Appendix G

Summary of Cost Analysis Methodology

Summary

The cost of the proposed ATCM to affected businesses is estimated to be $672,000 to $1,195,000 in initial capital and permitting costs and $55,000 to $94,000 in annual recurring costs. This equates to $150,000 to $257,000 dollars annually over the useful life of the control equipment. This cost represents the capital cost of equipment, annualized over its useful life, plus the annual recurring costs in 2004 dollars. The annual cost for facilities that would not be required to install additional controls ranges from $600 to $850 per facility. The annual cost for facilities that would be required to install additional controls ranges from about $5,000 to $55,000 (or $162,000 if the largest facility installs three HEPA systems) per facility.

The cost ranges represent minimum and maximum costs associated with the one facility that would need to upgrade from water curtains to a HEPA filter system. Based on information provided by the facility, we believe that one HEPA system for three spray booths would be sufficient to accommodate the quantities of chromium- and nickel-based materials being used at the facility and comply with the proposed ATCM. This situation is reflected in the lower end of the cost ranges provided above. If the business chose to install three HEPA systems for nine spray booths, to provide maximum operational flexibility, the costs would be greater, as represented by the upper end of the cost ranges provided above. However, the expenditure for upgrading nine spray booths would be a business decision that is not mandated by the proposed ATCM.

The cost for 31 of the 37 facilities that would not need to install control devices is summarized in Table G-1. All 31 facilities would need to initially report their emissions, and meet monitoring and recordkeeping requirements, which is estimated to cost $600 per year. Seventeen of the 31 facilities would need to modify or obtain a permit, which the ARB estimates will cost $2,232. Of the 17 facilities that will incur permit application fees, 12 do not have an existing permit, and will incur additional annual permit fees.

Table G-1:
Costs for Affected Facilities Not Installing Control Devices

Requirement	Cost	Number of Affected Facilities	Total Initial Capital Cost	Total Annual Recurring Cost
Reporting, Monitoring and Recordkeeping	$600	31	$0	$18,600
Permit Application Fee	$2,232	17	$0	$37,944
Annual Permit Fee	$246	12	$2,952	$0

The following discussion deals primarily with the methodology used to determine the cost to the six facilities that would need to install new control devices to meet the requirements of the proposed ATCM. A summary of the costs and assumptions used for each of the six facilities is shown in Tables G–2 and G-3.

Table G-2:
Cost Estimates and Assumptions Used for Four Facilities Needing New Control Devices to Meet the 99.999% or 99.97% Control Efficiency Requirement*

	Facility 1**	Facility 2	Facility 3	Facility 4	Total
Size of Filter System (in square feet of filter media)	15,000	6,000	6,000	6,000	
HEPA Filter Unit	Yes	No	No	No	
Dry Filter Unit	Yes	Yes	Yes	Yes	
Booth Needed	Yes	No	Yes	Yes	
Hood Needed	Yes	Yes	Yes	Yes	
Filter Replacement Frequency	One Year	Two Years	Two Years	Two Years	
Existing Permit	Yes	No	No	No	
Cost of Equipment	$213,172 - $639,517	$66,997	$87,440	$87,440	$455,049 - $881,394
Installation, Freight and Permit Fees	$50,868 - $148,139	$22,047	$22,047	$22,047	$117,009 - $214,280
Initial Capital Cost (fixed)	$264,040 - $787,656	$89,045	$109,488	$109,488	$572,061 - $1,095,677
Annualized Fixed Cost	$35,059 - $104,147	$12,230	$14,878	$14,878	$77,045 - $146,133
Annual Recurring Cost	$19,799 - $58,196	$3,815	$3,815	$3,815	$31,244 - $69,641
Total Annual Cost	$54,858 - $162,343	$16,046	$18,693	$18,693	$108,290 - $215,775

** The high end of the range assumes the facility would install three HEPA systems and three cyclones to control emissions from nine spray booths.

Table G-3:
Cost Estimate Used for Two Facilities Needing New Control Devices to Meet the 90% Control Efficiency Requirement*

	Facility 5	Facility 6	Total
Water Wash Spray Booth	$17,320	$17,320	$34,640
Installation, Freight and Permit Fees	$11,232	$11,232	$22,464
Disposal	$214	$214	$428
Electricity	$154	$154	$308
Recordkeeping	$600	$600	$1,200
Annual Permit Fee	$246	$246	$492
Initial Capital Cost (fixed)	$28,552	$28,552	$57,104
Annualized Fixed Cost	$3,698	$3,698	$7,396
Annual Recurring Cost	$1,214	$1,214	$2,428
Total Annual Cost	$4,912	$4,912	$9,824

* Estimates are based on discussions with manufacturers, information from the 2004 Thermal Spray Facility Survey, and confidential discussions with industry representatives. (ARB, 2004c; BOE, 2004; Gansert, 2004; Huack, 2004; Walters, 2004).

The cost to install a filter system can vary significantly depending on the configuration and layout of the existing facility and spray booths. Based on discussions with air filter manufacturers and confidential discussions with the thermal spray industry, we

assumed the installation costs to be 50% of the total cost of the blower, dust collector, control panel, other miscellaneous equipment and the HEPA filter unit, if applicable. The estimate for installation represents typical installation costs and assumes that the six facilities needing new control devices will not have special circumstances, such as a structure that needs to be heavily modified, that would increase this cost.

Tables G-4 and G-5 present the estimated initial capital cost of various components of control systems that facilities would install to meet the proposed ATCM requirements. In Table G-4 are estimates for control system components for a dry cartridge filter system with 6,000 square feet of filter media. In
Table G-5 are estimates for control system components for a dry cartridge filter system with 15,000 square feet of filter media and a HEPA unit.

Table G–4:
Estimated Equipment Costs for a Dry Cartridge Filter System with 6,000 Square Feet of Filter Media*

Item	**Estimated Cost**
20 hp Blower	$4,654
Control Panel	$3,635
Dust Collector	$24,436
Other Equipment	$3,248
Duct Work	$21,650
Dry Cartridge Filters, 24 filters at $90 each	$2,338
Hood	$7,036
Booth	$20,443
Installation	$16,616
Freight	$3,200
Permit Fee	$2,232
Total	**$109,488**

* Estimates are based on discussions with filter manufacturers, information from the 2004 Thermal Spray Facility Survey, product literature and confidential discussions with industry representatives. (ARB, 2004c; BOE, 2004; Fontaine, 2004; Gansert, 2002; Gansert, 2004; Jettan, 2004; Mills, 2002; Walters, 2003; Walters, 2004).

Table G–5:
Estimated Equipment Costs for a Single Dry Cartridge Filter System with 15,000 Square Feet of Filter Media and a HEPA Filter Unit*

Item	**Estimated Cost**
50 hp Blower	$6,291
Control Panel	$4,092
Dust Collector	$62,714
HEPA Filter Unit	$6,868
Cyclone	$12,990
Other Miscellaneous Equipment	$5,413
Duct Work	$21,650
Dry Cartridge Filters, 60 filters at $90 each	$5,845
HEPA Filters, 15 filters at $300 each	$4,871
Hood X 3	$21,109
Booth X 3	$61,329
Installation	$45,436
Freight	$3,200
Permit Fee	$2,232
Total	**$264,040**

* Estimates are based on discussions with filter manufacturers, information from the 2004 Thermal Spray Facility Survey, product literature and confidential discussions with industry. representatives. (ARB, 2004c; BOE, 2004; Fontaine, 2004; Gansert, 2002; Gansert, 2004; Jettan, 2004; Mills, 2002; Walters, 2003; Walters, 2004).

Table G-6 shows the estimated recurring cost for the facilities that would be required to install filter controls to meet the 99.999% or 99.97% control efficiency requirements. These estimates are based on the assumption that facility 1 installs a HEPA filter, and facilities 2-4 install dry cartridge filters.

Table G-6:
Recurring Costs for Four Facilities Needing New Control Devices to Meet the 99.999% or 99.97% Control Efficiency Requirement *

	Facility 1**	**Facility 2**	**Facility 3**	**Facility 4**
Operating Hours/Year	1000	250	250	250
Filter Change out Frequency	Every Year	Every 2 Years	Every 2 Years	Every 2 Years
Disposal Cost	$6,420 - $19,260	$1,284	$1,284	$1,284
Replacement Filters	$5,846 - $17,537	$1,169	$1,169	$1,169
Replacement HEPA Filters	$4,871 - $14,614	$0	$0	$0
Electrical Cost	$2,062 - $6,186	$516	$516	$516
Recordkeeping, Monitoring and Reporting	$600	$600	$600	$600
Annual Permit Fees	$0	$246	$246	$246
Total	**$19,799 - $58,197**	**$3,815**	**$3,815**	**$3,815**

* Estimates are based on discussions with filter manufacturers, information from the 2004 Thermal Spray Facility Survey, product literature, disposal companies and confidential discussions with industry representatives (BLS, 2004; Donaldson, 2004; Gottes, 2004; Jettan, 2004).

**** The high end of the range assumes the facility would install three HEPA systems and three cyclones to control emissions from nine spray booths.

Electrical cost was calculated as follows:

Electrical Cost = (motor hp) X (.75 kilowatts/hp) X ($0.1375/kilowatt-hour) X (annual hours of operation)

If the facility had an existing control device, their current electrical cost was calculated in the same fashion, and the incremental increase in electrical cost was used in the cost estimate.

Annualized Costs

We annualized non-recurring fixed costs using the Capital Recovery Method. Using this method, we multiplied the non-recurring fixed costs by the Capital Recovery Factor (CRF) to convert these costs into equal annual payments over a project horizon at a discount rate. The Capital Recovery Method for annualizing fixed costs is recommended by Cal/EPA (Cal/EPA, 1996), and is consistent with the methodology used in previous cost analyses for ARB regulations (ARB, 2000a; ARB, 2000b).

The CRF is calculated as follows:

$$CRF = \frac{i(1+i)^n}{(1+i)^n - 1}$$

where,

CRF = Capital Recovery Factor

i = *discount interest rate (assumed to be 5%)*
n = *project horizon or useful life of equipment*

All costs of the control devices were annualized over 10 years, except the cost of the blower, which was annualized over five years. These values are based on a conservative estimate of the expected lifetime of the equipment. The permit application or renewal fees were annualized over five years. The total annualized cost was obtained by adding the annual recurring costs to the annualized fixed costs derived by the Capital Recovery Method.

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