Alternatives to MACT:
Chromium Air Emission Reduction Strategies

By Carol Huston, CEF

The Iowa Waste Reduction Center (IWRC), located at the University of Northern Iowa, Cedar Falls, Iowa, has been the site of recent trials to try to find practical ways for businesses involved in chromium plating to reduce chromium emissions and to comply with the chromium emission concentration limits proposed by the U. S. Environmental Protection Agency (EPA). The results of the early tests presented here indicate that practical, cost effective methods of complying with the new limits can be achieved.

The **IWRC provides technical assistance to small businesses** in the areas of waste management and pollution prevention. The IWRC has initiated a Program for Toxic Air Pollutant Studies (PTAPS) through a two-year grant from the U.S. Small Business Administration. The program is developing and testing practical, low-cost strategies for reducing toxic air emissions from small businesses. These strategies are specifically designed to use in meeting and exceeding requirements resulting from the Clean Air Act Amendments (CAAA), and save money in the process.

The air emission reduction strategies are developed and tested in a laboratory setting where bench-scale air samples can be taken. Following the bench-top sampling procedure, the strategy is set up at an applied research facility where equipment is operating. Samples are taken numerous times to provide sufficient data on the effectiveness of the emission reduction strategy. The purpose of using fully operational equipment is to completely simulate standard operating conditions commonly found in an industrial setting. This type of applied research approach allows the strategies to be tested and developed quickly and facilitates the collection of data. Once a strategy has been successfully applied at the intermediate level, small businesses are asked to participate in on-site implementation. On-site implementation involves sampling of emissions during practical use of the emission reduction strategies at selected facilities.

In June 1993, a baffle system was designed for insertion into the exhaust duct where the duct attaches to the plating bath ventilation slots. The baffle system was constructed of three plexiglas sheets, each 0.5 cm (0.20 in.) thick. The plexiglass sheets were spaced 0.7 cm (0.28 in.) apart by using tubing as a spacer. The sheets had 0.6 cm (0.24 in.) diameter holes drilled in them at a distance of approximately 1 cm (0.39 in.) apart from one another. The top and bottom sheets had identical hole placement, while the middle sheet had holes that were offset from the other two, thereby creating a baffle. The baffle had a 22 percent open area. The baffle system was bolted together to facilitate the addition of more sheets for future testing.

Samples were taken without the baffle in place to establish a baseline of chromium emissions during bath operation. Following collection of the baseline samples, the baffle was installed and additional samples were taken. Finally, one layer of polypropylene balls was added to the bath to reduce the amount of chromium emissions to be trapped by the baffle. Analytical results are shown in Tables 1, 2, and 3. Table 1 are data resulting from sampling with no reduction technology, showing an average concentration of 297 mg/m^3. Table 2 pre-

Table 1
Chromium Emission Concentration
Baseline

Trial	Chromium Concentration, gm/m^3
1	316
2	291
3	290
4	276
5	348
6	314
7	290
8	298
9	280
10	268
Average	297

Table 2
Chromium Emission Concentration
Baffle System

Trial	Chromium Concentration, mg/m^3
1	111
2	70
3	35
4	33
5	30
6	111
7	103
8	77
9	82
Average	72

Table 3
Chromium Emission Concentration
Baffle System
With Polypropylene Balls

Trial	Chromium Concentration, mg/m^3
1	23
2	21
3	16
4	16
5	10
6	21
7	31
8	26
9	27
Average	21

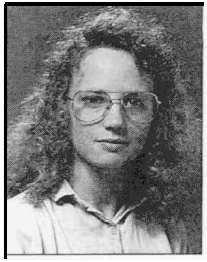
sents the data from sampling with only the baffle system in place and shows an average concentration of 72 mg/m^3. Data from samples taken with the solid polypropylene balls and baffle concurrently in use are presented in Table 3, showing an average concentration of 21 mg/m^3.

Initial review of the data indicates a 76 percent chromium emission reduction with use of the baffle system. When the baffle system is used concurrently with polypropylene balls, a 93 percent emission reduction can be achieved. Based on data provided by industrial facilities performing chromium plating, a 93 percent reduction will bring many platers within compliance of the proposed chromium emission concentration limit specified by the EPA.

Stack testing of these two strategies are now being conducted at the intermediate level. These tests are being performed at the IWRC's applied research facility using a fully equipped, operational, 500-gallon plating tank. The IWRC anticipates effective chromium emission reduction at the intermediate level, using these two strategies separately and concurrently. Two industrial sites have already been identified for final implementation in a "real world" setting. Field testing is expected to start in two to three months. Information regarding the effectiveness of the strategies will be made available as soon as possible following project completion.

For additional information on the Chromium Emission Reduction Project, please contact Carol Huston, IWRC, at 319/273-2079. Ž

About the Author



Carol Huston, CEF, is a waste reduction specialist with the Iowa Waste Reduction Center at the University of Northern Iowa, 75 Biology Research Complex, Cedar Falls, IA 50614-0185. She has a degree in chemistry from Iowa State University and has been working in hazardous waste management since 1982. Prior to joining the IWRC, she worked as a chemical aide for an international electronics manufacturer, assisting production and engineering staff in maintaining electroplating operations and ensuring environmental compliance at the Ames facility. As a chemistry student, she worked at ISU's hazardous waste management facility, performing chemical treatment and disposal and compiling EPA reports. Huston joined IWRC in July 1990 to provide on-site technical assistance to small businesses. She coordinates applied research on chromium electroplating emission reduction and is managing training programs for transportation maintenance facilities.