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Who's Meeting The MP&M Limits?

Last month, we examined how the EPA derived the Metal Product and Machinery (MP&M) limits for jobshops and the implications of their methodology. This month, we investigate the ability of the Strategic Goals Program (SGP) participating companies to meet the proposed MP&M limitations for jobshops. The analysis shows that no jobshops operating with normal practices are able to meet the proposed limits. A small percentage of facilities appear to be able to meet the proposed limits; however, these jobshops have limited production capability (*e.g.*, only aluminum finishing), or they operate extraordinary recovery or waste treatment processes. (For more information about the MP&M proposed regulations, visit www.nmfrc.org.)

Table 1—23 SGP Companies that Met Proposed MP&M Limits in Year 2000

#	Facility Information*	Discharge gal/yr	Sludge gen, lb/yr	Average Concentration in Discharge, mg/L Cd	Cr	Cu	CN	Pb	Ni	Ag	Zn
1	This facility processes aluminum substrates (anodizing, conversion coating). Cr is present in dichromate seal and chromate conversion coating. Cr rinses are in a counterflow configuration and concentrated rinse is used for evaporative make-up in the process tank. Atmospheric evaporators are also used to recover Cr rinse water. No chromium is discharged to the WWT system. The WWT system is a conventional chemical precipitation system.	17,526,705	446,180	0	.152	0.05	0	0	.212	0	0
2	This facility operates a range of metal finishing processes. Treatment system is designed for 100 gpm. Actual flow is 10 to 12 gpm. Facility attributes good WWT performance to long retention time.	3,089,893	21,400	.025	.094	.024	.003	.0003	.088	.003	0.04
3	This facility performs tin, lead and tin-lead plating on copper substrates. Treatment consists of conventional precipitation plus use of DTC, plus sand filtration and microfiltration. Local limits are very stringent (monthly average standards, Cu = 0.13, Pb = 0.05).	2,310,000	29,496					.014			
4	This facility operates a range of metal finishing processes. Current discharge is less than 1,000 gpd. Wastewater is discharged in batches (not everyday). Facility had direct discharge prior to 1986; indirect since 1986. WWT consists of IX plus batch treatment of regenerant.	230,256	41,100	0	0	.06		0		0	.08
5	This facility mostly performs precious metals plating. Also operates copper strike, copper plate and nickel plate. Copper plate process is closed-loop (electrowinning). Nickel plate process is closed-loop (IX). WWT consists of pH adjust, carbon bed, and IX. Facility uses a large quantity of water (>5 gal/$sales). Conventional CN destruct system, plus hypochlorite is pumped into trench after CN treatment as a precautionary measure. No sludge is produced by facility (liquid wastes, such as regenerant are hauled to treatment/recovery).	27,182,291	0	0	0	0.203	0.019	0	0.16	0	0.017
6	This facility is a decorative chromium shop. Ion exchange units process all rinse water containing metals. The IX units are sent off-site for regeneration. No other treatment is present on-site.	5,440,000	12,800	0.006	0.063	0.169	0.01	0.064	0.278	0.026	0.099
7	This facility performs reel to reel plating (mostly Ag, Ni, Au, and some Sn-Pb). Conventional waste treatment system is 30 years old and has been updated within the past 8 years. Water use has been significantly reduced by equipment changes (new plating units, new spay nozzles). Present wastewater volume is significantly lower than design flow of old system.	5,242,061	58,906	0.002	0.004	0.087	0.009	0.009	0.095	0.029	0.029
8	This facility performs sulfuric acid anodizing and a small volume of chem film. A clarifier is present, but very little sludge is generated. Sludge is removed from clarifier every 5 years. Zero sludge generation reported for 2000. Very high water use (7 gal/$ sales).	4,392,256	0	0.01	0.2	0.07	0.03	0.05	0.02	0.01	0.09
9	This facility performs anodizing (93% sulfuric and 7% chromic). Conventional treatment system is used which has a design capacity of 10,000 gpd. Extensive effort was made to reduce water use. Yr. 2000 flow rate was 5,000 gpd.	1,271,532	20,000		0.163	0	0.014	0			

The MP&M jobshops standards proposed by EPA cover 10 metals (Cd, Cu, Cr, Pb, Mn, Mo, Ni, Ag, Sn, Zn), plus other parameters. The standards are based on the measured performance of actual treatment systems (referred to as option 2) that use:

> a hydroxide precipitation, sedimentation treatment process, and
> some pollution prevention.

The hydroxide precipitation, sedimentation treatment process is also commonly referred to as "conventional treatment." One would expect that most well-operated metal finishing shops would have little or no problem meeting standards that are based on this technology. Due to the methodology employed by EPA for deriving MP&M limits, however, only a small percentage of metal finishing companies would be in full compliance with MP&M if those limits were in place today. As explained in last month's column, "How Did MP&M Come About?" finishers with more than one regulated metal present in their wastewater, and especially certain combinations of metals, are going to have difficulties meeting the proposed limits. Unfortunately, most jobshops fall into these two categories.

This article further examines the problem of complying with MP&M limits by analyzing data from participating SGP companies that submit data to the NMFRC annually on worksheets, so that their progress toward the seven SGP "goals" can be tracked. The data submitted by participants include, among other data, annual average concentration of regulated metals and cyanide in their wastewater discharge. These values are comparable to the long-term averages calculated by EPA when deriving the MP&M limits.

This analysis uses data from all SGP participants that submitted wastewater discharge data (Cd, Cu, Cr, CN, Ni, Pb, Ag, Zn) for calendar year 2000. The number of companies in this analysis is 196.

Why Most Don't Meet Limits

As explained in last month's column, EPA derived long-term average (LTA) values from jobshop monitoring data and used these numbers to generate the MP&M limits. Essentially, a company must meet LTAs if they expect to consistently comply with the standards. Comparing the annual effluent averages of SGP companies to the MP&M LTAs produces some rather startling results. Only 23 of the 196 SGP participants (12%) used in the analysis[1] would have been in full compliance during 2000!

The obvious inability of SGP companies to meet MP&M limits is due, in part, to the multiple metal effects identified in last month's column. Metal finishing compa-

Table 1—23 SGP Companies that Met Proposed MP&M Limits in Year 2000 (cont.)

#	Facility Information*	Discharge gal/yr	Sludge gen, lb/yr	Average Concentration in Discharge, mg/L Cd	Cr	Cu	CN	Pb	Ni	Ag	Zn
10	Small plating operation ($154K in 2000) used 2-3 days per week. Plating processes include silver, gold and tin plating. No tin effluent data available. Low sludge generation rate (123 lbs. in 2000).	262,800	123	0.01	0.01	0.08	0.02	0.07	0.02	0.03	0.06
11	This facility reprocesses used printing rolls. Metal finishing processes include grinding, polishing, and Cu, Ni, and Cr plating. Facility is able to do most of the rinsing over the plating tanks, which reduces drag-out losses. This facility employs a conventional wastewater treatment system designed for 10,000 gpd. Current flow rate is 4,500 gpd.	1,160,000	11,000	0.001	0	0.122	0.05	0.02	0.098	0	0.022
12	This facility refurbishes steel rollers. Plating processes (chromium and copper) do not generate any wastewater. Wastewater is from grinding operation. No wastewater treatment present and no sludge generated.	578,741	0	0.005		0.138	0.02	0.019	0.01		0.039
13	This one-man operation did $150K in 2000. 98% of workload is sulfuric acid anodizing; wastewater treated in limestone pit. No sludge generated.	171,292	0	0.004		0.08	0.04	0.01	0.14		0.08
14	This facility performs a range of metal finishing processes including sulfuric acid anodizing (20-25% of workload), copper, nickel and tin plating. Conventional WWT employed, plus spun polypropylene filter (1 micron) used for polishing effluent.	1,032,900	87,800	0.006	0.059	0.284	0.01	0.01	0.103	0.01	0.063
15	This facility is an auto bumper recycler. They operate nickel and chrome electroplating processes. They have a conventional treatment system that is operated at 60% of hydraulic capacity.	4,185,300	23,653	0.01	0.06	0.04	0.01	0.03	0.22	0.01	0.03
16	Metal finishing workload consists mostly of sulfuric acid anodizing and electroless nickel plating. Gold plating and conversion coating performed. Drag-out tanks are pumped out and liquid is sent off-site for treatment/recovery. Low sludge generation rate (450 lb in 2000).	3,316,000	450	0.0002	0.012	0.086	0.012	0.004	0.1345	0.001	0.082
17	No electroplating processes present at this facility. Metal finishing processes consist of parts washers, iron phosphating and painting. No wastewater treatment is present.	38,552	1,600	0.005	0.01	0.031	0.012	0.005	0.02	0.01	0.035
18	Limited number of processes performed (sulfuric acid anodizing: 60%; chromic acid anodizing: 40%). Some metal bearing rinses are processed through IX and the water is reused for rinsing. IX units are regenerated off-site. A conventional WWT system processes wastewater prior to discharge. WWT system was recently upgraded with new equipment.	901,809	79,500	0.011	0	0		0	0	0	0
19	This facility performs copper, tin, nickel and precious metal plating. Facility has installed extensive recycling system. Metals are captured in carbon canisters, which are sent off-site for recovery. Chemical precipitation system (using DTC) is operated only once per week to process wastewaters that cannot be recycled.	47,075,000	25,540	0.002	0.029	0.294	0.000	0.013	0.080	0.009	0.047
20	Unable to contact. No sludge generated.	1,749,572	0	0.01	0.03	0.018	0.01	0.008	0.086	0.01	0.079
21	Unable to contact.	1,297,140	372,530								0.05
22	Unable to contact.	12,250,000	68,200	0.02	0.04	.169	.015	.005	.178	.001	0.109
23	Unable to contact.	40,505,500	114,640	0	.028	.004	0	0	.014	0	.036

*Facility information collected through telephone interviews

nies are able to lower the discharge concentration of one or more metals, but are unable to lower the concentrations of all regulated metals simultaneously to the level of MP&M LTAs. Because compliance means meeting *all the limits, all the time*, most SGP companies fail the test.

It is also important to note that, in addition to parameters covered by SGP data, MP&M limits were also proposed for manganese, molybdenum, tin, and sulfide. These parameters are not regulated under existing electroplating or metal finishing standards and, therefore, SGP participants do not monitor for them. Some of the 23 participants who met the limits for the eight SGP parameters may not have met the limits for these other parameters.

Table 2—Summary of Potential Explanations for MP&M Compliance

#	All or mostly aluminum processing	Limited # and/or concentration of regulated metals in raw wastewater	Advanced recovery employed	Advanced EOP treatment employed	Excess EOP treatment capacity	Low-volume discharger and/or batch treatment	May exceed tin limit	Relies on off-site treatment
1	X	X	X					
2					X			
3				X			X	
4						X		
5		X	X	X				X
6		X		X				X
7					X		X	
8	X	X						
9	X	X			X			
10		X				X	X	
11					X	X		
12		X						
13	X	X				X		
14				X			X	
15		X			X			
16	X	X						X
17		X						

It is also important to note that SGP companies are average environmental performers when compared to the rest of the metal finishing industry—neither much better than, nor much worse than the industry average. This fact was discovered during a benchmarking study performed in 1998.[2] That study concluded that SGP companies were not statistically different from the remainder of the industry, with regard to factors such as volume of water discharged and sludge generation. That's not to say that SGP companies are not making environmental strides. Actually, just the opposite is true. SGP companies have reduced their production of normalized wastewater discharges by 40 percent, and the amount of metal discharged by 67 percent over their baseline. But the rest of the industry appears to be improving, as well.

How the Few Do It

One question remains. Who are the 12 percent of SGP participants that *did* meet MP&M limits in 2000? To find out more about these 23 companies, telephone interviews were conducted by the NMFRC. All but three of these companies were reached. A summary of information from those interviews and selected SGP data are presented in Table 1. The company numbers shown in column 1 were arbitrarily selected and are not related to SGP code numbers. Table 2 lists potential explanations for why some SGP companies were able to comply with proposed MP&M limits in 2000. Each of these explanations is discussed below.

All or Primarily Aluminum Processing. Companies primarily engaged in aluminum processing, such as sulfuric acid anodizing will typically have a low concentration of regulated metal in their raw wastewater. Operations that are solely sulfuric acid anodizing are covered under a separate MP&M subcategory (non-chromium anodizing category) from jobshops. None of the 19 SGP facilities contacted fall into the non-chromium anodizing category. For several of the facilities, however, sulfuric acid anodizing makes up more than 50 percent of their workload.

Limited Number and/or Concentration of Regulated Metals in Raw Wastewater. Some companies perform a limited number of plating processes and, as a result, have only a few metal parameters to consider during treatment. This reduces the complexity of the treatment process and can result in lower discharge concentrations.

Advanced Recovery Employed. Some companies employ an advanced technology for recovery of chemicals, which may eliminate or reduce the concentration of metals in the raw wastewater. Advance recovery is only applicable to certain metal finishing processes, and is cost effective in even fewer cases. Examples of metal finishing processes that are less amenable to advanced recovery include: electroless nickel, tin, and zinc plating; conversion coating, cleaning, and etching.

Advanced EOP Treatment Employed. Some companies employ advanced end-of-pipe treatment processes beyond those selected by EPA as the basis of the MP&M jobshop standards. Advanced technologies are sometimes installed to meet local standards that are more stringent than existing national effluent guidelines. Local standards may be set at stringent levels to overcome a deficiency at the POTW.

Excess EOP Treatment Capacity. Some treatment systems were designed and built at a significantly higher hydraulic capacity than the current flow rate. This increases the retention time beyond normal design criteria and may result in improved metal removal. In most cases, very high retention times are not practical or affordable.

Low-volume Discharger and/or Batch Treatment. Small plating operations often employ manually operated batch treatment systems. These systems are impractical for larger operations, but are easier to control than continuous flow systems. Also, wastewater from batch systems can be tested prior to discharge, to help prevent discharges of inadequately treated wastewater.

May Exceed Tin Limit. Tin was not considered in this analysis because it is not regulated under existing electroplating or metal finishing standards, and therefore, SGP participants do not monitor for it. Companies that use tin in their processes may have difficulty meeting the proposed MP&M limit. Other parameters that were not considered in this analysis are manganese, molybdenum, and sulfide.

Relies on Off-site Treatment. Some companies employ a treatment strategy that relies on off-site facilities to process liquid wastes or ion exchange resins. Off-site treatment is a good option for companies located within a reasonable trucking distance to permitted facilities, but it is not available to all metal finishers.

As indicated here, at least one of these explanations is applicable to each of the 19 companies contacted and, for approximately half of the companies, three or more explanations apply. So although 12 percent of the SGP participants are able to meet the proposed MP&M limits, it is always accomplished within some extenuating circumstances, and outside the normal operating practices of jobshops.

[1] *Data were used from all SGP participants that submitted worksheets by 6/10/01 containing discharge data and were not zero-discharge facilities.*

[2] *National Center for Manufacturing Sciences, "Benchmarking Metal Finishing,"* NCMS Report 0076RE00*, June 2000.*