

PRELIMINARY CONTROL TECHNOLOGY ASSESSMENT

OF

ELECTRO-COATINGS, INC.  
Houston, Texas

Survey Date:  
April 7, 1981

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

PLACE VISITED: Electro-Coatings, Inc.  
Houston, Texas

DATE OF VISIT: April 7, 1981

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EMPLOYEE REPRESENTATIVES  
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Southern Region  
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PURPOSE OF SURVEY: To investigate Electro-Coatings' methods of  
contaminant control, and to determine the  
plant's suitability for an in-depth control  
technology survey.

## ABSTRACT

A walk-through control technology survey was conducted at Electro-Coatings, Inc. in Houston, Texas on April 7, 1981. This company is involved in hard chrome plating of oil field drilling equipment and printing rollers. A preliminary assessment of control technology including engineering controls, control monitoring, work practices, and personal protective equipment was made during the visit. A determination was made of the feasibility of performing a detailed survey at 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 the control methods used to limit employee exposures in electroplating and cleaning operations. Exposures to plating tank constituents have been documented as a cause of a variety of health problems. One such substance of concern is chromium, which represents the focus of this study. Chromium exposure can cause irritation of the skin, mucous membranes, and respiratory tract, resulting in skin ulceration and nasal septum perforation.

This survey was initiated to become familiar with unique or effective methods of controlling emissions from plating operations with a special emphasis on chrome plating; in an effort to identify a well-controlled operation for in-depth study.

## PLANT DESCRIPTION

Electro-Coatings, Inc. is a combined plating operation and machine shop located in separate facilities. The plating operation is a job-shop engaged primarily in hard chrome plating of oil field drilling equipment and printing equipment. The age of the plating facility is 16 years.

The production area consists of one large open room, 9,600 sq ft in area, separated into two bays. Within the larger of the two bays are housed four large rectangular plating tanks, positioned end-to-end to form two plating lines. Plating line 1 contains tanks "A" and "B" which are each 24 feet by 4 feet by 7 feet. Plating line 2 contains tanks "C" and "D" which are 10 feet by 3-1/2 feet by 7 feet. The plating lines are divided into 17 stations; each station is supplied current by a separate rectifier.

Within the smaller bay are two cylindrical tanks, "E" and "F", with 36-inch and 46-inch circumferences, respectively. Tank "E" is 21 feet in depth, and tank "F" is 18 feet in depth. These tanks are designed to accommodate hydraulic cylinder rods and printing rolls.

The chrome plating tanks are made of steel with "Koroseal" lining.

## PROCESS DESCRIPTION

The major operation at this plant is hard chrome plating. In hard chrome plating, a heavy coating is used to take advantage of the special properties of chromium, such as the ability to withstand heat and corrosion. The plating operation requires a chromic acid (chromium trioxide) concentration of 33 ounces per gallon of solution. Operation temperature is usually stabilized at 130°F. The electrical current needed for each tank ranges from 1,000 to 1,500 amps. The tank solutions are tested periodically to determine the chromic acid concentration.

Most of the parts to be plated are received at the plant with freshly-machined surfaces, often from the company's machine shop. Consequently, little pre-treatment is required for most of the parts. Those parts which require

cleaning are manually cleaned with common household cleanser (Comet). The pieces are then wiped clean and assembled for plating. A reverse-current etching step activates the surface of the part to be plated. A fixture is attached to one end of the metal piece for attachment to a plating rack. The racks are hoisted by overhead cranes which are semi-automatically operated. The racks are mechanically carried to a series of etching, rinsing, chrome plating and rinsing tanks. The approximate plating time in the chrome tanks is 5 to 8 hours. While the racks are submerged in the tanks, the employee prepares another rack for processing.

The desired chrome thickness is 0.001 to 0.05 inch. When the pieces have acquired this thickness, they are removed from the plating tank and dipped in a cold water rinse. The racks are then allowed to dry. The pieces, once dry, are removed and prepared for shipment.

#### ENGINEERING CONTROLS

Local exhaust ventilation is utilized at each plating tank. Tank "A" has two-sided slot hoods extending the length of the tank. Tank mists are exhausted via 3-inch slots into an 18-inch plenum which extends the length of the tank. Air flows laterally to the western end of the tank to an end take-off hood with a vertical 36-inch round duct which exhausts to the roof. Tank "B" has an identical configuration with the hood and duct located at the eastern end of the tank.

Tanks "C" and "D" are covered with large plastic sheets to prevent mist or vapor evolution. These tanks are located near an open door which creates an interfering cross-current in this area. The tanks are equipped with single-sided slot hoods with an 18-inch plenum which extends the length of the tanks. Air is exhausted through a 36-inch round duct of the same configuration as that for tanks "A" and "B". An automatic spray rinse tank (3-1/2 feet by 3-1/2 feet by 6 feet) is located between the two plating tanks and is similarly exhausted.

Tanks "E" and "F" are locally ventilated with a circular exhaust hood around the rim of the cylindrical tanks. Mists are exhausted through 3-inch slots into an 18-inch round duct.

The exhaust ducts from each tank enter a large (42-inch) duct located outside the building. The outside duct empties exhausted air into a scrubber system. The system is equipped with a 44-1/2 inch backward curved fan, rated 30,000 SCFM at 6-inches W.G. There is no regularly scheduled maintenance for the ventilation system, but maintenance and cleaning of the system and entire shop is performed periodically by trained maintenance personnel.

#### WORKFORCE DESCRIPTION

Electro-Coatings employs 11 persons, all involved with plating operations. There are two shifts: 6:00 a.m. - 2:30 p.m. and 2:30 p.m. - 11:00 p.m. Employees are supplied with protective gloves and aprons. A barrier cream product by Jergens (SBS<sup>44</sup>) has proven effective as well. Respirators are not in use; however, a self-contained breathing apparatus is available for maintenance and emergency use. There is no respirator training program.

Employees are provided with an emergency shower located at the N. end of the plant. An air conditioned lunchroom separated from the plating operation is also provided.

#### SAMPLING PROGRAM

There is no regular sampling program. Samples were recently taken by a local OSHA industrial hygienist (Linda Crockett). The sampling results, according to the plant manager, revealed that the plating operation is in compliance with OSHA regulations. No written report of the OSHA findings was available.

#### MISCELLANEOUS

The survey was performed on a moderately windy day with an approximate ambient temperature of 75°F.

#### EVALUATION AND RECOMMENDATIONS

Electro-Coatings, Inc. appears to be a well-controlled plating operation with enthusiastic management interest in maintaining good controls. With the exception of tank "E" which has a corroded hood (plans are made to replace it), all plating tanks have good engineering controls. Smoke tube observation indicated good capture velocities at tank surfaces. This plant is highly-recommended for a detailed survey.