PRELIMINARY CONTROL TECHNOLOGY ASSESSMENT

OF

TWA MAINTENANCE FACILITY
Kansas City, Missouri

Survey Conducted By:
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Report Written By:
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ECTB 106-18a

General Industry Section
Engineering Control Technology Branch
Division of Physical Sciences and Engineering
National Institute for Occupational Safety and Health
Cincinnati, Ohio 45226

PURPOSE OF SURVEY:	To investigate TWA methods of air contaminant control for plating and cleaning operations at their maintenance facility, and to determine the plant's suitability for an in-depth control technology survey.
EMPLOYER REPRESENTATIVES CONTACTED:	Richard Davis, Manager Environmental Measurement D. M. Nightwine, Supervisor Plating and Flame Spray Shops
EMPLOYEE REPRESENTATIVE CONTACTED:	Fred Hilgardner International Association of Machinists and Aerospace Workers Local 1650
STANDARD INDUSTRIAL CLASSIFICATION OF PLANT:	SIC 3471 Electroplating, Plating, Polishing, Anodizing, and Coloring
ANALYTICAL WORK DONE BY:	Nonapplicable

ABSTRACT

A walk-through control technology survey of plating and cleaning operations was conducted at TWA maintenance facility in Kansas City, Missouri in August, 1981. The maintenance shop plates all the required airplane parts from small washers to 10-foot-long landing gears using a variety of chemical plating baths. A preliminary assessment of control technology including engineering controls, work practices, and personal protective equipment was made during the visit. Based on the results of a preliminary survey, a detailed survey is planned for this plant.

INTRODUCTION

The Engineering Control Technology Branch of the Division of Physical Sciences and Engineering, NIOSH, is conducting a research study to assess and document control methods for minimizing worker exposure in electroplating and cleaning operations. Exposures to plating tank mists and gases have been documented as a cause of a variety of health problems. These substances include chromium, cyanide, and sulfuric acid. Chromium exposure can cause irritation of the skin, mucous membranes, and respiratory tract resulting in skin ulceration and nasal septum perforation. High concentrations of cyanides can cause death, while lower concentrations can cause headaches, weakness, confusion, nausea, and vomiting. Sulfuric acid exposure is irritating to skin and may cause scarring of the skin and mouth, edema in the lungs, and blindness.

The survey was conducted to obtain information on control technology including engineering controls, work practices and protective equipment, and to determine the suitability of this plant for a detailed survey.

PLANT DESCRIPTION

Electroplating operations are located at the TWA maintenance base and are housed in a large brick building. The plating area is 5,500 square feet. Aircraft and engine parts and ground equipment, ranging in size from tiny washers to landing gear 10-feet-long, are cleaned and plated. The 12-year-old shop contains approximately 75 tanks for plating and cleaning. The maintenance base total employment is close to 5,000.

Plating processes include silver cyanide, copper cyanide, cadmium cyanide, and chromic acid. Cleaning and stripping operations include perchloroethylene degreasers, sulfuric acid, nitric acid, hydrochloric acid and caustic solutions, and nickel cyanide strip.

Plating tanks vary in area from 3-feet by 3-feet to 10-feet by 6-feet and are 2-1/2-feet to 10-feet-deep. The degreaser units are 8-feet by 4-feet and 8-feet-deep.

The plating shop operates two shifts with approximately 15 workers on the day shift and 3 workers on the evening shift. Day shift operates from 7:15 a.m. to 3:45 p.m. Employees have a large cafeteria located in a nearby building available to them.

PROCESS DESCRIPTION

Parts brought into the plating area are cleaned and then dipped in a vat of hot wax to cover the part surfaces that will not be plated. After cooling, the wax is trimmed and the part brought into the plating area. Overhead hoists are used by platers to move parts in and out of the tanks. Most parts plated are handled individually, although a small amount of barrel plating is done.

Filters for cleaning the recirculating plating solutions are located above the floor. This permits easy maintenance of the filters.

The plating baths used are as follows:

Silver cyanide bath consists of 40 to 50 gm/L KAgCN and 60 to 90 gm/L KCN. There are three plating tanks: two are 3-feet by 3-feet by 30-inches-deep, and one is 2-feet by 8-feet by 30-inches-deep.

Copper cyanide strike bath is a high cyanide bath with 15 to 30 gm/L CuCN and 7 to 22 gm/L free NaCN. The one tank is 3-feet by 3-feet by 30-inches.

Nickel cyanide strip bath contains 12 oz/gal CN. The one tank is 3-feet by 3-feet by 30-inches-deep and the other 5-feet by 5-feet by 9-feet-deep.

Cadmium cyanide bath consists of 49 to 56 gm/L CdO and 67 to 112 gm/L free NaCN. Two tanks are 5-feet by 9-feet by 10-feet-deep.

Chromic acid baths contain 33 oz/gal chromic acid. The 17 chromic acid tanks range in area from 5 to 32 sq ft.

Mr. Nightwine provided us with blueprints showing the layout of the entire plating shop. Photographs of the shop were also taken.

ENGINEERING CONTROLS, WORK PRACTICES, AND PERSONAL PROTECTIVE EQUIPMENT

Most of the plating and cleaning tanks are equipped with local exhaust ventilation. In addition, four of the chrome tanks have sliding covers. The local exhaust systems vent from three sides of the tanks and exhaust downward through an exhaust tunnel in the floor of the building. The silver, copper, nickel, and chromic acid plating baths all have three-sided exhaust ventilation; however, only one of the two cadmium tanks is ventilated. All except two of the chromic acid tanks have covers, including the four tanks with a sliding cover. A perchloroethylene degreaser tank is equipped with an electrically operated roll-up cover, and a refrigerator chiller. All the remaining cleaning tanks are equipped with local exhaust ventilation. A large make-up air unit supplies air to the plating shop.

Workers wear face shields when adding chemicals to baths, and the chemicals are added at a slow rate to prevent a violent reaction. Workers delivering chemical barrels to the plating area wear one-quarter face dust respirators. Chemicals used regularly are kept near the plating tanks. The main chemical supply is stored in a detached building.

Protective equipment required in the plating area include safety glasses with side shields and safety shoes.

HEALTH AND SAFETY PROGRAM

Industrial hygiene at the TWA maintenance facility is performed by two full-time persons. In addition, the union health and safety committee spend considerable time on health and safety matters. A nurse is on duty at all times.

A formal training program for new employees in the plating area has not been established, and none is planned because of the extremely low employee turnover (fewer than one new employee per year).

CONCLUSIONS/RECOMMENDATIONS

The plating shop at the TWA maintenance facility is recommended for a detailed survey. There are a number of operations with the potential for causing high worker exposures. These include chromic acid, cadmium cyanide, silver cyanide, and copper cyanide, and the perchloroethylene degreasing. Almost all the tanks are equipped with local exhaust ventilation including three-sided exhaust hoods. Some tanks have covers. An in-depth survey will also provide an opportunity to evaluate a large plating area with high density of plating and cleaning tanks, and thus determine whether high concentrations of hazardous chemicals occur in the general shop air.