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# 1. DESCRIPTION OF FACILITY, PRODUCTION, AND OPERATION

## *1.1. General description*

Valley Plating, Inc. is a mil spec approved electroplating facility providing services to the aircraft and aerospace industry. The company also provides types 1, 2 and 3 anodize in a segregated portion of the facility. The facility is located on the corner of Albany and Amber Streets. The area of the facility in which the electroplating operations are conducted totals 6000 sq. ft. which includes 6 plating lines. The area of the facility where anodize operations are conducted totals approx. 13,000 sq. ft., which includes two process lines. The area of the entire facility is 45,000 square feet, which includes support departments, shipping / receiving, office space, wastewater treatment, cafeteria, etc.

All exterior walls are of brick or poured concrete. The flooring throughout the facility is all 8" to 10" poured concrete. There are no floor drains within the facility that would allow spills or liquid from cleanup activities to leave the building untreated.

## *1.2. Process lines*

The size and overall capacity of the process lines remains somewhat constant in the plating facility, since almost all of the manufacturing space is being utilized. Production levels are somewhat constant but do fluctuate from time to time due to market trends and customer production requirements. Typically, production levels increase the second half of the month. Therefore, the daily production flow discharged from the facility is in direct proportion to the level of production being processed on the process lines. All information in this report is based on empirical operating data.

The facility operates two extended production shifts per day, five to six days a week; usually totaling 17 production hours per day. There are at present about 90 full time employees at Valley Plating, Inc., consisting of about 70 first shift employees and about 20 second shift employees.

## *1.3. Raw materials*

Valley Plating, Inc. uses at least 50 different raw materials consisting of both proprietary and nonproprietary chemicals. Many of them, however, are redundant and contain the same listed chemical ingredients. The following is a generic listing of the chemicals used in the aqueous process solutions for the electroplating and anodizing operations.

BASIC PROCESS CHEMICAL LISTING:

| | |
|---|---|
| Ammonium Hydroxide | Phosphoric Acid |
| Ammonium Nitrate | Potassium Hydroxide |
| Ammonium Biflouride | Potassium Cyanide |
| Boric Acid | Potassium Silver Cyanide |
| Cadmium Compounds | Sodium Cyanide |
| Chromium Compounds | Sodium Dichromate |
| Copper Compounds | Sodium Hydroxide |
| Copper Cyanide | Sodium Hypochlorite 15% |
| Hydrochloric Acid | Sodium Metabisulfite |
| Nickel Compounds | Sulfuric Acid |
| Nitric Acid | Tin Compounds |

### *1.4. Wet process lines*

There are six wet process lines within the plating department, each designed to provide specific metal finishes. A brief description of these lines are as follows:

- Line # 1 - Passivation of stainless steel, bright Tin, Sulfamate Nickel, & Black Oxide on CRS.
- Line # 2 - Sulfamate Nickel, Cadmium
- Line # 3 - Cadmium (4 Plating Baths)
- Line # 4 - Cadmium (3 Plating Baths)
- Line # 5 - Cyanide Copper & Cyanide Silver
- Line # 6 - Cyanide Copper, Cyanide Metal Strip, Manganese Phosphate

There are two main wet process lines within the anodizing department, each designed to provide specific metal finishes. A brief description of these lines are as follows:

- Line # A1 - Type II Anodize
- Line # A2 - Chem-film on aluminum, Types I and III Anodize

The above process lines consists of actual plating and anodize tanks along with a series of pre & post treatment solutions applicable to that particular process which generally consists of:

- Soak & Electrolytic Alkaline Cleaners
- Acid Activators
- Alkaline Cyanide Descalers
- Acidic Electrolytic Strike Solutions
- Alkaline Cyanide Strike Solutions
- Post Chromating Solutions

### *1.5. Process water*

Incoming process water is purchased from the City of Springfield public water supply. A continuous flow of clean water to the rinse tanks is used and is essential to maintain the high quality standards required for the products. Any product staining due to unclean contaminated rinse waters are grounds for rejection. Although "counter-flow" reuse of rinse baths in series is a practice used as much as possible, the final rinse must be clean water. Each rinse tank utilized a flow restrictive device for water conservation purposes.

### *1.6. Sanitary wastewater discharge*

One 4" buried sanitary discharge line is located approximately 5 ft. east of the building shipping entrance which connects to the sewer system located in Albany Street. (See appended site plan.) The average daily discharge of sanitary sewage is estimated at approx 1000 gallons. This flow is based on an average employee base of 90; @ 11 GPD per capita.

### *1.7. Pretreated process wastewater discharges*

One 6" final (pretreated) effluent discharge exits the northwest corner of the Waste Treatment Room and discharges to the sewer system located in Amber Street. The average daily wastewater flow rate is estimated at 60,000 gallons per day (GPD); more specifically addressed and described below.

# 2. GENERAL DESCRIPTION OF PRETREATMENT PROCESS

Valley Plating, Inc. discharges to the Springfield Publicly Owned Treatment Works (POTW) an average daily pretreated wastewater flow of about 60,000 gallons per day (GPD) over an average operating period of 17 hours per day in compliance with the City's Sewer Use Ordinance and the Valley Plating, Inc. discharge permit issued by the City. The average flow rate is estimated at 60 gallons per minute (gpm). The current wastewater discharge permit, issued by the Springfield Dept. of Public Works Industrial Pretreatment Division (IPD) went into effect October 24, 2006 for all metal finishing operations conducted on site. IWDP Permit No. 22200.

The pretreated industrial wastewater discharge originates from two sources:

1. Electroplating and metal finishing operations on ferrous and non ferrous metals

and

2. Chemical conversion and anodize operations on aluminum.

## *2.1. Plating lines*

The wastewater from the plating lines is segregated by characteristic and pretreatment need at its source into separate raw wastewater lines:

1. Cyanide-bearing rinsewaters,
2. Chromium-bearing rinsewaters,
3. Rinsewaters which require metals removal,
4. All other rinsewaters which require only pH adjustment prior to discharge, and
5. Highly concentrated spent plating bath wastewater dumps (batch treated). (Refer to batch treatment procedures in the appendix).

## *2.2. Aluminum anodizing lines*

The wastewater from the aluminum anodizing section of the facility is segregated by characteristic and pretreatment need at its source into separate raw wastewater lines:

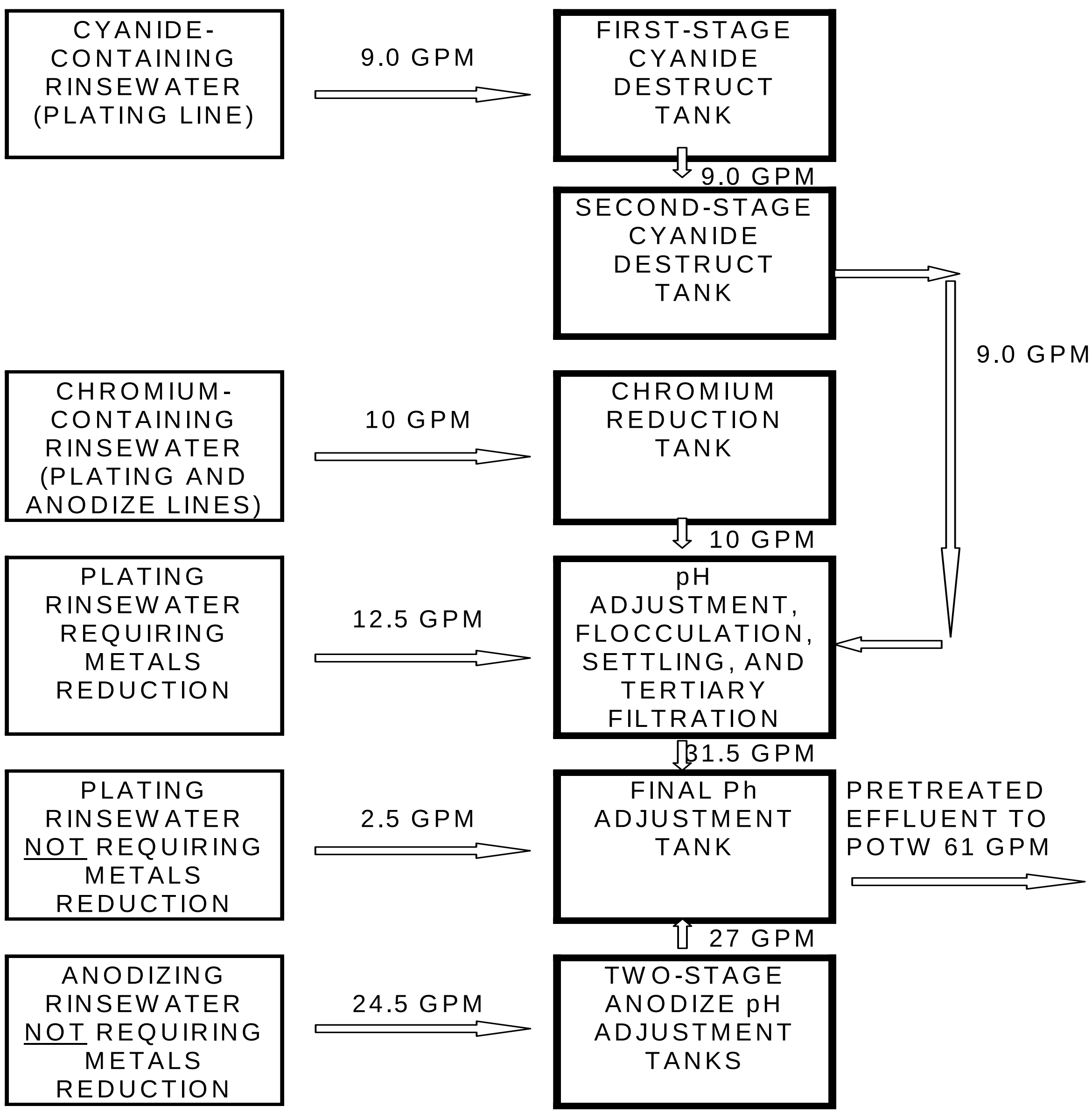
1. Non chromium-bearing rinsewaters which require only pH adjustment,

2. Chromium-bearing rinsewaters, and
3. Highly concentrated spent anodizing bath wastewater dumps (batch treated). (Refer to batch treatment procedures in the appendix).

The wastewater treatment system has been in operation and permitted locally for several years. The system has maintained compliance in accordance with all state and local regulations and therefore operating knowledge of the sources of flow, pretreatment requirements etc. have been established.

For purposes of clarity, the various rinsewater (continuous flow) waste streams are shown in the schematic flow diagram below with maximum flow rates:

**FLOW DIAGRAM OF PROCESS WASTEWATER THROUGH PRETREATMENT SYSTEM, VALLEY PLATING, INC.**



### *2.3. Metal Plating Wastewaters*

The dilute rinsewaters are treated as required on a continuous "flow-through" basis in the pretreatment facilities as described below.

Spent plating solutions are batch-treated or held for off-site shipment for recycling or disposal in accordance with RCRA regulations. Valley Plating has a Class A recycling permit; No. BWPHW 21. Batch treated waste is pumped directly into the sludge thickening tanks for dewatering.

For purposes of clarity regarding the segregated pretreatment lines, each will be discussed separately in this report as its own process, even though most of the wastewaters are pretreated together in the pH adjustment tank and all unit processes downstream of that point in the facility. Batch treatment procedures for spent process solutions are found in the on-site O & M Manual.

### *2.4. Anodizing Wastewaters*

The dilute rinsewaters are treated as required on a continuous "flow-through" basis in the pretreatment facilities. The rinsewater which requires chromium reduction, precipitation, and removal are treated along with the chromium-bearing plating wastewaters in the same tank and pretreatment process. The pH is adjusted on a continuous basis in a two-stage neutralization system for the remaining wastewaters which do not require metals precipitation and removal; and thence discharged to the final pH adjustment tank prior to discharge to the POTW.

Spent anodizing solutions are batch-treated or held for off-site shipment for disposal in accordance with RCRA regulations. Batch treated waste is pumped directly into the sludge thickening tanks for dewatering.

For purposes of clarity regarding the two segregated pretreatment lines, both will be discussed separately in this report as its own process, even though the wastewaters are joined together eventually within the pretreatment system.

## 3. Cyanide-bearing wastewater (metal plating operation only)

All wastewater from the rinse tanks which contain cyanide are processed through this pretreatment line. A schematic diagram of the cyanide pretreatment system is appended for reference, and the waste loading criteria for all unit processes in the pretreatment line are also appended. In addition, the specific details of the unit process mechanical and control equipment is appended; including model numbers, mixer horsepower's and rpm's, etc.

The wastewater discharges by gravity into the cyanide destruct system which consists of two stages. The first stage is the continuously mixed cyanide oxidation reaction tank where the pH is raised above 10.5 through the addition of sodium hydroxide, and chlorine is added as sodium hypochlorite. A pH meter/controller is used to maintain pH. An ORP meter/controller is set to maintain the ORP at +450 mv. Sodium cyanate is formed through this reaction at high pH.

The wastewater then discharges by gravity into the second stage continuously mixed cyanide oxidation tank where the pH is lowered to a range of between 8.5 and 9.0 through the addition of dilute sulfuric acid, and chlorine is added as sodium hypochlorite. A pH meter/controller is used to maintain pH. An ORP meter/controller is set to maintain the ORP at +750 mv. This stage completes the cyanide destruction reaction where the cyanate further breaks down to form carbon dioxide and nitrogen.

The wastewater then discharges by gravity into the pH adjustment tank, where it is joined by other waste streams, as shown on the schematic. Sodium hydroxide and sulfuric acid are added at this point to maintain a pH in the 10.5 to 11.0 range to precipitate all metals. A pH meter/controller is used to maintain pH. The tank is continuously mixed.

Precipitated wastewater is then pumped at 35 gpm to the flocculation tank through a static in-line mixer. Polyelectrolyte is fed into the line prior to the in-line mixer to cause flocculation to occur. The wastewater is then gravity fed into an inclined plate settler to effect solids/liquid separation. Sludge is pumped from the bottom of the settler into the sludge thickening tanks on a batch basis.

The wastewater is then pumped into the secondary settling and thence through tertiary bag and cartridge filters. From the filters the wastewater, with the suspended and dissolved solids removed, is finally neutralized in the final pH adjustment tank with pH recording.

Final flow rate is monitored and recorded through a $90^o$ vee-notch weir prior to the discharge manhole.

All details of the equipment used in these processes in appended. For summary purposes, the average reaction times, etc. for the unit processes are tabulated as follows:

| **UNIT PROCESS** | **AVERAGE LOADING CRITERIA** |
|---|---|
| First Stage Cyanide Reaction Tank | 50 minutes reaction time |
| Second Stage Cyanide Reaction Tank | 125 minutes reaction time |
| pH Adjustment tank | 20 minutes reaction time |
| Flocculation Tank | 4.5 minutes flocculation time |
| Inclined Plate Settler | 3050 GPD/sq. ft. |
| Secondary Clarifier | 4.2 hours |

| UNIT PROCESS | AVERAGE LOADING CRITERIA |
|---|---|
| Tertiary Bag Filter No. 1 | 5 micron W/4.0 sq. ft. filter area |
| Tertiary Bag Filter No. 2 | 3 micron W/4.0 sq. ft. filter area |
| Tertiary Cartridge Filter No. 3 | 1.0 micron W/5.5 sq. ft. filter area |
| Tertiary Cartridge Filter No. 4 | 0.5 micron W/5.5 sq. ft. filter area |
| Final pH Adjustment | 9 minutes reaction time |
| Sludge Thickeners | 600 gallons capacity |
| Sludge Filter Press | 4.0 cubic ft. capacity |

## 4. Chromium-bearing wastewater (metal plating and anodizing operations)

All wastewater from the rinse tanks which contain chromium are processed through this pretreatment line. A schematic diagram of the chromium pretreatment system is appended for reference, and the waste loading criteria for all unit processes in the pretreatment line are also appended. In addition, the specific details of the unit process mechanical and control equipment is appended; including model numbers, mixer horsepower's and rpm's, etc.

The wastewater discharges by gravity into the chromium reduction reaction tank where the Hexavalent chromium (soluble) is reduced to a trivalent state from which it can be precipitated and settled at high pH. Sodium Metabisulfite is used to reduce the hexavalent chromium and sulfuric acid is used to control the pH. A pH meter/controller is used to maintain pH. Sodium Metabisulfite addition is automatically controlled by maintaining an ORP reading of 150 millivolts, to assure a complete reaction. The pH for this reaction is maintained below 3.0. An ORP meter/controller is used to control the reaction. The tank is continuously mixed.

The wastewater then discharges by gravity into the pH adjustment tank, where it is joined by the other waste streams, as shown on the schematic. Sodium hydroxide and sulfuric acid are added at this point to maintain a pH in the 105 to 11.0 range to precipitate all metals. A pH meter/controller is used to maintain pH. The tank is continuously mixed.

Precipitated wastewater is then pumped at 35 gpm to the flocculation tank through a static in-line mixer. Polyelectrolyte is fed into the line prior to the in-line mixer to enhance flocculation. The wastewater is then gravity fed into an inclined plate settler to effect solids/liquid separation. Sludge is pumped from the bottom of the settler into the sludge thickening tanks on a batch basis.

The wastewater is then pumped into the secondary settling and thence through tertiary filter bags and cartridge filters. From the filters the wastewater, with the suspended and dissolved solids removed, is finally neutralized in the final pH adjustment tank with pH recording.

Final flow rate is monitored and recorded through a vee-notch weir prior to the discharge manhole.

All details of the equipment used in these processes in appended. For summary purposes, the average reaction times, etc. for the unit processes are tabulated as follows:

| **UNIT PROCESS** | **AVERAGE LOADING CRITERIA** |
|---|---|
| Chromium Reduction Reaction Tank | 55 minutes reaction time |
| pH Adjustment tank | 20 minutes reaction time |
| Flocculation Tank | 4.5 minutes flocculation time |
| Inclined Plate Settler | 3050 GPD/sq. ft. |
| Secondary Clarifier | 4.5 hours |
| Tertiary Bag Filter No. 1 | 5 micron W/4.0 sq. ft. filter area |
| Tertiary Bag Filter No. 2 | 3 micron W/4.0 sq. ft. filter area |
| Tertiary Cartridge Filter No. 3 | 1.0 micron W/5.5 sq. ft. filter area |
| Tertiary Cartridge Filter No. 4 | 0.5 micron W/5.5 sq. ft. filter area |
| Final pH Adjustment | 9 minutes reaction time |
| Sludge Thickeners | 600 gallons capacity |
| Sludge Filter Press | 4.0 cubic ft. capacity |

## 5. Rinsewaters from plating operation which require metals removal

All plating wastewater from the rinse tanks which contains neither cyanide nor chromium, but require metals precipitation and removal prior to discharge are processed directly through the pH adjustment tank. All plating wastewater from the rinse tanks which contains neither cyanide nor chromium, nor requires metals precipitation and removal prior to discharge is piped directly to the final pH adjustment tank. A schematic diagram of this pretreatment system is appended for reference, and the waste loading criteria for all unit processes in the pretreatment line are also appended. In addition, the specific details of the unit process mechanical and control equipment is appended; including model numbers, mixer horsepower's and rpm's, etc.

The wastewater discharges by gravity into the pH adjustment tank, where it is joined by the other waste streams, as shown on the schematic. Sodium hydroxide and sulfuric acid are added at this point to maintain a pH in the 10.5 to 11.0 range to precipitate all metals. A pH meter/controller is used to maintain pH. The tank is continuously mixed.

Precipitated wastewater is then pumped at 35 gpm to the flocculation tank through a static in-line mixer. Polyelectrolyte is fed into the line prior to the in-line mixer to enhance flocculation. The wastewater is then gravity fed into an inclined plate settler to effect solids/liquid separation. Sludge is pumped from the bottom of the settler into the sludge thickening tanks on a batch basis.

The wastewater is then pumped into the secondary settling tank and thence through tertiary bag and cartridge filters. From the filters the wastewater, with the suspended and dissolved solids removed, is finally neutralized in the final pH adjustment tank with pH recording.

Final flow rate is monitored and recorded through a vee-notch weir prior to the discharge manhole.

All details of the equipment used in these processes in appended. For summary purposes, the average reaction times, etc. for the unit processes are tabulated as follows:

| UNIT PROCESS | AVERAGE LOADING CRITERIA |
|---|---|
| pH Adjustment tank | 20 minutes reaction time |
| Flocculation Tank | 4.5 minutes flocculation time |
| Inclined Plate Settler | 3050 GPD/sq. ft. |
| Secondary Clarifier | 4.5 hours |
| Tertiary Bag Filter No. 1 | 5 micron W/4.0 sq. ft. filter area |
| Tertiary Bag Filter No. 2 | 3 micron W/4.0 sq. ft. filter area |
| Tertiary Cartridge Filter No. 3 | 1.0 micron W/5.5 sq. ft. filter area |
| Tertiary Cartridge Filter No. 4 | 0.5 micron W/5.5 sq. ft. filter area |
| Final pH Adjustment | 9 minutes reaction time |
| Sludge Thickeners | 600 gallons capacity |
| Sludge Filter Press | 4.0 cubic ft. capacity |

## 6. All other plating rinsewaters which require only pH adjustment

All other rinsewaters from the plating operation which require only pH adjustment are piped directly to the final pH adjustment tank by gravity. Final flow rate is monitored and recorded through a vee-notch weir prior to the discharge manhole.

## 7. All other anodizing rinsewaters which require only pH adjustment

All other rinsewaters from the anodizing operation which require only pH adjustment are pumped from the sump pit to the two neutralization tanks which are provided for this purpose; thence the neutralized wastewater flows directly to the final pH adjustment tank by gravity. Final flow rate is monitored and recorded through a vee-notch weir prior to the discharge manhole.

All of the equipment used in these processes is detailed in the appendix. For summary purposes, the average reaction times, etc. for the unit processes are tabulated as follows:

| **UNIT PROCESS** | **AVERAGE LOADING CRITERIA** |
|---|---|
| First Stage pH neutralization tank | 12 minutes reaction time |
| Second Stage pH neutralization tank | 15 minutes reaction time |
| Final pH Adjustment | 9 minutes reaction time |

Details and specific information relative to the process equipment, supporting pumps, controls, etc. are provided in the appendix along with schematic diagrams of the pretreatment processes.

# 8. APPENDIX

***8.1. EQUIPMENT; SIZE, RATINGS, AND FUNCTIONS FOR PLATING WASTEWATER PRETREATMENT SYSTEM***

***8.2. EQUIPMENT; SIZE, RATINGS, AND FUNCTIONS FOR ANODIZE WASTEWATER PRETREATMENT SYSTEM***

***8.3. LOCUS PLAN***

***8.4. FACILITY SITE PLAN***

***8.5. UNIT PROCESS LOADING CRITERIA FOR PRETREATMENT SYSTEMS***

***8.6. SCHEMATIC DIAGRAM OF CYANIDE PRETREATMENT SYSTEM***

***8.7. SCHEMATIC DIAGRAM OF CHROMIUM PRETREATMENT SYSTEM***

***8.8. SCHEMATIC DIAGRAM OF PRETREATMENT SYSTEM FOR NON-CYANIDE AND NON-CHROMIUM BEARING RAW WASTEWATERS WHICH REQUIRE METALS REMOVAL***