Advice & Counsel

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EPA Official Responds to MP&M Column

Dear Advice and Counsel:

I have read your recent “Advice and Counsel” column entitled “Q&A on the Metal Products and Machinery Regs” in the September, 1995 issue of *Plating and Surface Finishing.* As the Work Assignment Manager for the technical portion of the Metal Products & Machinery (MP&M) Phase I Project, I wish to clear up several misconceptions brought out in your column. Wherever possible, I have referenced the Development Document for the Proposed Effluent Limitations Guidelines and Standards for the Metal Products and Machinery Phase I Point Source Category (EPA 821-R-95-021, April 1995) which is available through the National Technical Information Service (NTIS). Specifically, I am responding to the five question/answer issues described below.

Issue #1

Question: We are using those technologies now and are having a hard time meeting 433 standards. How can EPA say this technology will meet numerical standards that are 10 to 50 times lower?

EPA Response: The data used to calculate the effluent standards are from actual MP&M sites at which EPA conducted sampling episodes. These sites have well-operated chemical precipitation and sedimentation systems in place (or alkaline chlorination for treatment of cyanide). These data are presented in Table 11-1 (page 11-3) of the referenced Development Document. The criteria for being considered “well-operated” are also presented in Section 11.

Issue #2

Question: Can alkaline chlorination be fine-tuned to meet 0.02 mg/L limits?

EPA Response: Again, the data used to calculate this effluent standard are from real MP&M sites with well-operated alkaline chlorination systems. Three-quarters of the systems sampled were able to consistently reduce the concentration of cyanide to 0.02 mg/L or less. Cyanide concentrations were measured using EPA method 335.2 for total cyanide. The detection limit for this method ranged from 0.01-0.02 mg/L. These data are presented in Section 11 of the referenced Development Document.

Question. If my alkaline chlorination system cannot meet 0.02 mg/L, how were the companies that EPA used to establish the regulations able to meet these numbers?

EPA Response: The limits for cyanide are based on data from samples collected immediately following alkaline chlorination as performed at actual MP&M sites prior to commingling with any non-cyanide wastewater (i.e., without “dilution”). The locations of the sampling points are found in the individual sampling episode reports that are contained in Section 5.2.1 of the administrative record. Monitoring for cyanide shall be performed at the effluent from the cyanide destruction unit prior to combination with other streams, as stated in the Section 438.12(a) of the proposed MP&M Phase I Regulation.

Issue #4

Question: The proposed regulations assume that I can recycle my cutting fluids continuously through sterilization (pasteurization). Is this true?

EPA Response: The proposed regulations are based on centrifugation and pasteurization to extend the life of the machining coolant by a factor of five; achieving an 80% reduction in discharge volume from this operation. This is explained on page 10-5 of the Development Document referenced above. Extension of the usable life of water-soluble machining coolants was observed at several MP&M sites and documented in surveys received by EPA from MP&M sites. In some cases, zero discharge of water-soluble machining coolant through centrifugation was also observed; however, the Agency did not base the regulation on zero discharge of machining coolants because of the concerns noted in your column.

Issue #5

Question: What would it take to meet these numbers, and what would it cost?

EPA Response: Again, the data used to calculate the effluent standards are from actual MP&M sites at which EPA conducted sampling episodes. These sites have well-operated chemical precipitation and sedimentation systems in place (or alkaline chlorination for treatment of cyanide). The Agency estimated the costs for the treatment option selected and this, together with the pollutant reduction estimates, provided a basis for evaluating the options. EPA did examine a treatment option that contained advanced end-of-pipe treatment technologies, such as ion exchange and reverse osmosis. This option was rejected because of the large economic impact that would be placed on the industry. For the option selected, the estimated costs for indirect dischargers to upgrade their treatment systems in order to comply with the proposed limits is approximately $337 million dollars in capital costs and $145 million in operating, maintenance, and monitoring costs (both are in 1989 dollars). The estimated costs for direct dischargers are approximately $59 million dollars in capital costs and $13.1 million dollars in operating, maintenance, and monitoring costs (both are in 1989 dollars). The Agency estimates 1,837 direct dischargers and 1, 792 indirect dischargers (out of an estimated 8,706 facilities) will be affected by the proposed regulation.

I hope my input has clarified some of the issues presented in your column and cleared up any misconceptions. I trust that you will update your readers with this information. Please feel free to contact me at (202) 260-9817 with any questions on these issues or for review of any planned columns regarding the proposed MP&M regulation.

Sincerely,
Steven P. Geil,
Chemical Engineer
MP&M Work Assignment Manager

Dear Mr. Geil,

Thank you for the time you took to help clarify the issues, but some significant questions remain and your responses to some of the issues raised by the reader do not match information we have at hand:

1. EPA based the 40CFR part 433 effluent standards on the same technologies that are now being touted to meet these proposed Metal Products & Machinery Effluent Standards. In setting the Metal Finishing Standards, EPA studied and sampled many more facilities and analyzed many more samples than for MP&M. On what basis can EPA now say that facilities that have used this technology and have just barely been able to meet metal finishing regulations, can now use the same technology to meet discharge limits that are 10 to 50 times lower in concentration? The answer that facilities need to be "better operated" is inadequate, because most all of these facilities are well-operated. Further, you indicate that the effluent standards for MP&M are based on actual MP&M sites at which EPA conducted sampling episodes. There is a big difference between "Joe's Radiator Repair Shop" and a large captive manufacturer. The mix of facilities you used to determine what MP&M sites could achieve was woefully deficient in facilities that do electroplating.

2. If three-quarters of your well-operated MP&M facilities were truly able to consistently meet 0.02 ppm of total cyanide and if this truly was at the point of treatment, then the only response I can give is that these MP&M sites bear absolutely no resemblance to a typical metal finishing facility using cyanide solutions to do electroplating on steel parts. It is very well known in the industry that iron-cyanide complexes are not subject to destruction by alkaline chlorination, and no amount of "well operation" can destroy them or prevent them from being formed in the first place.

I refer you to your agency's own document, EPA 440/1-83/091, Development Document for Effluent Limitations Guidelines and Standards for the Metal Finishing Point Source Category. EPA sampled 30 facilities and analyzed 90 samples for cyanide amenable to chlorination. Of those 90 samples, 83 contained *cyanide amenable to chlorination* above 0.02 ppm after dilution with non-cyanide waste streams, yielding dilution factors ranging from 1 to 19.9!

Table 7-55 of the same document provides 15 sites and 47 samples that were used to set total cyanide standards. Only data from "well-operated facilities" was used by EPA. Of these 47 samples from "well-operated facilities," 43 exceeded the proposed 0.02 ppm MP&M total cyanide standard. EPA reported a mean effluent concentration of 0.18 ppm total cyanide with a variability factor of 6.68 daily and 3.61 10-day, yielding standards of 1.2 and 0.65 ppm as the achievable discharge concentration for total cyanide.

The opinion that 0.02 ppm total cyanide cannot be achieved at the point of treatment using alkaline chlorination on cyanide wastewater containing iron-cyanide complexes is not mine alone. I have yet to meet an engineer or system designer who disagrees with this statement. ASTM "Standard Methods for the Examination of Water and Wastewater" states: "Iron cyanides, because they do not dissociate to any degree, are not oxidized by chlorination."

In calculating MP&M effluent limitations for cyanide, EPA attempted to combine completely incompatible data bases. Of the three facilities used to set effluent limitations, two showed non-detectable levels of cyanide after treatment, while the third facility showed significant levels. These data are consistent with data from two facilities with wastewater containing cyanide amenable to chlorination and one facility with wastewater containing complexed (iron) cyanide. These facilities are not achieving equivalent effluent concentrations; therefore, the database should not be used to set effluent guidelines. The data base for the Metal Finishing Standards is far more extensive and representative of the real world.

In Chicago, we have a POTW plant that treats an average daily flow of 1,500,000 gal of wastewater. This plant does not treat water from any categorically regulated industry. Yet the influent to this plant contains up to 0.02 ppm of total cyanide, indicating that this is clearly the limit of detection, or background level for cyanide in wastewater. Any lower detection limits were probably achieved with pure water.

To illustrate our point further, a Wisconsin jobshop plater has gone far beyond alkaline chlorination for destruction of cyanide. A schematic of the system used by this plater is provided. This plater has systematically eliminated all unnecessary cyanide processes, including elimination of cyanide from cleaners, copper plating, and brass plating. A total reduction of cyanide usage of almost 76 percent was achieved between 1990 and the present. The remaining cyanide-based process used by this plater is silver plating. For this process, this facility has installed a drag-out rinse after plating, equipped with an electrolytic recovery cell. Following the drag-out rinse is a DI water rinse that is routed to an ion exchange system. The discharge from the ion exchange system is routed to a two-stage alkaline chlorination system, followed by sedimentation. At the end of this entire train of treatment and after commingling with non-cyanide wastewater, the discharge contains an average of 0.05 ppm based on self-compliance monitoring during 1995! From January of 1994 until the present, this plater has determined cyanide levels ranging from none detected to 0.3 mg/L.

3. I did not misrepresent or misunderstand what I was told by an EPA representative at a Common Sense Initiative (CSI) sub-committee meeting. That official told me that the low levels of cyanide found at facilities evaluated by EPA were "end of pipe." Others were present at this same meeting and heard the same comment.

4. EPA Method 335.2 for total cyanide states in para 1.1.3: "The colorimetric procedure is used for concentrations below 1 mg/L of cyanide and is sensitive to about 0.02 mg/L."

Because EPA proposes to set the 30-day average at 0.02 mg/L, a company would have to obtain numerous analytical results far below 0.02 to obtain an average of 0.02. To illustrate, if a company takes six samples for compliance monitoring, and one sample is 0.03mg/L (in compliance with the one-day-maximum), if the remaining five samples are in compliance at a level of 0.02 mg/L, the 30-day average calculates out to 0.022 and a violation has occurred, even though the company was in compliance with all daily maximums. The remaining five samples would need to average less than 0.02 mg/L (approximately 0.018 mg/L) to

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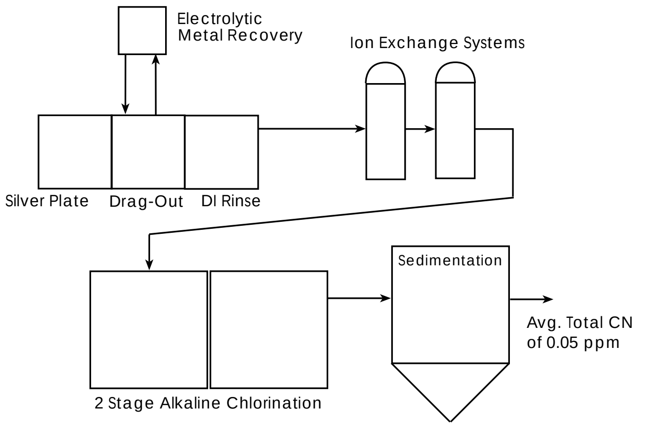
achieve the maximum monthly allowable concentration. Of course, "well-operated" facilities would not want to be just at the maximum allowable, so they would want to shoot for a monthly average of, say, 0.01 mg/L. To achieve a monthly average of 0.01 mg/L, after one sample read 0.03 mg/L, the remaining five samples would need to average 0.006 mg/L, which is even below the detection limit that you indicate is possible with this procedure.

5. Your estimated costs for indirect dischargers to upgrade their treatment systems in order to comply with the proposed MP&M standards, of 337 million dollars calculates out to almost $200,000 per facility. This average cost is not realistic because:

a. It does not take into account major costs involved in discontinuation of cyanide-based processes because of inability to treat to the proposed limitations.
b. It does not take into account major costs involved in installing systems that go beyond alkaline chlorination to treat complexed cyanides to the proposed standards (assuming there is technology to achieve this).
c. EPA's determination of the capital cost for compliance with the flow reduction requirements of the MP&M regulations is significantly underestimated.
d. The need for additional building space to contain the required equipment is not included in the EPA capital cost estimates (reference pages 12-7 and Table 124). Most, if not all, of the equipment recommended by EPA would need to be installed inside a building.
e. It is not clear whether electrical/instrumentation costs have been included in the direct capital costs (e.g., costs for motor starters, wiring, conduit, pH controllers, ORP controllers). Furthermore, the treatment technologies described by the regulations typically include only one pump for wastewater, chemical, or solids transfer; industry practice, however, demands a spare installed pump.
f. Many of the equipment requirements for the proposed treatment systems were overlooked in the EPA cost estimates. The use of alum for oil breaking typically requires pH control, because alum is least soluble at a pH near 7. No mention is made of chemical feed systems or instrumentation that would enable pH control to be maintained.

Advanced Cyanide Destruct System Used by Midwest Plater



The proposed pretreatment system for chelated metals assumes a constant pH of 8 and a constant dosage of sodium borohydride. The actual pH and dosage of borohydride will be a function of the metal that is chelated. In addition, the use of sodium borohydride may result in the need to install boron treatment, because it is not removed using conventional hydroxide precipitation and is often locally regulated. Costs for this equipment are not included in the estimates. The proposed chemical precipitation and sedimentation technology does not include a pH control system to regulate the feed of lime. The precipitation and removal of metals is directly related to the system's ability to control the pH at the desired set point. Also, the proposed system only provides 5 minutes of mix time for lime neutralization, when 30 minutes of reaction time (a bigger reaction tank at higher cost) is needed to properly mix lime to adequately control the pH set point. The use of ion exchange (either end-of-pipe of in-process) generally requires pre-filtration to remove suspended solids that can blind the exchange resin. No mention of filtration is made in the technology description for ion exchange (p. 12-31), nor are the costs included.

Vendor cost quotations and actual project costs were reviewed in an effort to evaluate the equations used by EPA to develop the cost impact of the MP&M Effluent Guidelines. The costs predicted by EPA's MP&M Design and Cost Model were compared to actual equipment pricing for many of the equations.

In general, the EPA-calculated MP&M costs were significantly lower than actual vendor quotations:

- **Agitators**—A comparison of the actual vendor agitator costs and the EPA-calculated MP&M costs indicates that EPA is low by a factor of 3–6.
- **Lamella Plate Separators**—Vendor quotes indicate that EPA-estimated costs are low by a factor of 6.
- **Filter Presses**—A comparison indicates that EPA estimates are low by a factor of 2–3.
- **Sulfuric Acid Feed System**—The vendor-quoted cost is 2-3 times higher than EPA calculated costs.
- **Caustic Soda Feed System**—The vendor-quoted cost indicates that EPA projections are low by a factor of 2.
- **Wastewater Pumps**—A comparison indicates that EPA-estimated costs are low by a factor range of 2 to 3.

I appreciate this opportunity to discuss a few of the MP&M issues with EPA. It would have been more productive if these discussions had taken place *before* an unreasonable regulation was proposed.

AESF made formal comments on the proposed MP&M Guidelines, in conjunction with the National Association of Metal Finishers (NAMF) and Metal Finishing Suppliers Association (MFSA) through efforts coordinated by the joint industry Government Advisory Committee (GAC), before the comment period ended on October 27. Copies are available from Bill Sonntag (Phone: 202/965-5190; FAX: 202/338-5950).

Although the comment period is closed, EPA has encouraged industry members to continue to make comments concerning the impact of MP&M Guidelines on the industry. o

Note: The author credits Chester Engineers for the data/information cited on economic issues, and some of the response on the cyanide issue in this article.