Costs For Air Pollution Control Equipment For Coal-Fired Industrial Boilers[1]

Pollutant	PM	HCl	CO	Hg/Dioxins
Likely Control	• FF[2] (58)	• SDA (541)[3]	• CATOX (613)	• CI – (303) • CI and FF (265)
Comments	• Only 58 units—those with no controls or only cyclones—need a FF to control for PM. It is assumed555 units have sufficient controls in place for PM, although many of the ESPs will need to be upgraded or replaced. Note that many units are assumed to need FF's for Hg and dioxin controls.	• Units already having (i) a wet scrubber; or (ii) ddry scrubber (SDA have sufficient controls for HCl and thus, do not need SDAs.	• All units are assumed to need a catalytic oxidizer to reduce CO. Note, it is uncertain if this technology is applicable to coal-fired boilers. Significant operating costs could be incurred to destroy organic HAPs in boiler exhaust.	• Units already having (i) a dry or wet scrubber; or (ii) dry sorbent injection with a FF have sufficient controls for hg/dioxins and thus, do not need CIs or FFs. • Based on estimates that units will be required to control for 90% of Hg, a combination of CI and FF controls will be necessary to control for Hg, as well as dioxins.
Capital Cost Per Unit	• Range of FF Costs Per Unit: $1M-$9M • Average Per Unit FF Cost: $5.4M[4]	• Range of SDA Costs Per Unit: $2M-$49M • Average Per Unit SDA Cost: $16M[5]	• Range of CATOX Costs Per Unit: $1M-$23M • Average Per Unit Cost of CATOX: $7.7M[6]	• Range of CI Costs Per Unit: $0.3-$2.9M • Average Per Unit Cost of CI: $1M[7] • Range of CI and FF Costs Per Unit: $4.8M-$32M • Average Per Unit Cost of CI and FF: $13.5M[8]

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[1] The chart includes data for 613 coal-fired units included in the "coal" categories under Column H on the spreadsheet.

[2] The abbreviations used for controls are as follows: FF (Fabric Filter); SDA (Spray Dryer Absorber); ESP (Electrostatic Precipitator); CATOX (Catalytic Oxidation); and CI (Carbon Injection).

[3] Three hundred ninety units need SDAs; however, EPA did not have capacity data for four of the units requiring SDAs and therefore, the cost on the spreadsheet defaulted to zero. Because the cost for those units is not actually zero, those four units were excluded from the average calculation, and the average was determined using 386 (390-4) as the total number of units requiring SDAs.

[4] Average FF cost was calculated by adding up the per unit cost for every unit requiring a FF to get the total cost for all units requiring a FF ($214) and then dividing the total cost by the number of units requiring FFs (40).

[5] Calculation per formula above: $6,147M ÷ 386.

[6] Calculation per the formula above: $3,362M ÷ 434. All 442 units need CATOX; however, EPA does not have capacity data for eight of the units, so they were excluded from the average calculation per fn3 (442 – 8).

[7] Calculation per the formula above: $214M ÷ 226. Two hundred thirty units need just CI; however, because EPA does not have capacity information for four (really 2, but units 5503 and 5504 defaulted to zero as well – why is that?) of these units, they were excluded from the average calculation per fn3 (230 – 4).

O&M Cost Per Unit		• Average Annual Per Unit O&M Cost for SDAs: $0.6M[9]		Average Annual Per Unit O&M Cost for CI: $0.6M[10]
# of Coal-Fired Boilers for which EPA has Data	442 • 40 units need FFs per comment above	442 • 390 need SDAs per comment above	442 • All 442 need CATOX	442 • 230 units need CI only (b/c they already have a FF or a FF was added to control for PM) • 177 units need CI and a FF • 35 units need neither CI nor a FF because they have sufficient controls for Hg/dioxins
Total Cost to Coal-Fired Boilers	$307 M (capital)	$8.4 B (capital) $293 M/yr annual O/M	$4.6 B	$3.8 B (capital) $210M (O&M)
Average Cost Per Unit Assuming Annual O&M Costs: $31.3M	$5.4M	$16M (capital) $0.6M (O&M) TOTAL: $16.6M	$7.7M	$1M (capital – assuming FF for PM control) $0.6 (O&M) TOTAL: $1.6M

[8] Calculation per formula above: $2364 ÷ 175. One hundred seventy-seven units need CI and a FF; however, because EPA does not have capacity information for two of these units, they were excluded from the average calculation (177 – 2) (same here; units 5503 and 5504).

[9] Average annual O&M cost for SDAs was calculated by adding up the per unit O&M cost for each unit ($227M) in Column U and then dividing the total cost by the number of units requiring SDAs for which there is capacity data per fn3 (386).

[10] Average annual O&M cost for CI was calculated by adding up the per unit O&M cost for each unit ($143M) in Column V and then dividing the total cost by the number of units requiring CI for which there is capacity data per fn7 (226).