Evaluation of the Hexavalent Chromium Airborne Toxic Control Measure (ATCM) for Chrome Plating and Chromic Acid Anodizing Operations

Stakeholder Workgroup Meetings

El Monte, CA - November 22, 2002

San Francisco, CA - November 25, 2002

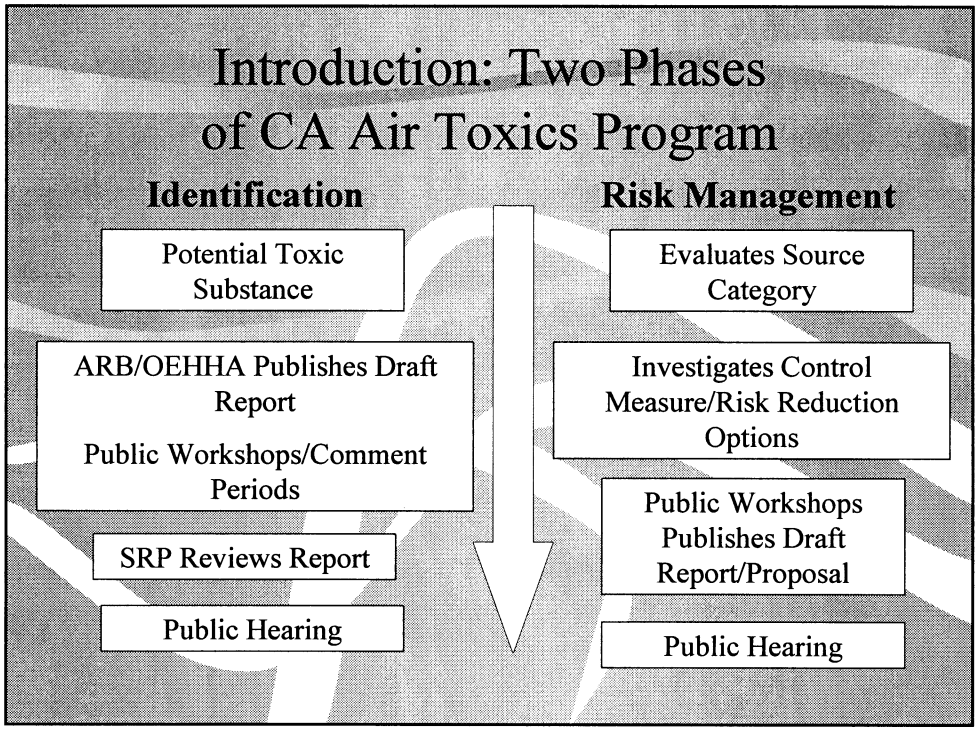
Fresno, CA - December 17, 2002

California Environmental Protection Agency

Air Resources Board

Outline

- Introduction
- Industry characterization
- Review of control technologies
- Results of Barrio Logan assessment
- Receptor information
- Decorative chromium plating emissions testing program
- Alternatives
- Other considerations



Introduction

- Identified by the ARB as a Toxic Air Contaminant (TAC) in 1986
- A potent human carcinogen
  - No threshold level

Introduction

- Chrome Plating ATCM
  - Adopted in 1988
  - Amended in 1998 for equivalency with federal National Emission Standard for Hazardous Air Pollutants (NESHAP)

Introduction: Requirement for Developing ATCMs

- Health and Safety Code 39650 et seq. (AB 1807)

Standard for Control

Reduce emissions to lowest level achievable through Application of Best Available Control Technology (BACT) or more effective method

- Establishes separate and distinct processes for the identification and control of Toxic Air Contaminants
- Today's meeting part of the control phase or risk management

STANDARDS

Existing Hard Chrome

Facility Size	*≤ 60 million amp-hr*	*≥ 60 million amp-hr*	
Large	≤ 0.006 mg/amp-hr	≤ 0.006 mg/amp-hr	
Medium	≤ 0.03 mg/amp-hr	≤ 0.006 mg/amp-hr	≤ 0.03 mg/amp-hr or 0.015 mg/dscm
Small	≤ 0.15 mg/amp-hr	≤ 0.03 mg/amp-hr	≤ 0.15 mg/amp-hr or 0.015 mg/dscm

STANDARDS

New/Modified Hard Chrome

Facility Size	*≤ 60 million amp-hr*	*≥ 60 million amp-hr*
Large	≤ 0.006 mg/amp-hr	≤ 0.006 mg/amp-hr
Medium/ Small	≤ 0.03 mg/amp-hr	≤ 0.006 mg/amp-hr

STANDARDS

Decorative and Acid Anodizing

Method of Compliance	Requirement
add-on air pollution control equipment, or chemical fume suppressants, or mechanical fume suppressants (i.e. polyballs)	$\leq$ 0.01 mg/dscm ($4.4\ 10^{-6}$ gr/dscf)
Chemical fume suppressants containing a wetting agent	$\leq$ 45 dynes/cm (3.1×10^{-3} lbF/ft)

STANDARDS

Decorative Facilities using Cr^{3+}

Method of Compliance	Requirement
add-on air pollution control equipment, or chemical fume suppressants, or mechanical fume suppressants (i.e. polyballs)	$\leq$ 0.01 mg/dscm ($4.4\ 10^{-6}$ gr/dscf)
Chemical fume suppressants containing a wetting agent	Use wetting agent as bath ingredient and comply with recordkeeping and reporting requirements

Questions Posed in January

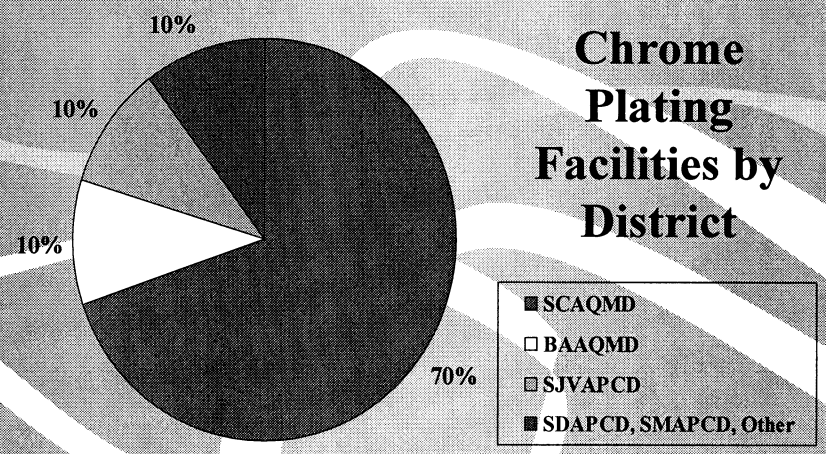
1) Do the standards represent the most stringent that are technologically feasible?
2) Are plating facilities located near sensitive receptors?
3) Can the regulation be improved to ensure continuous compliance?

Industry Characterization

Industry Characterization

- Data Collection
  - Districts provided data on active chromium plating facilities and their emissions
  - Emissions based on actual or permitted amp-hr for each facility
  - Types of controls
  - Work in progress

Industry Characterization

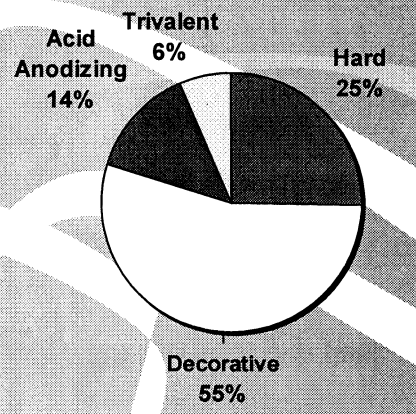


Chrome Plating Facilities by District

Industry Characterization

Statewide Chromium Plating Facilities by Plating Type

Total Facilities: 195



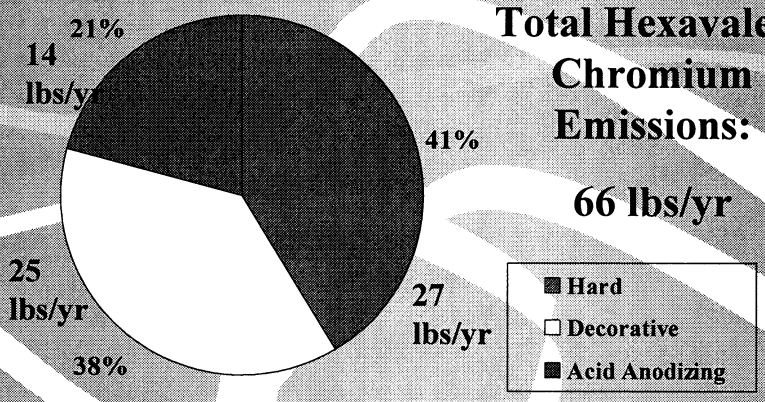
Note: Some may be counted twice in this graph since there are facilities that do a variety of plating

Industry Characterization

Available Amp- Hour Data

	Hard	Decorative	Acid Anodizing	All
Range	150,000 – 568,000,000	5,000 – 150,000,000	2,000 – 50,000,000	2,000 – 568,000,000
Mean	64,300,000	13,400,000	5,000,000	28,000,000
Median	27,700,000	500,000	2,700,000	3,500,000

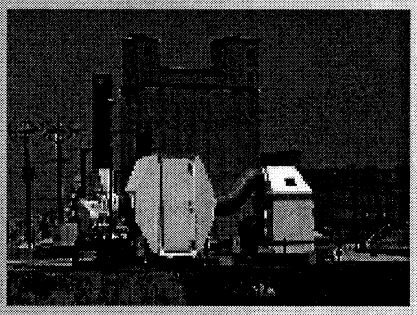
Industry Characterization

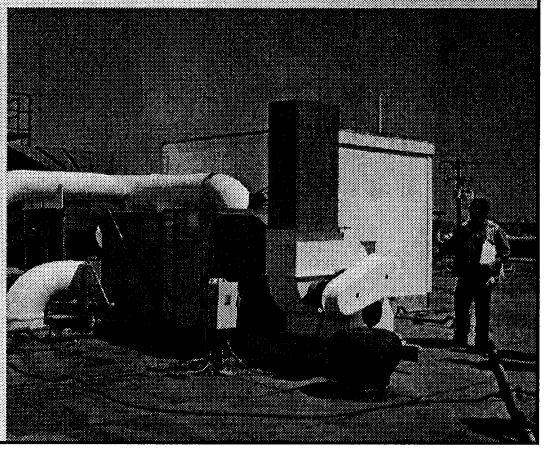


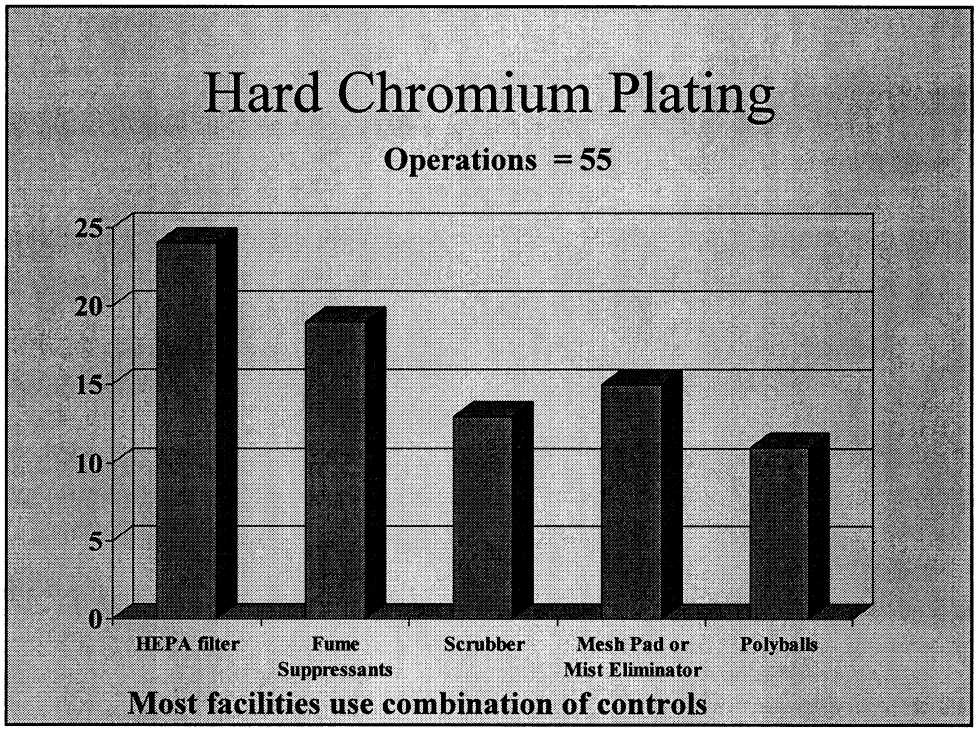
Total Hexavalent Chromium Emissions:

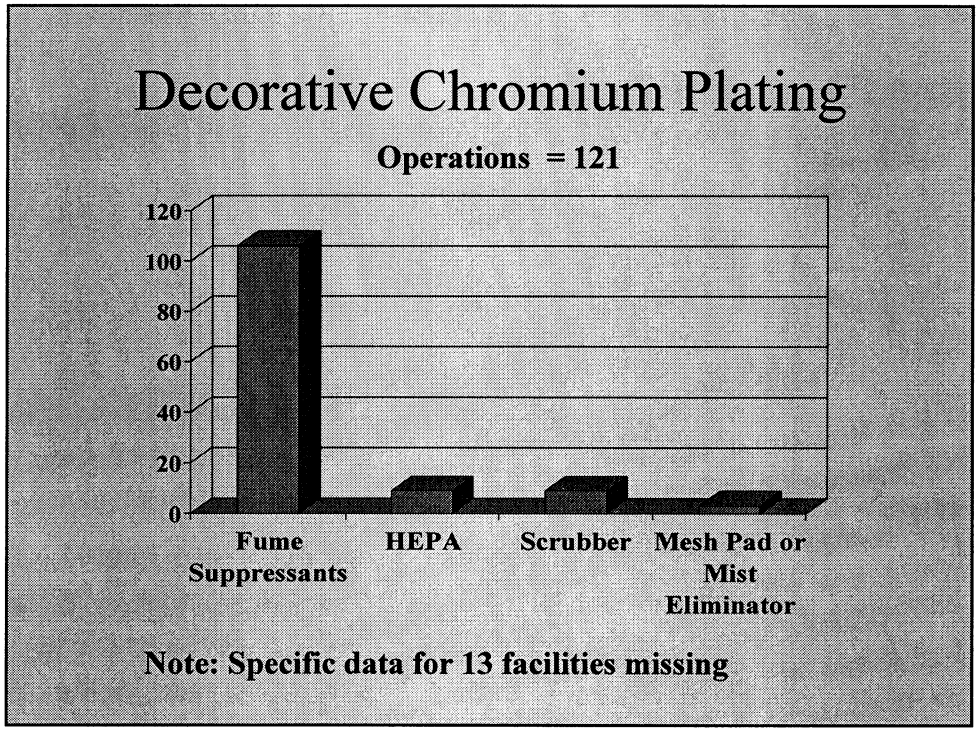
66 lbs/yr

Review of Control Technology



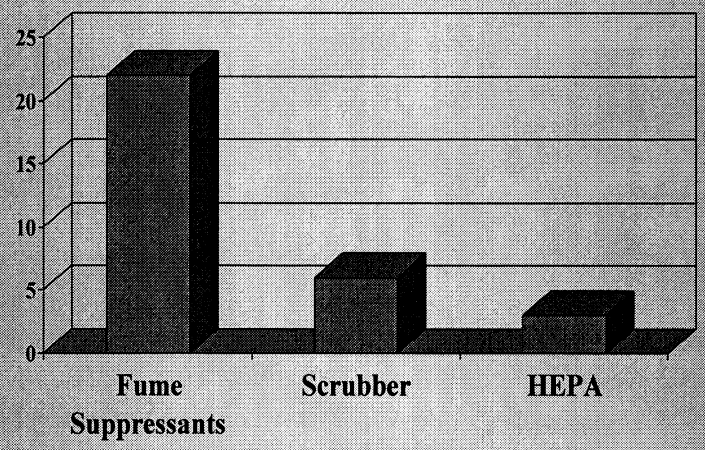



Hard Chromium Plating
Operations = 55
25
20
15
10
5
0
HEPA filter
Fume Suppressants
Scrubber
Mesh Pad or Mist Eliminator
Polyballs
Most facilities use combination of controls


Decorative Chromium Plating
Operations = 121
120
100
80
60
40
20
0
Fume Suppressants
HEPA
Scrubber
Mesh Pad or Mist Eliminator
Note: Specific data for 13 facilities missing

Chromic Acid Anodizing

Operations = 31



Note: Specific data for 10 facilities missing

Chemical Fume Suppressants

- Three main types
  - Wetting agents that reduce surface tension
  - Foam blankets
  - Combination
- Surface tension measurement
  - Differs by type of instrument used
  - Fume suppressant efficiency depends on surface tension

Chemical Fume Suppressants

- Commonly used fume suppressants
  - Bench Brite CR-1700
  - Fumetrol 101 and 140
  - Proquel
  - Dis Mist NP
  - MSP-ST
  - Spray Stop

Source Test Review

54 source tests with emission rate information

8 > 0.006 mg/Amp-hr

46 ≤ 0.006 mg/Amp-hr

*35/46 district approved

21 > 0.001 mg/Amp-hr

27 ≤ 0.001 mg/Amp-hr

*19/27 district approved

*Note: Data from all facilities, not just active facilities in CA

Reported Emission Rates

Control Equipment	Emission Rate (mg/Amp-hr)
• HEPA with additional controls	• 0.00007 - 0.006
• 2 or 3 stage mist eliminator	• 0.00001 - 0.0002
• Fume suppressant only	• 0.003 - 0.01

Results of the Barrio Logan Assessment

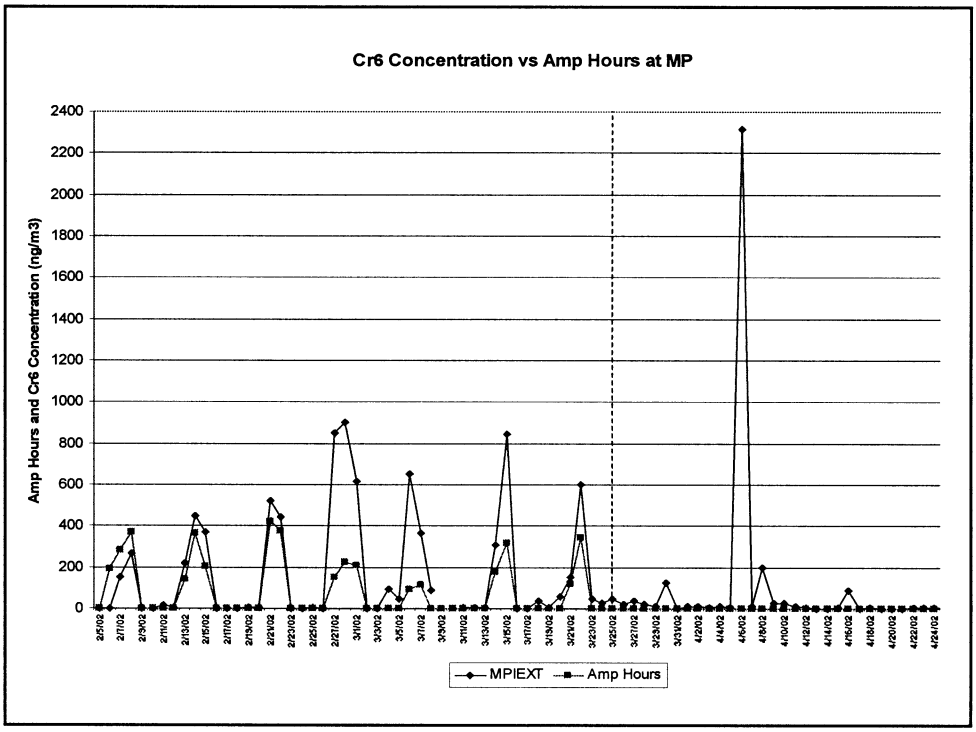
AIR MONITORING

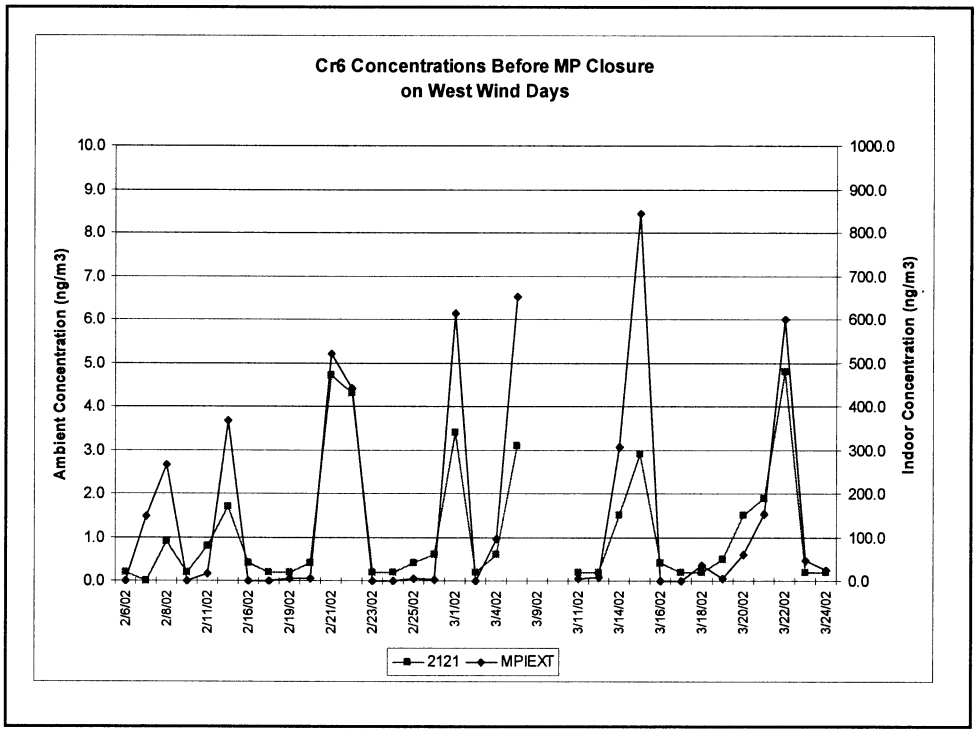
Intensive Study Period

- Initial monitoring - December, 2001
- Ambient monitoring Feb - May, 2002
- Ambient and indoor monitoring
- Source test at hard chrome operation

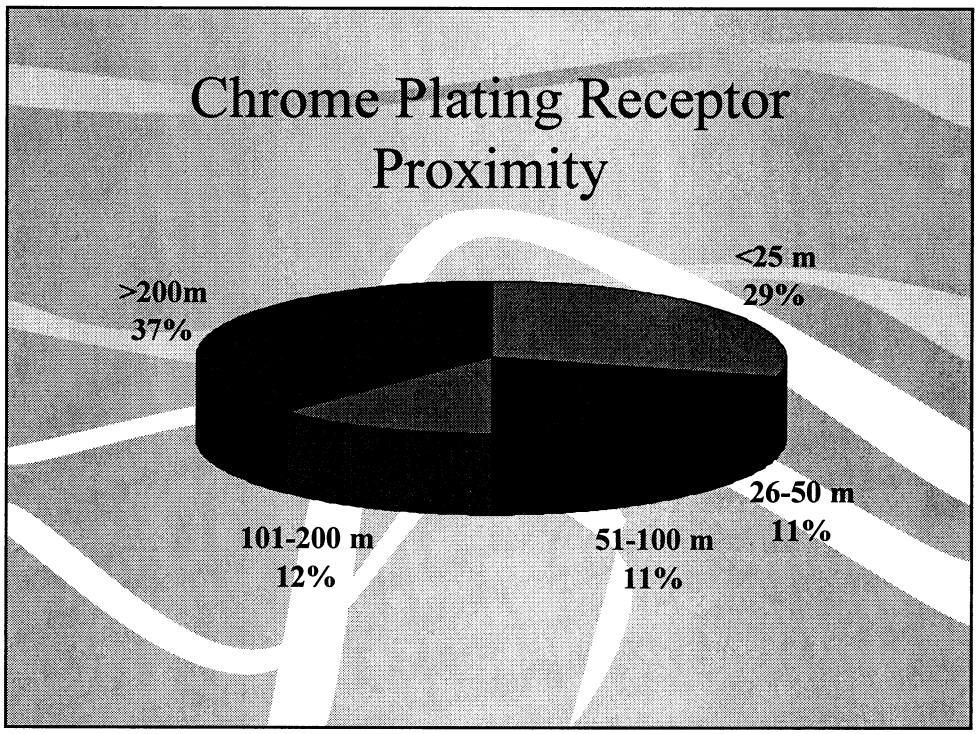
Master Plating - Case Study

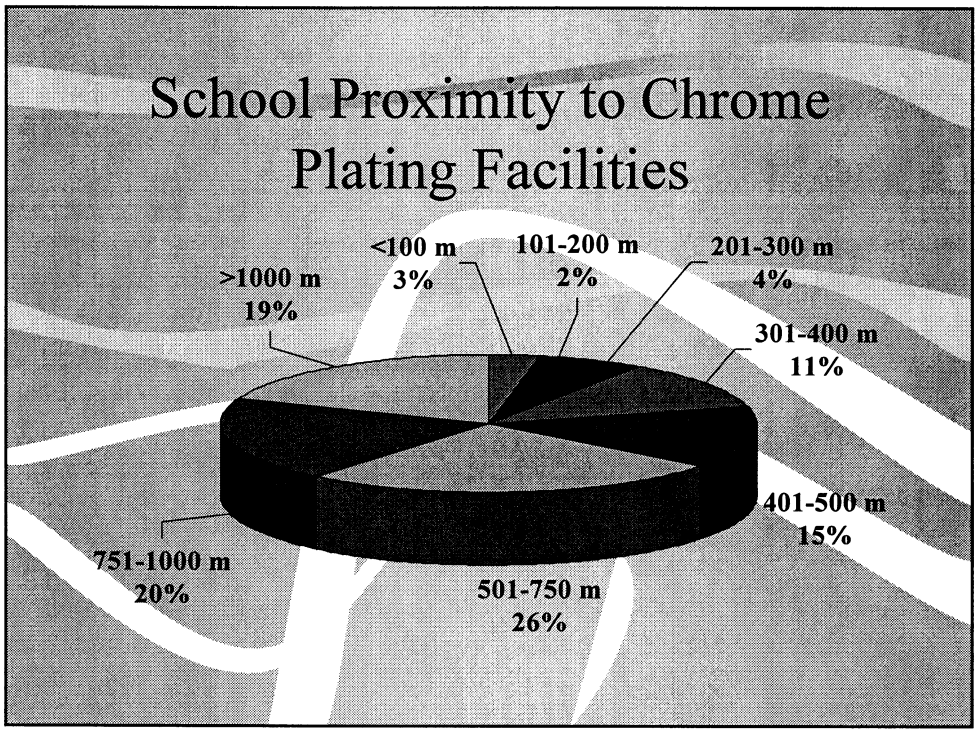
- General
  - Decorative plating shop
  - No direct ventilation of tanks
  - Complied using chemical fume suppressants
  - Plating typically 2-3 times/week
  - Maximum 423 Amp-hr/day
- Master Plating discontinued chrome plating, March 22, 2002

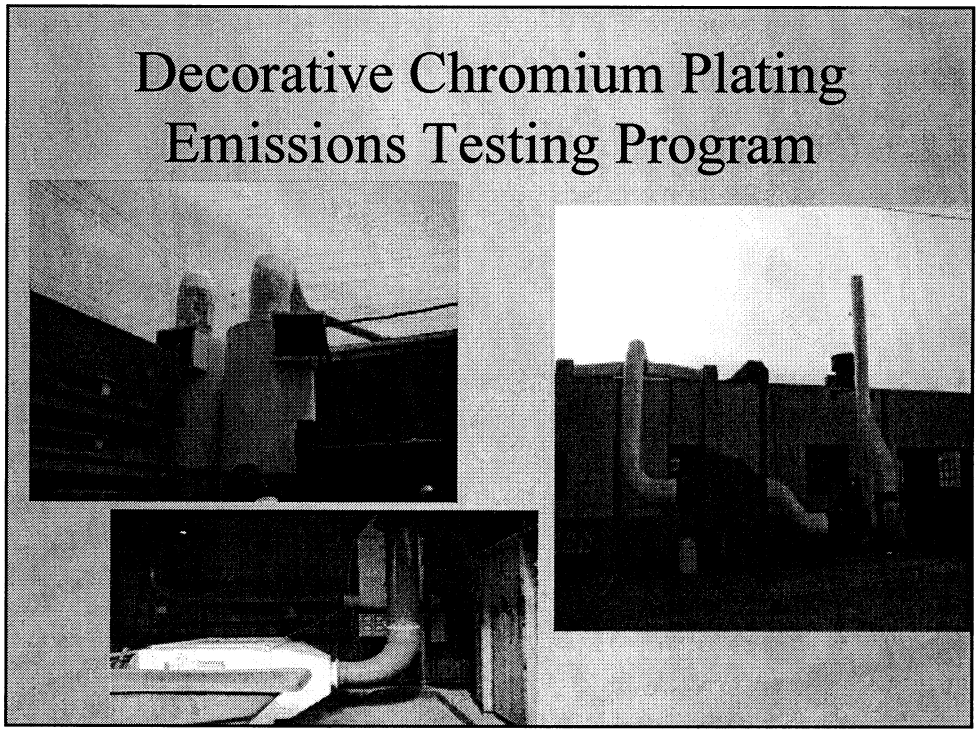

Cr6 Concentration vs Amp Hours at MP
Amp Hours and Cr6 Concentration (ng/m3)
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
MPIEXT
Amp Hours


Cr6 Concentrations Before MP Closure
on West Wind Days
Ambient Concentration (ng/m3)
Indoor Concentration (ng/m3)
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
1000.0
900.0
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
2/6/02
2/8/02
2/11/02
2/16/02
2/19/02
2/21/02
2/23/02
2/25/02
3/1/02
3/4/02
3/9/02
3/11/02
3/14/02
3/16/02
3/18/02
3/20/02
3/22/02
3/24/02
2121
MPIEXT

Receptor Information




School Proximity to Chrome Plating Facilities
<100 m 3%
101-200 m 2%
201-300 m 4%
301-400 m 11%
401-500 m 15%
501-750 m 26%
751-1000 m 20%
>1000 m 19%


Decorative Chromium Plating Emissions Testing Program

Decorative Chromium Plating Emissions Testing Program

- To improve understanding of decorative chromium plating emissions
- Variety of decorative chromium plating facilities to be tested
- Source tests
- Indoor monitoring
- Conducted by ARB staff with cooperation of district and industry

Decorative Chromium Plating Emissions Testing Program

- Type of facilities tested
  - With ventilation
  - Without ventilation - construct a fabricated hood
- Controls tested
  - Fume suppressants (all facilities)
  - Composite Mesh Pad
- Compare tensiometer and stalagmometer readings

Decorative Chromium Plating Emissions Testing Program

- Draft protocol was reviewed by stakeholders
- The protocol will be finalized this month
- Testing begins - January, 2003

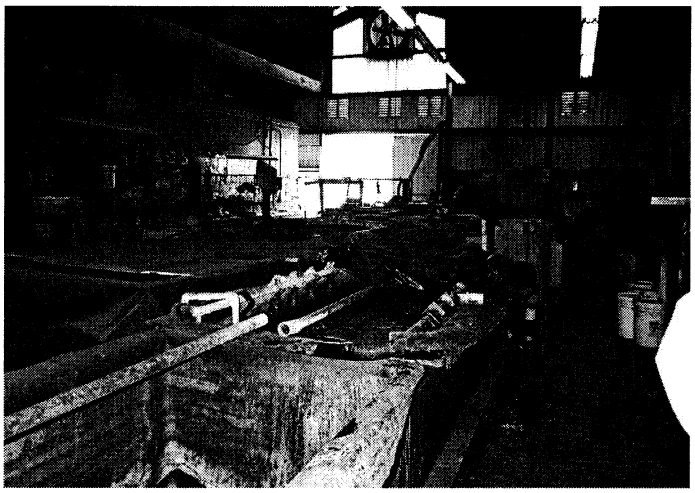
Alternatives

- Alternative for decorative plating - trivalent chromium
  - Studies demonstrate trivalent chromium can be utilized under all conditions comparable to hexavalent chromium
  - Reduced toxicity
  - Greater throwing power
  - Less drag out

Alternatives

- Trivalent chromium
  - New solutions easier to maintain
  - 14 facilities using trivalent chromium in California
- Researching alternatives to Cr^{6+}
  - Hard chromium options limited

Other Considerations



Fugitive Emissions

- Data from Master Plating show indoor air emissions from fugitive dust affecting nearby residence
- Additional dust samples collected by SDAPCD
  - 4 / 8 samples showed highest Cr^{+6} concentration close to plating tank
  - All 4 samples were from decorative chromium operations

Housekeeping Considerations

- Fugitive dust emissions not addressed in the current ATCM
  - current ATCM directed at process emissions
- We are evaluating if feasible measures can be taken
- Looking for assistance

Training and Compliance Assistance

- To increase compliance rate among this source category
- Compliance Assistance Handbooks
  - English and Spanish Versions
- Training will be offered by ARB staff to chrome plating operators
- First classes scheduled in SCAQMD
  - December 3rd and 13th, 2002

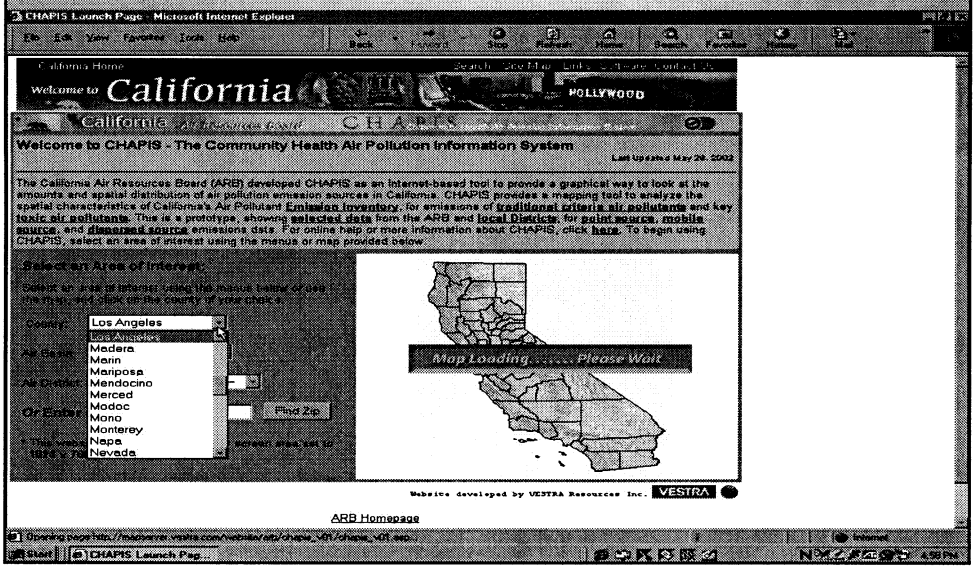
Federal NESHAP

- June 5, 2002 - Federal Register Notice
  - Would allow hard chrome plating facilities to comply with just fume suppressants
  - Would allow different standard for surface tension reading based on instrument used
  - Other miscellaneous provisions

Federal NESHAP

- September 9, 2002 - ARB requested supporting documentation and extension of the comment period
- EPA will reissue federal register

Community Health Air Pollution Information System (CHAPIS)



Populating Data for Initial Phase

- Initial list of pollutants
- Initial categories of facilities
  - criteria pollutants for 10 tons/yr facilities
  - Toxics for refineries and power plants (>50MW)
- Initial data release - spring/summer 2003
- Ongoing future additions- collaboration with CAPCOA and districts

Next Steps

- Emissions testing program begins - January, 2003
- Testing program results
- Risk characterization
- Technical assessment
- Board hearing - late 2003

More Information

- Air Toxics website:
http://www.arb.ca.gov/toxics/toxics.htm
- Chrome Plating ATCM website
http://www.arb.ca.gov/toxics/chrome/chrome.htm
- Staff Contact:
  - ATCM: Shobna Pandhoh- spandhoh@arb.ca.gov
  - Training: Terone Preston - tpreston@arb.ca.gov
  - CHAPIS: Beth Schwehr - bschwehr@arb.ca.gov