

## **EPA Cost Estimates for NO<sub>x</sub> Controls on Pulp and Paper Boilers are too Low by 100->300%**

Recent studies<sup>1, 2</sup> have revealed that in the experience of the pulp and paper industry, capital cost and cost efficiency for some NO<sub>x</sub> controls on industrial boilers are 100->300% higher than EPA's estimated costs for such controls. Highlights of the studies include:

### **Low NO<sub>x</sub> Burners (LNB)**

Capital costs and cost efficiencies for LNB for coal or coal/wood fired boilers are 260%-328% higher (depending on boiler size) than EPA's estimated costs.<sup>3</sup>

### **Selective Catalytic Reduction (SCR)**

Capital costs and cost efficiencies for SCR for coal fired boilers are 201-253% higher (depending on boiler size) than EPA's estimated costs.<sup>4</sup> To the best of our knowledge, SCR has never been demonstrated on coal fired boilers in the pulp and paper industry.

### **Selective Non-Catalytic Reduction (SNCR)**

EPA has estimated capital costs and cost efficiencies for SNCR used on coal fired boilers. No estimates were determined for wood fired boilers which are common in the pulp and paper industry. Capital costs and cost efficiencies for SNCR used on wood fired boilers are 130-165% higher than EPA's estimated costs for SNCR on coal fired boilers.<sup>5</sup>

<sup>1</sup>*Evaluation of Air Pollution Control Costs for the Pulp and Paper Industry*, May 1, 2003, Stone & Webster Management Consultants, Inc., 24 pp.

<sup>2</sup>*AF&PA Emission Control Study – Cost Estimate & Industry-Wide Model Phase I Pulp & Paper Industry*, September 2001, BE&K Engineering, 104 pp.

<sup>3</sup>See analysis summary on Page 2 (Please consider this summary analysis and the following 2 summaries as drafts since they have not been approved by AF&PA members).

<sup>4</sup>See analysis summary on Page 3.

<sup>5</sup>See analysis summary on Page 4.

Questions regarding cost estimates of boiler controls in the pulp and paper industry can be addressed to Glynn Rountree at 202-463-2762 or at [Glynn\\_rountree@afandpa.org](mailto:Glynn_rountree@afandpa.org).

**AF&PA — EPA Control Cost Comparison**  
**NOx Emissions, Coal**  
**LNB**

	Fuel	Technology	Reduction %	Capacity Factor	Capital Cost (\$ amount in 1000s) <sup>7 8 9</sup>			Cost Efficiency \$/ton of NOx		
					100MMBtu/hr	250MMBtu/hr	1000MMBtu/hr	100 MMBtu/hr	250 MMBtu/hr	1000 MMBtu/hr
EPA <sup>10</sup>	Coal	LNB <sup>11</sup>	51	50 83	\$509	\$968	\$2,554	849 512	645 389	426 256
AF&PA <sup>12</sup>	Coal <sup>13</sup> (or coal/ woodburner)	LNB (Good)	max .3lb/MMBtu	50 85	\$1,673	\$2,908	\$6,662	2789 1682	1937 1168	1111 668
<b>Percentage Difference</b>					328%	300%	260%	328%	300%	260%

**Capital Cost and Cost Efficiency**

AF&PA's capital cost and cost efficiency figures, taken from *AF&PA Emission Control Study—Cost Estimate & Industry-Wide Model Phase I Pulp & Paper Industry* (BE&K Engineering 2001), for LNB controls with coal-fired 100 MMBtu/hr boilers averaged approximately 328 percent more than EPA's figures for LNB controls with coal-fired 100 MMBtu/hr. AF&PA's capital cost and cost efficiency figures for LNB controls with coal-fired 250 MMBtu/hr boilers averaged approximately 300 percent more than EPA's figures for LNB controls with coal-fired 250 MMBtu/hr boilers. AF&PA's capital cost and cost efficiency figures for LNB controls with coal-fired 1000 MMBtu/hr boilers averaged approximately 260 percent more than EPA's figures for LNB controls with coal-fired 1000 MMBtu/hr boilers.

<sup>7</sup> Unclear if EPA's capital cost includes retrofit and indirect cost similar to the SO2 breakdown costs.

<sup>8</sup> EPA uses a scaling factor of .3 to project cost for boiler sizes

<sup>9</sup> AF&PA costs were scaled using a factor of .6

<sup>10</sup> Source: *Methodology, Assumptions, and Reference Preliminary NOx Controls Cost Estimates For Industrial Boilers*, EPA 2003

<sup>11</sup> LNB – Low NOx Burner

<sup>12</sup> Source: *AF&PA Emission Control Study—Cost Estimate & Industry-Wide Model Phase I Pulp & Paper Industry* (BE&K 2001)

<sup>13</sup> Coal boilers are 300,000lb/hr steam (roughly = 460MMBtu/hr)

**AF&PA — EPA Control Cost Comparison**  
**NOx Emissions, Coal**  
**SCR**

	Fuel	Technology	Reduction %	Capacity Factor	Capital Cost (\$ amount in 1000s) <sup>14 15 16</sup>			Cost Efficiency \$/ton of NOx		
					100MMBtu/hr	250MMBtu/hr	1000MMBtu/hr	100 MMBtu/hr	250 MMBtu/hr	1000 MMBtu/hr
EPA <sup>17</sup>	Coal	SCR <sup>18</sup>	80	50	\$1,456	\$2,765	\$7,298	2141	1766	1359
				83				1349	1123	876
AF&PA	Coal <sup>1920</sup>	SCR (Best)	80%, .17 lb/MMBtu, 30 day ave	50	\$3,693	\$6,440	\$14,703	5438	4114	2731
				85				3426	2616	1760
<b>Percentage Difference</b>					253%	232%	201%	253%	232%	201%

**Capital Cost and Cost Efficiency**

AF&PA's capital cost and cost efficiency figures, taken from *Evaluation of Air and Pollution Control Costs for the Pulp and Paper Industry* (Stone & Webster Management Consultants 2003), for SCR controls with a 80 percent reduction rate and coal-fired 100 MMBtu/hr boilers averaged approximately 253 percent greater than EPA's figures for SCR controls with coal-fired 100 MMBtu/hr boilers. AF&PA's capital cost and cost efficiency figures for SCR controls and coal-fired 250 MMBtu/hr boilers averaged approximately 232 percent greater than EPA's figures for SCR controls with coal-fired 250 MMBtu/hr boilers. AF&PA's capital cost and cost efficiency figures for SCR controls and coal-fired 1000 MMBtu/hr boilers averaged approximately 201 percent greater than EPA's figures for SCR controls with coal-fired 1000 MMBtu/hr boilers.

<sup>14</sup> Unclear if EPA's capital cost includes retrofit and indirect cost similar to the SO2 breakdown costs.

<sup>15</sup> EPA uses a scaling factor of .3 to project cost for boiler sizes

<sup>16</sup> AF&PA costs were scaled using a factor of .6

<sup>17</sup> Source: *Methodology, Assumptions, and Reference Preliminary NOx Controls Cost Estimates For Industrial Boilers*, EPA 2003

<sup>18</sup> SCR – Selective Catalytic Reduction

<sup>19</sup> Coal boilers are 300,000lb/hr steam (roughly = 460MMBtu/hr)

<sup>20</sup> Source: *Evaluation of Air and Pollution control Costs for the Pulp and Paper Industry*, Stone & Webster Management Consultants, Inc., 2003

**AF&PA — EPA Control Cost Comparison**  
**NOx Emissions, Coal and Wood**  
**SNCR**

	Fuel	Technology	Reduction %	Capacity Factor	Capital Cost (\$ amount in 1000s) <sup>21 22 23</sup>			Cost Efficiency \$/ton of NOx		
					100MMBtu/hr	250MMBtu/hr	1000MMBtu/hr	100 MMBtu/hr	250 MMBtu/hr	1000 MMBtu/hr
EPA <sup>24</sup>	Coal	SNCR <sup>25</sup>	40	14	\$526	\$1,000	\$2,639	4970	4015	2962
				50				2073	1814	1510
				83				1625	1473	1285
AF&PA <sup>27</sup>	Wood	SNCR (Best) <sup>28</sup>	.15lb/MMBtu	50	\$868	\$1,504	\$3,455	3420	2721	1978
Percentage Difference					165%	150%	130%	165%	150%	130%

<sup>21</sup> Unclear if EPA's capital cost includes retrofit and indirect cost similar to the SO2 breakdown costs.

<sup>22</sup> EPA uses a scaling factor of .3 to project cost for boiler sizes

<sup>23</sup> AF&PA costs were scaled using a factor of .6

<sup>24</sup> Source: *Methodology, Assumptions, and Reference Preliminary NOx Controls Cost Estimates For Industrial Boilers*, EPA 2003

<sup>25</sup> SNCR – Selective Non-Catalytic Reduction

<sup>27</sup> Source: *AF&PA Emission Control Study—Cost Estimate & Industry-Wide Model Phase I Pulp & Paper Industry* (BE&K 2001)

<sup>28</sup> Wood boiler size is 300,000 lb/hr steam (300,000 lb/hr steam coal boiler roughly = 460 MMBtu)