



Interoffice Communication

To J. A. DeBernardi
From D. A. Pruitt
Date May 14, 1981
Subject Muriatic Acid Carbon Bed Economics

Attached is a summary of the economics for installation of a carbon bed to remove the green coloration from the plant's muriatic acid stream and sell the muriatic acid to Reagent Chemical for 35% of market value. For the base case, which assumed current production rates for the first 1½ years and expansion rates for the remainder of the project life, a DCF rate of return of 90.6% was calculated. It was assumed that muriatic acid would only be produced when burning light ends and that the entire plant light ends production will be incinerated, based on 1980 production for present rates (a conservative estimate), and based on the expansion design material balance for expanded rates. Capital costs for the project were estimated to be \$146,000. This includes the price of a new carbon bed vessel and the required piping for operation and carbon regeneration.

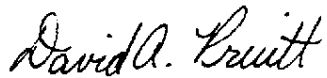
Several sensitivities were calculated to determine the effects of possible variances on the project. As can be seen in the attached Project Economics Sensitivity Analysis, the project provides a high DCF rate of return even for the worst cases. Regeneration costs and carbon replacement have very little effect on the overall project economics, while capital costs, revenues, light ends prices, and the plant expansion show a much greater effect.

Calculations show that if light ends prices increased to greater than 4.41¢ per pound, acid could not be economically concentrated while incinerating light ends. The sale of light ends to another customer (such as PPG) which would not require Conoco to pay transportation charges would drastically reduce the profits from muriatic acid sales. With no light ends incineration, an acid concentration of at least 16% from HCl Absorber C-901 must be maintained to make acid concentration and sales economical.

One other factor which would have a very significant impact on the carbon bed installation would be the sale of "as is" acid. Reagent has contacted Conoco and reported that they may have a market for 27% HCl with much less restrictive quality specifications than the 31.5% HCl. If 27% acid can be sold with no carbon bed cleanup requirement, a minimum price of 1.15¢ per pound (\$23/ton or approximately 14% of market value) on a dry HCl basis would result in economics equally attractive to the base case for the carbon bed project. Also, the risks involved with 27% HCl sales would be much lower than those with a carbon bed and 31.5% HCl sales. Therefore, it appears that the sale of 27% HCl with no cleanup is much more attractive if a price of at least \$23 per ton can be obtained.

J. A. DeBernardi
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Please contact me if there are any questions or comments concerning the economics of muriatic acid sales.

A handwritten signature in cursive script that reads "David A. Pruitt".

David A. Pruitt
Process Engineer

br
cc + attachment
JWW-MLA-GLF-PLF-HLH-DLD-PE
Mike Eagen - Houston

CCR 000067122

MURIATIC ACID CARBON BED
PROJECT ECONOMICS SENSITIVITY ANALYSIS

Base Case: Capital Commitment: \$146,000

DCF Return: 90.6%

Discounted Payout Period: 2.5 years

<u>Possible Variances</u>			<u>% DCF Return</u>	
<u>Minus</u>	<u>Plus</u>		<u>Impaired To</u>	<u>Improved To</u>
+ 50%	-30%	Capital Commitment(1)	66.5	118.8
+100%		Capital Commitment(1)	53.0	
- 20%	+20%	Revenue(2)	72.5	107.3
		Light Ends Valued at Sale Price(3)	34.7	
+100%	-50%	Regeneration Costs(4)	76.3	97.0
6 mo.	2 yr.	Carbon Replacement Frequency(5)	87.8	92.3
		No Expansion(6)	67.8	

Notes:

- 1) Capital Commitment - +50% and -30% reflect the range of the less than budget quality estimate. +100% reflects a large contingency factor.
- 2) Revenue - +20% and -20% reflect possible fluctuations in cost savings.
- 3) Light Ends Valued at Sale Price - Variance reflects the possibility that light ends be sold with no transportation costs.
- 4) Regeneration - This variance reflects the effect of changes in regeneration costs.
- 5) Carbon Replacement Frequency - This variance reflects the possibility that carbon replacement will not occur once a year.
- 6) No Expansion - This variance reflects muriatic acid production rates based on current light ends production for the life of the project.

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MURIATIC ACID CARBON BED
PROJECT ECONOMIC BASIS

Capital Cost

- 1) The capital cost of \$146,000 is based on a budget estimate taken from a 1980 definitive estimate. The budget estimate contains added cost of \$15,000 for a new carbon bed rather than the used Reagent bed and \$9,000 for new steam piping. The estimate was escalated at 12½%.

Revenues

- 1) Cost Savings

Revenues are the difference between operating costs when light ends are incinerated and acid is sold, and operating costs for acid neutralization. Current acid production rates are assumed for 1½ years, while expansion rates are assumed for the remainder of the project life. Muriatic acid prices are from M. C. Eagen and all costs are from the March, 1981 IPA. All prices and costs are escalated at the rates used in the 1981 Capital Budget. (See Tables 1, 2, and 3 attached)

Costs

- 1) Regeneration

Regeneration frequency is assumed to be after 80 bed volumes of acid have been treated based on laboratory tests. This frequency is approximately every 2 weeks before expansion and every 4½ days after expansion. Costs are based on 20,000 lbs. of 50 psig steam, 20,500 lbs. (three bed volumes) of muriatic acid, and 22,440 gallons (10 bed volumes) of process water. Costs are escalated at 12% per year.

- 2) Carbon Replacement

Replacement of carbon is assumed yearly and costs are escalated at 12%.

- 3) Maintenance

4% of construction capital for the first year of operation (plant experience) and escalated at 8% per year.

- 4) Insurance and Taxes

2% of construction capital for the first year of operation (plant experience) and escalated at 7% per year.

Other

- 1) Engineering and Startup

5% of construction capital (plant experience).

- 2) Salvage Value

5% of construction capital (plant experience).

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TABLE I -- Revenue and Cost Summary for Muriatic Acid (Hourly Basis)

Item	Unit	¢/Unit	CASE I		CASE II	
			Neutralize HCl		Burn LE & Concentrate	
			Quantity	Revenue (Cost)\$	Quantity	Revenue (Cost)\$
Muriatic Acid	Lb.	2.8	0	0	1535	\$42.98
Anhydrous HCl	Lb.	5.5682	0	(0)	362	(20.16)
Light Ends	Lb.	0.7500	0	(0)	943	(7.07)
Natural Gas	MSCF	320.7841	10.4	(33.36)	6.954	(22.31)
Water	M Gal.	14.3125	0	(0)	0.420	(0.06)
Limestone	Lb.	0.7279	1014	(7.38)	0	(0)
Electricity	KWH	2.9260	10.44	(0.31)	26.48	(0.77)
Caustic	Lb.	10.4223	8	(0.83)	0	(0)
Margin				(\$41.88)		(\$7.39)

Cost Savings = (\$7.39) - (\$41.88) = \$34.49/Hr.

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TABLE 2 -- Revenue and Cost Summary for Muriatic Acid After Expansion (Hourly Basis)

Item	Unit	¢/Unit	CASE I		CASE II	
			Neutralize HCl		Burn LE & Concentrate	
			Quantity	Revenue (Cost)\$	Quantity	Revenue (Cost)\$
Muriatic Acid	Lb.	2.8	0	0	2135	\$59.78
Anhydrous HCl	Lb.	5.5682	0	(0)	504	(28.13)
Light Ends	Lb.	0.7500	0	(0)	1135	(8.51)
Natural Gas	MSCF	320.7841	10.4	(33.36)	6.252	(20.06)
Water	M Gal.	14.3125	0	(0)	0.420	(0.06)
Limestone	Lb.	0.7279	1521	(11.07)	0	(0)
Electricity	KWH	2.9260	10.44	(0.31)	26.48	(0.77)
Caustic	Lb.	10.4223	12	(1.25)	0	(0)
Margin				(\$45.99)		\$2.25

Cost Savings = \$2.25 - (\$45.99) = \$48.24/Hr.

TABLE 3 -- Yearly Cost Savings for Muriatic Acid Sales

Case	Light Ends Production MM Lbs./Yr.	Operation Time Hrs./Yr.	Total Cost Savings \$/Yr.
Existing Plant	5.025	5,329	184
Expanded Plant	9.080	8,000	386

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5-11-81

MURIATIC ACID CARBON BED

BASE CASE

CALCULATION OF PROJECT ECONOMICS (M\$)

PROJECT YEAR	-2	-1	1	2	3	4	5	6	7	8	9	10
REVENUES												
COST SAVINGS			184.0	301.0	432.0	457.0	484.0	512.0	541.0	573.0	606.0	641.0
COSTS												
MAINTENANCE			5.8	6.3	6.8	7.4	7.9	8.6	9.3	10.0	10.8	11.7
INSURANCE AND TAXES			2.9	3.1	3.3	3.6	3.8	4.1	4.4	4.7	5.0	5.4
REGENERATION			14.5	42.1	85.2	95.4	107.0	120.0	134.0	150.0	168.0	188.0
CARBON REPLACEMENT			8.0	9.0	10.0	11.2	12.6	14.1	15.8	17.7	19.8	22.2
DEPRECIATION-CONSTRUCTION CAPITAL			19.5	33.7	26.5	22.1	17.7	13.3	6.0	0.0	0.0	0.0
TOTAL COSTS			50.7	94.2	131.9	139.7	149.0	160.0	169.4	182.4	203.6	227.2
TAXABLE INCOME			133.3	206.8	300.1	317.3	335.0	352.0	371.6	390.6	402.4	413.6
INCOME TAX			64.0	99.2	144.0	152.3	160.8	168.9	178.4	187.5	193.1	198.6
INVESTMENT TAX CREDIT			14.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AFTER TAX INCOME			83.9	107.5	156.1	165.0	174.2	183.0	193.2	203.1	209.2	215.2
OPERATING CASH FLOW			103.4	141.3	182.6	187.1	191.9	196.3	199.2	203.1	209.2	215.2
INVESTMENT												
CONSTRUCTION CAPITAL (0.0)(-146.0)												
AFTER TAX STARTUP (3.8)												
SALVAGE VALUE-CONSTRUCTION CAPITAL												7.3
NET CASH FLOW (0.0)(-149.8)			103.4	141.3	182.6	187.1	191.9	196.3	199.2	203.1	209.2	222.5

DCF RETURN= 90.6%
DISCOUNTED PAYOUT PERIOD, YEARS= 2.5

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