700	300	10,000
Supplemental RATA*	1,900	7,300	300	9,500
Quarterly CGA's	2,400	0	1,100	3,500
Record Keeping & Reporting	11,400	0	200	11,600
Annual Review & Update	13,700	0	3,500	17,200
Totals	39,800	15,000	5,500	60,300

* NOTE: Relative Accuracy Test Audit

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CEMPIKL2

5/31/95

Type of Model	Type of Site
Extractive	Existing

Unit	Monitor Locations Before	After	Stack	Cost
CO Analyzer	0	0	0	10,000.00
CO2/O2 Analyzer	0	0	0	5,000.00
Flow Monitor	0	0	0	20,000.00
HCl Analyzer	0	0	216	15,000.00
NOx Analyzer	0	0	0	15,000.00
Opacity Monitor	0	0	0	20,000.00
SO2 Analyzer	0	0	0	10,000.00
# of Gas Monitors	0	216	216	
Total # of Monitors	0	0	216	

Sampling Lines After Control Unit 1
Sampling Lines Before Control Unit

Estimated First-Costs

	Labor w/OH	Labor Ctr	Test DCs	Other	Total
Planning	4,000		0	2,300	6,300
Select Type of Equipment	28,900		0	100	29,000
Provide Support Facilities	0		0	335,600	335,600
Purchase CEMS	0		0	4,448,000	4,448,000
Install & Check CEMS	345,500		0	6,800	352,300
Performance Spec Tests	45,400		131,700	15,500	192,600
Prepare QA/QC Plan	40,700		204,100	1,600	246,400
Totals	464,500		335,800	4,809,900	5,610,200

Operation and Maintenance	404,300	0	1,700	406,000
Annual RATA*	31,100	53,600	8,900	93,600
Supplemental RATA*	34,600	34,700	1,900	71,200
Quarterly CGA's	34,900	0	47,000	81,900
Record Keeping & Reporting	178,800	0	200	179,000
Annual Review & Update	75,400	0	3,760,600	3,836,000
Totals	759,100	88,300	3,820,300	4,667,700

* NOTE: Relative Accuracy Test Audit

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CEMPIKL3

5/31/95

Type of Model	Type of Site
Extractive	Existing

Unit	Monitor Locations Before	After	Stack	Cost
CO Analyzer	0	0	0	10,000.00
CO2/O2 Analyzer	0	0	0	5,000.00
Flow Monitor	0	0	0	20,000.00
HCl Analyzer	0	0	2	15,000.00
NOx Analyzer	0	0	0	15,000.00
Opacity Monitor	0	0	0	20,000.00
SO2 Analyzer	0	0	0	10,000.00
# of Gas Monitors	0	2	2	
Total # of Monitors	0	0	2	

Sampling Lines After Control Unit 1
Sampling Lines Before Control Unit

Estimated First-Costs

	Labor w/OH	Test Ctr	Other DCs	Total	
Planning		4,000	0	600	4,600
Select Type of Equipment		10,500	0	100	10,600
Provide Support Facilities		0	0	14,600	14,600
Purchase CEMS		0	0	61,000	61,000
Install & Check CEMS		10,700	0	2,000	12,700
Performance Spec Tests		3,400	10,700	1,100	15,200
Prepare QA/QC Plan		2,600	9,700	600	12,900
Totals		31,200	20,400	80,000	131,600

Operation and Maintenance	10,200	0	100	10,300
Annual RATA*	2,100	7,900	300	10,300
Supplemental RATA*	2,100	7,400	300	9,800
Quarterly CGA's	2,600	0	1,300	3,900
Record Keeping & Reporting	12,200	0	200	12,400
Annual Review & Update	13,900	0	4,900	18,800
Totals	43,100	15,300	7,100	65,500

* NOTE: Relative Accuracy Test Audit

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