10/29/08

BP BART
Fuel Gas Conditioning Cost Effectiveness Calculation - Overall
Cherry Point Refinery, Whatcom County, Washington

CAPITAL COSTS		
DIRECT COSTS	**COST**	**Source**
A. Purchased Equipment		
a. Equipment (Material & Labor)	$4,475,340	BP FGC Team Appraise Estimate
b. Concrete (Material & Labor)	$222,900	BP FGC Team Appraise Estimate
b. Civil (Material & Labor)	$690,100	BP FGC Team Appraise Estimate
c. Steel (Material & Labor)	$761,400	BP FGC Team Appraise Estimate
d. Fireproofing (Material & Labor)	$595,900	BP FGC Team Appraise Estimate
e. Piping (Material & Labor)	$4,806,160	BP FGC Team Appraise Estimate
f. Insulation (Material & Labor)	$627,800	BP FGC Team Appraise Estimate
g. Instruments (Material & Labor)	$2,007,500	BP FGC Team Appraise Estimate
b. Electrical (Material & Labor)	$231,660	BP FGC Team Appraise Estimate
i. Conduit (Material & Labor)	$457,100	BP FGC Team Appraise Estimate
j. Painting (Material & Labor)	$140,300	BP FGC Team Appraise Estimate
k. Scaffolding (Material & Labor)	$1,482,100	BP FGC Team Appraise Estimate
l. Firewatch/Holewatch (Material & Labor)	$650,300	BP FGC Team Appraise Estimate
m. MTO Allowance (Material & Labor)	$2,008,000	BP FGC Team Appraise Estimate
n. Freight	$428,000	BP FGC Team Appraise Estimate
Total Direct Field Costs	$19,557,560	*Calculation*
B. Direct Installation Costs		
a. Construction Service Labor (included in craft billing rates)	$0	BP FGC Team Appraise Estimate
b. Non-Productive (bus) time (5%)	$410,805	BP FGC Team Appraise Estimate
c. Small Tools (included in craft billing rates)	$0	BP FGC Team Appraise Estimate
d. Consumables (included in craft billing rates)	$0	BP FGC Team Appraise Estimate
e. Non-Payroll Taxes & Insurance (included in craft billing rates)	$0	BP FGC Team Appraise Estimate
f. Construction Equipment (included in craft billing rates)	$0	BP FGC Team Appraise Estimate
g. Field Staff (included in craft billing rates)	$0	BP FGC Team Appraise Estimate
h. OH & Profit (included in craft billing rates)	$0	BP FGC Team Appraise Estimate
i. Premium on OT Work (11%)	$999,591	BP FGC Team Appraise Estimate
j. Per Diem Allowance (6%)	$373,686	BP FGC Team Appraise Estimate
k. Crane Cost	$200,000	BP FGC Team Appraise Estimate
l. Safety Control (5%)	$410,905	BP FGC Team Appraise Estimate
Total Direct Installation Costs	$2,394,987	*Calculation*
Total Direct Costs	$21,952,960	*Calculation*
INDIRECT COSTS		
C. Indirect Installation		
a. Detailed Design (16%)	$9,293,200	BP FGC Team Appraise Estimate
b. License Fee	$100,000	BP FGC Team Appraise Estimate
c. Proprietary Hardware	$800,000	BP FGC Team Appraise Estimate
d. Engineering Fee	$130,000	BP FGC Team Appraise Estimate
e. Client Costs (20%)	$6,250,000	BP FGC Team Appraise Estimate
Total Indirect Costs [ICC]	$16,573,200	*Calculation*
D. Project Contingency ([DCC + ICC]*0.4)	$15,755,680	Jacobs - ROM ± 50%
E. Escalation	$0	BP FGC Team Appraise Estimate
F. Catalyst	$75,000	BP FGC Team Appraise Estimate
G. Substation	$10,000,000	BP FGC Team Appraise Estimate
H. NHT Upgrades	$5,000,000	BP FGC Team Appraise Estimate
I. Vaporizer in LEU	$5,000,000	BP FGC Team Appraise Estimate
Total Project Cost (in 2006 dollars)	$70,590,225	*Calculation*
Total Annualized Capital Costs [TACC] (20 years @ 7% interest)	$6,663,218	*Calculation*
DIRECT AND INDIRECT ANNUALIZED COSTS		
DIRECT OPERATING COSTS (DOC)		
J. Operating Cost (assumed 0.035 *installed cost)	$2,470,658	Jacobs
K. Maintenance Labor and Costs (0.015*installed cost)	$1,058,853	Jacobs based on OAQPS
Control Combination - Total Direct and Indirect Annualized Costs [TDIAC] (DOC+IOC)	$3,529,511	*Calculation*
TOTAL ANNUALIZED COSTS [TAC] (TACC+TDIAC)	$10,192,729	*Calculation*

OAQPS "EPA Air Pollution Cost Manual" Sixth Edition, January 2002, EPA/452/B-02-001
Office of Air Quality Planning and Standards (OAQPS).

Changed from SO_2

BART Emission Unit ID	Point ID	BART Source Point Discription	PM Reduction tpy	Total Project Cost $	Total Operating Cost $	Cost per ton $/ton
1	10	Crude Charge Heater	6	13,529,778	676,489	$323,896
34	12	South Vacuum Heater	2	4,251,434	212,572	$323,896
3	22	Naphtha HDS Charge Heater	1	2,417,661	120,883	$323,896
4	23	Naphtha HDS Stripper Reboiler	1	1,462,001	73,100	$323,896
5	20	#1 Reformer Heaters	7	16,180,082	809,004	$323,896
6	40	Coker Charge Heater (#1 North)	1	3,257,000	162,850	$323,896
7	41	Coker Charge Heater (#2 South)	1	3,314,020	165,701	$323,896
8	50	Diesel HDS Charge Heater	0	768,634	38,432	$323,896
9	51	Diesel HDS Stabilizer Reboiler	1	1,274,974	63,749	$323,896
10	60	Reforming Furnace #1 - (North H2 Plant)	3	7,018,059	350,903	$323,896
11	61	Reforming Furnace #2 - (South H2 Plant)	3	6,883,491	344,175	$323,896
12	32	R-1 HC Reactor Heater	1	2,034,484	101,724	$323,896
13	33	R-4 HC Reactor Heater	0	957,485	47,874	$323,896
14	30	1st Stage HC Fractionator Reboiler	2	3,945,121	197,256	$323,896
15	31	2nd Stage HC Fractionator Reboiler	1	3,296,002	164,800	$323,896
		Sum	31			

File: appendix E PM10 - PM25.XLS
Worksheet = FGC-Overall