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ESTIMATING THE ECONOMIC IMPACT OF ENVIRONMENTAL INVESTMENTS ON RETAIL COSTS AND DEALER STRATEGIES FOR OFFSETTING THESE COSTS

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INTRODUCTION

Retail agrichemical dealers have become increasingly familiar with the concept of containment over the past several years. Currently, containment regulations are in place in 13 states, and are being drafted in 7 others. Agrichemical dealers in these states will be required to assess the potential environmental impact of their operating practices on the land under and around the retail production site. These dealers, both dry and fluid, will be required to install containment around their fertilizer storage and material transfer points to prevent spilled fertilizers and chemicals from contaminating the soil and/or surface-groundwater resources. Typically, containment includes concrete loading/unloading pads, dikes around tanks and mixing equipment, synthetic liners under storage tanks, storm water retention systems, etc.

Obviously, the addition of these containment structures or devices will increase dealer costs. Since the investments will be "dry" or passive, no increase in returns is expected that can be directly attributed to this investment in the traditional sense. However, these increased costs will impact profitability, and in order to maintain margins, dealers will have to adjust marketing, pricing, and operational strategies accordingly in most instances. Their options include: (1) increasing tonnage at current prices, (2) increasing product prices, (3) reducing costs, or (4) accepting a lower return. Typically, the fertilizer dealer will attempt to use a combination of the above options in order to maintain profitability. However, no single best strategy exists for all dealers.

A recent survey of TVA model site and individual technology demonstration dealers attempted to gain insight into the impact these investments in containment structures, changing operating practices, and state containment regulations were having on annual production costs. The survey revealed that only 3 of the 27 demonstrators responding to the survey had made initial estimates of the additional annual costs that would be incurred as a result of the environmental investment. Thus, it is apparent that a methodology for estimating annual environmental costs, based on the level of investment, would be useful to agrichemcial dealers for planning purposes prior to the actual investment.

The purpose of this paper is to (1) provide the agrichemical dealer a methodology for quickly estimating the potential impact that environmental investments will have on annual production costs, and (2) to evaluate the effectiveness of alternative management strategies employed to offset some, or in some cases, all of these additional costs.

IMPACT OF ENVIRONMENTAL INVESTMENTS ON ANNUAL PRODUCTION COSTS

The first step in the analysis is to annualize the fixed costs associated with the proposed environmental investment. Annual fixed costs would include (1) depreciation, (2) maintenance and repairs, (3) taxes and insurance, and (4) interest costs. The actual costs incurred by agrichemical dealers will vary, but preliminary estimates can be reasonably approximated. Depreciation, in this paper, is calculated based on the straight-line method, no salvage value, and a 15 year life of the environmental asset. Annual maintenance and repair costs associated with pollution prevention structures at TVA demonstration sites averaged 2.5-percent of initial investment in environmental structures. Annual taxes and insurance cost at the TVA demonstration sites averaged 2.2-percent of initial environmental investment. Interest costs are calculated based on a 10-percent annual rate with a 3 year payoff.

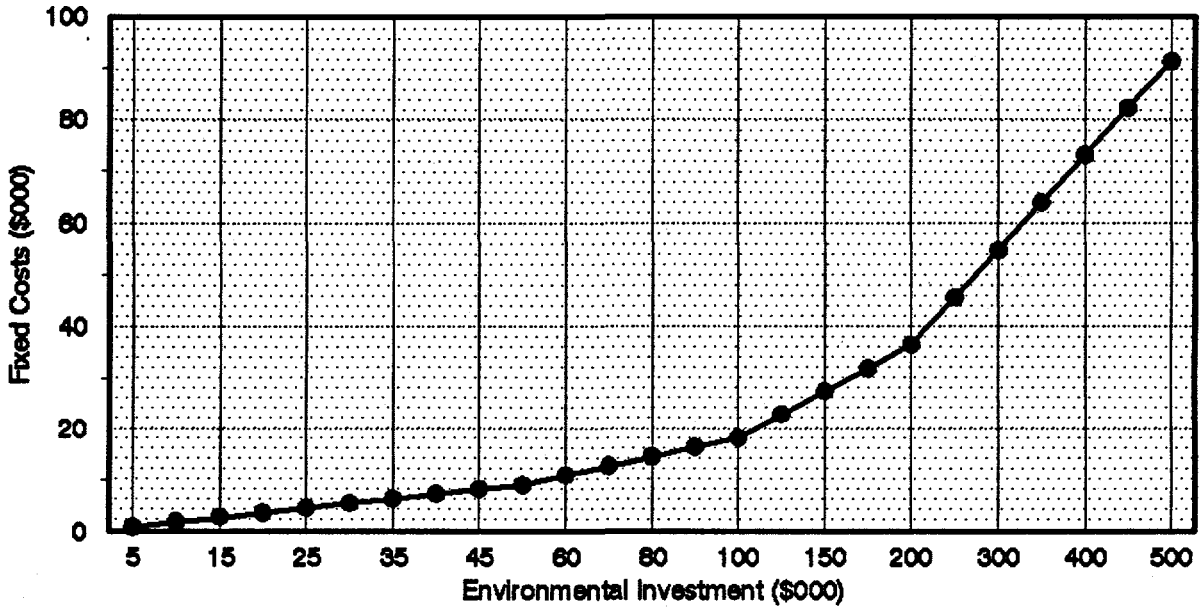
Using this approach, estimated annual costs associated with environmental investments ranging from $5,000 to $500,000 are presented in appendix table 1 and shown graphically in figure 1 on the following page. To use this table, read down the left-hand column for the appropriate investment and then read across to the right-hand column for the associated annual cost. For example, the estimated annual costs associated with the $100,000 median investment in environmental structures at 18 TVA demonstration sites would be equal to $18,245 per year.

The argument could be made that there are also environmentally related variable costs that should be considered. However, in most instances, these operating costs are labor related and represent a more efficient utilization of the existing labor complement rather than an addition to it.

IMPACT OF ENVIRONMENTAL INVESTMENTS ON BREAK-EVEN TONNAGE AND PROFITS

Appendix table 2 contains the initial assumptions on tonnage, price, and profitability for a hypothetical agrichemical site prior to the environmental investment being made. Annual tonnage is assumed to be 10,000 tons per year with an average blended selling price for all fertilizer products of $214.20 per ton. Variable operating costs, comprised of the blended cost per ton of raw materials used in the production of fertilizer products, are equal to $190.00 per ton. Fixed costs are assumed to be $200,000 per year or $20.00 per ton. This ratio of price to cost yields an initial net profit margin of 2-percent for the business unit prior to environmental outlays.

Figure 1
Estimated Annual Fixed Costs Associated With Alternative Levels Of Environmental Investment



Given these assumptions on profitability, what impact does the increase in annual costs arising from environmental investments have on tonnage and/or product pricing if the dealer wants to maintain his current financial position? Though the most accurate estimates would be obtained from a detailed economic analysis, the concept of "Contribution to Overhead" (CTO) can be used to obtain "ball park" estimates.

The CTO shows the portion of each unit of sales that remain after variable costs are covered and that can be applied toward fixed or overhead costs. The dollar value of additional sales required to offset annual environmental costs is generated by dividing the estimated annual cost of the environmental investment by the CTO. The additional fertilizer tonnage required to generate this sales volume is calculated by dividing the additional dollar sales volume by the blended selling price for fertilizer products.

The CTO is calculated by subtracting the variable cost per dollar of sales from the revenue per dollar of sales. For example, if the average selling price of fertilizer is $214.20 per ton and the variable cost $190 per ton, the CTO per dollar of sales would be $0.1130 (($214.20-$190.00)/$214.20). In this example, the cost of raw materials was assumed to be the only variable cost although any cost that is variable in nature should be included. However, in most cases raw materials cost dominates variable cost and therefore is a good proxy for total variable cost.

By definition, the CTO changes as product prices and/or variable costs change. As the CTO changes so does the sales volume required to offset the additional annual cost associated with a specified investment. Conversely, as product prices change, so does the tonnage necessary to generate a specified sales volume for a given CTO.

The data in Appendix Table 3 illustrate the relationships discussed above. This table contains: (1) the estimated annual cost associated with alternative levels of environmental investment (columns 1-2), (2) the estimated additional dollar sales volume and tonnage (over and above current sales levels) that must be generated to cover the annual cost of environmental investment and maintain profitability (option 1, columns 3-4), and (3) the sensitivity of sales volume/tonnage, as well as the CTO and facility break-even tonnage, to changes in product pricing.

OPTIONS AVAILABLE TO THE AGRICHEMCIAL DEALER

To illustrate the mechanics of the process and how it can be used to evaluate the financial impact of investments in fertilizer containment, let's assume a $100,000 investment in containment is required to meet regulatory requirements. The annual cost of this investment is estimated to be $18,245 (from appendix table 1). What options or management strategies are available to the dealer to offset the additional environmental costs and maintain profitability?

Option 1--Increase Annual Tonnage With No Price Increase

An agribusiness dealer who is operating on a positive net margin can offset at least a portion of the annual environmental costs by increasing annual tonnage. The additional dollar sales volume and associated tonnage that must be generated to cover environmental costs and maintain pre-investment profitability is found in appendix table 3, columns 3 and 4.

In this example, the additional sales and tonnage required to offset the annual cost of the environmental investment is estimated to be $161,489 and 754 tons respectively. The additional sales volume is calculated by dividing the additional annual cost ($18,245) by the CTO per dollar of sales ($0.1130). The additional tonnage is calculated by dividing the additional annual sales volume ($161,489) by the blended price of fertilizer products sold ($214.20).

The agribusiness dealer may or may not have the capability of increasing his annual tonnage 754 tons which is equal to about a 7.5 percent annual increase. If the dealer cannot find the additional tonnage in his market, as a result of current commodity programs, lower average application rates, or the dealer competition in the market area, other options should be evaluated.

Option 2--Increase Product Prices

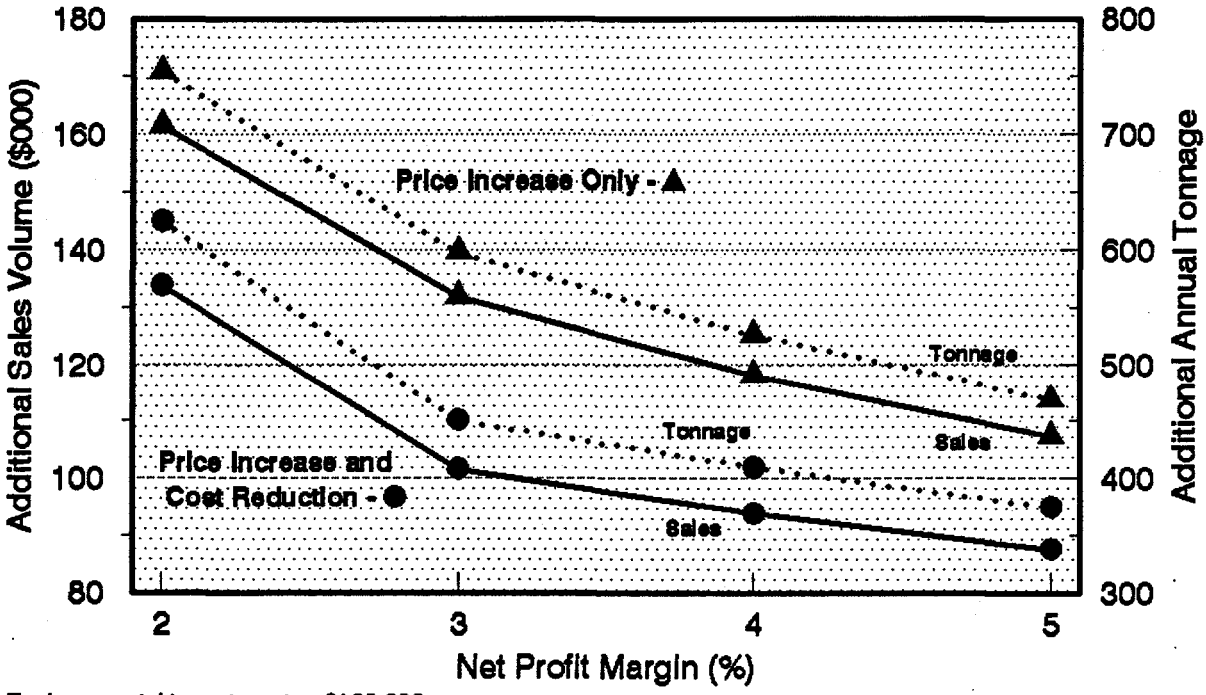
A second option that may be available to the dealer is to increase product prices, which in turn increases the CTO (assuming variable costs remain constant) and reduces the sales volume and tonnage required to offset the increased cost and remain in a stable financial situation. These options are shown in columns 5-10 of appendix table 3, and illustrated graphically in figure 2 on the following page.

Here we see that if product prices increase from $214.20 to $220.50, increasing the net profit margin from 2 to 3 percent, the CTO increases to $0.1383. The increase in CTO reduces the dollar sales required to offset the cost of the investment from $161,489 in Option #1 to $131,901. The additional tonnage necessary to generate this new sales volume declines from 754 to 598 tons. This data, which illustrates the impact that product pricing has on break-even sales and tonnage, is represented by the top two lines in figure 2.

If the dealer can increase the average selling price to $224.70, increasing the net profit margin to 4-percent, the sales volume required to offset the cost of the investment would decline still further to $118,144 or 526 tons; and increasing the net margin to 5-percent would reduce the additional sales volume to $107,358 or 469 tons.

The recent TVA survey of demonstration dealers revealed that all dealers had attempted to increase tonnage and prices. While 80-percent of the demonstrators reported tonnage

Figure 2
Estimated Additional Sales Volume and Tonnage Required to Offset Annual Environmental Costs



Environmental Investment = $100,000
Estimated Annual Cost Of Investment = $18,245

increases, about half indicated that increased tonnage had offset 28-percent of their additional annual costs. All the demonstrators indicated they had tried to increase product prices but were limited by their competitors, many of whom were still in non-compliance with containment regulations. However, about half of the respondents reported that increased product prices had offset 40-percent of the additional environmental costs. Unfortunately, the demonstrators reporting these two sets of numbers were not necessarily the same so the percentages are not additive. What was clear was that these dealers were pursuing a mix of management strategies designed to offset the cost of their environmental investment.

Agricultural market factors and competition among agrichemical dealers will limit the extent to which tonnage and/or price increases can be used to offset increased costs associated with environmental investments. Therefore, the astute dealer must determine the maximum price the farmers in his market area are willing to pay, set his prices accordingly, and then aggressively compete for market share. If environmental costs are still not covered, or attaining additional market share is not feasible, the dealer must then cut costs to maintain or improve profitability.

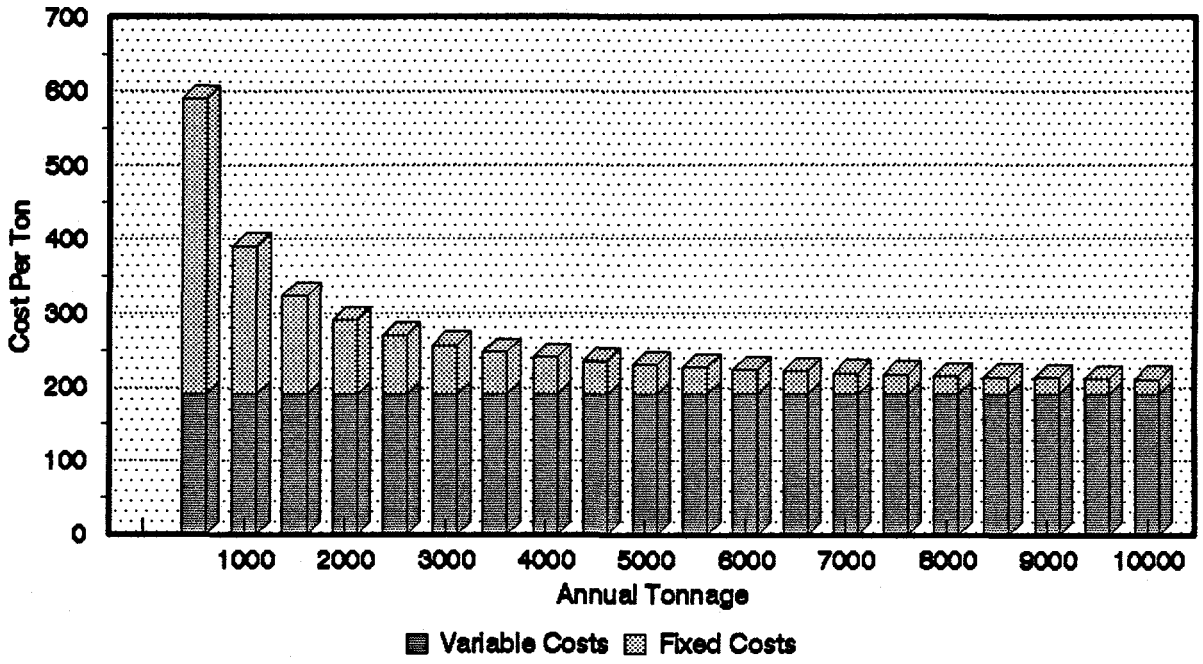
Option 3--Reduce Costs/Increase Product Prices

The cost structure for a typical agrichemical facility is shown graphically in figure 3. While the data is hypothetical in nature and follows the example used in this paper, it does closely represent the basic cost structure TVA has observed in the agrichemical industry over the past 15 years.. That being, variable costs account for 80 to 90 percent of total annual cost of production at mature agrichemical facilities. Variable costs, primarily consisting of raw material costs, are constant and in the example are set at $190.00 per ton. However, annual fixed costs, when converted to a per ton basis, decline as annual production increases. The decline is relatively sharp initially, and then "flattens" out after about 4,000-5,000 TPY of production is achieved. The end result is that total cost too becomes relatively constant after 4,000-5,000 TPY as economies of scale are attained. Until such time as additional investments are made to increase plant capacity the only way to quickly and effectively reduce the total cost of production is to lower the delivered cost of raw materials.

Production costs can also be lowered by reducing expenditures for maintenance and repairs, reduce "part-time labor expenditures, and eliminate those farmer services and/or product lines that have only marginal returns. These reductions may also facilitate the retirement of fixed assets, thereby reducing annual fixed costs. However, these reductions may also impact production and application capacity and efficiency as well as a loss of market share, so care must be taken before these changes are implemented.

It is important to remember that the additional sales and tonnage required to maintain profitability are directly impacted by the product pricing and the level of variable cost. As

Figure 3
Cost Structure For Hypothetical Agrichemical Facility



variable costs are lowered (i.e. reduced raw material costs), the CTO increases and results in less additional sales and tonnage being required to offset the costs associated with an investment. A reduction in fixed costs does not change the calculated CTO value and thus does not lower the additional sales required even though the net profit margin is increased and facility break-even tonnage is reduced.

For example, if variable costs could be reduced by $5 per ton to $185, the new CTO would be $0.1363 (appendix table 4, Option 3A). The sales volume required to offset the $18,245 annual cost of the environmental investment would decline from $161,489 in Option #1 to $133,837 and additional tonnage would decline from 754 tons to 625.

A combined management strategy of reducing variable costs and increasing product prices offers the greatest probability of maintaining or improving profitability (Option 3B in appendix table 4, and the lower two lines in figure 2). Using this combined strategy, additional sales were reduced by an additional $25,438 or 122 tons over increasing prices only as defined in Option #2. In addition, the net profit margin increased by almost 2.5-percent and facility break-even tonnage declined by an average of just over 1,000 tons.

Option 4--No Increase in Tonnage or Price

The only viable option for many dealers may be to just absorb the additional cost associated with environmental investments. In this example, the dealer had a 2-percent initial net profit margin; if the additional $18,245 annual costs were simply absorbed, the profit margin would decline to 1.12-percent.

However, in many cases where dealers are operating near break-even, absorbing additional costs would result in a negative profit margin; and may be a viable option in the very short run--the dealer will stay in business as long as variable production costs are covered. Market conditions do change. A competitor may go out of business freeing up market share, or raw material costs (variable costs) may decline, resulting in changes in CTO that make break-even sales and tonnage attainable. Also, there are many tangible and intangible benefits associated with environmental investments that tend to enhance profitability.

Summary

Without question, containment requirements will cause adjustments in the retail fertilizer industry. The companies that already have good environmental management practices in place probably will increase their market area (and tonnage) at the expense of the low-volume, low-margin, operations.

Containment costs will have a significant impact on the profit/volume relationship of fertilizer operations. Aggressive dealers will need to enter into these investment decisions with estimates of the probable impact on profitability and options for ensuring the long-term economic viability of their operation.

The purpose of this paper has been to provide the retail fertilizer dealer with a "quick and dirty" approach to estimating the potential impact of environmental containment on his business's financial future. It is not meant to be a substitute for the more rigorous and detailed financial analysis needed when contemplating a decision of this potential impact.

APPENDIXES

Appendix Table 1
Estimated Annual Fixed Costs Associated With Alternative Levels Of Investment In Pollution Prevention Structures

Investment In Containment	Depreciation	Taxes And Insurance	Maintenance And Repairs	Interest On Investment	Annual Fixed Cost
			(Dollars)		
5,000	333	110	125	344	**912**
10,000	667	220	250	688	**1,824**
15,000	1,000	330	375	1,032	**2,737**
20,000	1,333	440	500	1,376	**3,649**
25,000	1,667	550	625	1,720	**4,561**
30,000	2,000	660	750	2,063	**5,473**
35,000	2,333	770	875	2,407	**6,386**
40,000	2,667	880	1,000	2,751	**7,298**
45,000	3,000	990	1,125	3,095	**8,210**
50,000	3,333	1,100	1,250	3,439	**9,122**
60,000	4,000	1,320	1,500	4,127	**10,947**
70,000	4,667	1,540	1,750	4,815	**12,771**
80,000	5,333	1,760	2,000	5,503	**14,596**
90,000	6,000	1,980	2,250	6,190	**16,420**
100,000	6,667	2,200	2,500	6,878	**18,245**
125,000	8,333	2,750	3,125	8,598	**22,806**
150,000	10,000	3,300	3,750	10,317	**27,367**
175,000	11,667	3,850	4,375	12,037	**31,928**
200,000	13,333	4,400	5,000	13,756	**36,490**
250,000	16,667	5,500	6,250	17,195	**45,612**
300,000	20,000	6,600	7,500	20,634	**54,734**
350,000	23,333	7,700	8,750	24,074	**63,857**
400,000	26,667	8,800	10,000	27,513	**72,979**
450,000	30,000	9,900	11,250	30,952	**82,102**
500,000	33,333	11,000	12,500	34,391	**91,224**

Inputs For Calculation Of Annual Costs:		
Depreciable Life (Years)	15	
Salvage Value	$0	
Taxes and Insurance (% Of Investment)	2.20%	
Maintenance and Repairs (% Of Investment)	2.50%	
Interest Rate On Investment And Length Of Loan	10.00%	3 Years
Operating Costs (% Of Investment)	13.00%	

Appendix Table 2

Initial Tonnage, Price, and Profitability Assumptions

Item	Total Revenue/Cost	Revenue/Cost Per Ton
Annual Tonnage	10,000	
Average Blended Price		$214.20
Total Revenue	$2,142,000	$4.20
Total Cost	$2,100,000	$210.00
Variable Costs	$1,900,000	$190.00
Fixed Costs	$200,000	$20.00
Net Profit Margin		**2.00%**
CTO - Per Dollar Sales		$.1130
Break-even Tonnage		8,264

Appendix Table 3

Estimated Additional Tonnage Necessary For Specified Pricing Strategies Required To Offset The Additional Overhead Costs Associated With Investments In Environmental Containment

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
		Option 1 No Increase In Price		Option 2 Alternative Pricing Strategies					
		No Change In Net Margin		1% Increase In Net Margin		2% Increase In Net Margin		3% Increase In Net Margin	
Amount Of Investment	Estimated Annual Cost	Additional $ Sales	Tonnage	Additional Sales	Tonnage	Additional Sales	Tonnage	Additional Sales	Tonnage
(Dollars)		(Dollars)	(Tons)	(Dollars)	(Tons)	(Dollars)	(Tons)	(Dollars)	(Tons)
5,000	912	8,074	38	6,595	30	5,907	26	5,368	23
10,000	1,824	16,149	75	13,190	60	11,814	53	10,736	47
15,000	2,737	24,223	113	19,785	90	17,722	79	16,104	70
20,000	3,649	32,298	151	26,380	120	23,629	105	21,472	94
25,000	4,561	40,372	188	32,975	150	29,536	131	26,840	117
30,000	5,473	48,447	226	39,570	179	35,443	158	32,207	141
35,000	6,386	56,521	264	46,165	209	41,351	184	37,575	164
40,000	7,298	64,596	302	52,760	239	47,258	210	42,943	188
45,000	8,210	72,670	339	59,355	269	53,165	237	48,311	211
50,000	9,122	80,745	377	65,951	299	59,072	263	53,679	235
60,000	10,947	96,894	452	79,141	359	70,887	315	64,415	281
70,000	12,771	113,042	528	92,331	419	82,701	368	75,151	328
80,000	14,596	129,191	603	105,521	479	94,515	421	85,887	375
90,000	16,420	145,340	679	118,711	538	106,330	473	96,622	422
100,000	18,245	161,489	754	131,901	598	118,144	526	107,358	469
125,000	22,806	201,862	942	164,876	748	147,680	657	134,198	586
150,000	27,367	242,234	1,131	197,852	897	177,217	789	161,037	704
175,000	31,928	282,606	1,319	230,827	1,047	206,753	920	187,877	821
200,000	36,490	322,978	1,508	263,802	1,196	236,289	1,052	214,717	938
250,000	45,612	403,723	1,885	329,753	1,495	295,361	1,314	268,396	1,173
300,000	54,734	484,468	2,262	395,703	1,795	354,433	1,577	322,075	1,407
350,000	63,857	565,212	2,639	461,654	2,094	413,505	1,840	375,754	1,642
400,000	72,979	645,957	3,016	527,604	2,393	472,577	2,103	429,433	1,876
450,000	82,102	726,701	3,393	593,555	2,692	531,650	2,366	483,112	2,111
500,000	91,224	807,446	3,770	659,505	2,991	590,722	2,629	536,791	2,345
Annual Tonnage		10,000							
Average Blended Price			$214.20		$220.50		$224.70		$228.90
Total Revenue		$2,142,000	$4.20		$10.50		$14.70		$18.90
Total Cost		$2,100,000	$210.00		$210.00		$210.00		$210.00
Variable Costs		$1,900,000	$190.00		$190.00		$190.00		$190.00
Fixed Costs			$20.00		$20.00		$20.00		$20.00
Net Profit Margin			2.00%		3.00%		4.00%		5.00%
CTO - Per Dollar Sales			$.1130		$.1383		$.1544		$.1699
Break-even Tonnage			8,264		6,557		5,764		5,141

Appendix Table 4

Estimated Additional Tonnage Necessary For Specified Pricing/Cost Management Strategies Required To Offset The Additional Overhead Costs Associated With Investments In Environmental Containment

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
		Option 3A No Increase In Price		Option 3B Alternative Pricing Strategies					
		No Change In Net Margin		1% Increase In Net Margin		2% Increase In Net Margin		3% Increase In Net Margin	
Amount Of Investment	Estimated Annual Cost	Additional $ Sales	Tonnage	Additional Sales	Tonnage	Additional Sales	Tonnage	Additional Sales	Tonnage
(Dollars)		(Dollars)	(Tons)	(Dollars)	(Tons)	(Dollars)	(Tons)	(Dollars)	(Tons)
5,000	912	6,692	31	5,084	23	4,700	20	4,381	19
10,000	1,824	13,384	62	10,169	45	9,401	41	8,762	38
15,000	2,737	20,076	94	15,253	68	14,101	61	13,144	56
20,000	3,649	26,767	125	20,338	90	18,802	82	17,525	75
25,000	4,561	33,459	156	25,422	113	23,502	102	21,906	94
30,000	5,473	40,151	187	30,507	135	28,203	123	26,287	113
35,000	6,386	46,843	219	35,591	158	32,903	143	30,668	131
40,000	7,298	53,535	250	40,675	180	37,604	164	35,050	150
45,000	8,210	60,227	281	45,760	203	42,304	184	39,431	169
50,000	9,122	66,918	312	50,844	226	47,004	205	43,812	188
60,000	10,947	80,302	375	61,013	271	56,405	246	52,574	225
70,000	12,771	93,686	437	71,182	316	65,806	287	61,337	263
80,000	14,596	107,070	500	81,351	361	75,207	328	70,099	300
90,000	16,420	120,453	562	91,520	406	84,608	369	78,861	338
100,000	18,245	133,837	625	101,688	451	94,009	410	87,624	375
125,000	22,806	167,296	781	127,110	564	117,511	512	109,530	469
150,000	27,367	200,755	937	152,533	677	141,013	614	131,436	563
175,000	31,928	234,215	1,093	177,955	789	164,516	717	153,342	656
200,000	36,490	267,674	1,250	203,377	902	188,018	819	175,248	750
250,000	45,612	334,592	1,562	254,221	1,128	235,022	1,024	219,060	938
300,000	54,734	401,511	1,874	305,065	1,353	282,027	1,229	262,872	1,125
350,000	63,857	468,429	2,187	355,909	1,579	329,031	1,433	306,684	1,313
400,000	72,979	535,348	2,499	406,753	1,804	376,036	1,638	350,495	1,500
450,000	82,102	602,266	2,812	457,598	2,030	423,040	1,843	394,307	1,688
500,000	91,224	669,185	3,124	508,442	2,255	470,045	2,048	438,119	1,875
Annual Tonnage		10,000							
Average Blended Price			$214.20		$225.45		$229.55		$233.65
Total Revenue		$2,142,000	$9.20		$20.45		$24.55		$28.65
Total Cost		$2,050,000	$205.00		$205.00		$205.00		$205.00
Variable Costs		$1,850,000	$185.00		$185.00		$185.00		$185.00
Fixed Costs			$20.00		$20.00		$20.00		$20.00
Net Profit Margin			**4.49%**		**5.49%**		**6.49%**		**7.49%**
CTO - Per Dollar Sales			$.1363		$.1794		$.1941		$.2082
Break-even Tonnage			6,849		4,944		4,489		4,111