Feasibility of Crab Meal Processing in the Chesapeake Bay Region: II. An Integrated Economic Analysis For Hampton/Newport News, Virginia

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Introduction

The crab waste problem in Virginia and Maryland has been well documented by past research efforts, (Hatem, 1980) (Murray and DuPaul 1981) (Cathcart et. al. 1984). Murray and DuPaul (1981) documented both the magnitude and location of the problem in Maryland and Virginia. Their analysis provided a description of the total waste disposal problem in the Bay and pinpointed specific trouble spots. The report provided enterprise budgets for three locations; Hampton, Virginia, Crisfield, Maryland, and Cambridge, Maryland. These locations were chosen because of their proximity to crab processors and their ability to produce sufficient quantities of crab waste to make a meal processing facility feasible. In addition to the description of the volume and location of the waste, the report outlined the various advantages and disadvantages of alternative waste disposal techniques. The analysis did not include the site specific costs of securing land and providing transportation.

Murray and DuPaul (1981) analyzed the risks and opportunities associated with crab meal processing and concluded that meal processing could provide a substantial return on investment. It was felt that the report would stimulate the necessary investment to solve the waste disposal problem in the region. However, this investment has not occurred in the Hampton Roads area and crab waste disposal remains a primary problem for many processors.

This report will focus on the Newport News Seafood Industrial Park as a primary location for a crab meal processing facility. However, this analysis would apply to other areas close to the major crab processing plants. The Seafood Industrial Park site was chosen because it is close to several large producers of crab waste which would help to minimize the costs associated with transportation. Another advantage of this location is found in the nature of the park itself. The Newport News Seafood Industrial Park was created to foster seafood development in the greater Hampton Roads area. The location of a waste processing facility would help solve a persistent problem faced by most seafood processors as it could possibly render the wastes of other seafood processors as well as crab processors.

This analysis attempts to address the questions surrounding the costs required to implement and operate an integrated transportation and production network for crab waste in the Hampton Roads area. It updates the original analysis, presents new equipment alternatives, and provides a description of the transportation needs and options. In most cases, this report uses the basic assumptions outlined in the original analysis. However, certain changes in the basic assumptions have been made to accommodate the different operating characteristics of each brand of equipment or changing economic conditions.

Processing Equipment

The equipment analyzed in this report has been selected for its suitability for processing crab waste. All units evaluated are capable of processing the large volumes of crab waste which would be available during the peak months of the crab processing season. Manufacturers' specifications were used when actual operating information was not available. Manufacturers' specifications tend to be conservative, and this factor may have caused us to overestimate the operating costs of some of the units analyzed. Nevertheless, this approach provides reasonable estimates of the operating costs of each unit. Manufacturers were given the opportunity to respond with bid estimates meeting specific guidelines concerning volume and manpower requirements.

The processing equipment analysis was based on the following assumptions:

1) One full-time manager and one part-time or seasonal worker will be employed. The manager will be paid $20,000 per annum. This figure includes a 25 percent assessment for benefits. A seasonal worker will be paid $8,400 per year, based upon a $5 per hour wage rate, 40 hours per week for 42 weeks. These figures have been adjusted upward from the 1981 analysis to reflect current pay requirements in local industry.

2) Unemployment and Workmen's Compensation insurance were estimated at 4 percent. FICA taxes were estimated at 7 percent. These costs have been revised upward from the 1981 analysis.

3) Maintenance and repair costs were based on a graduated scale for the level of production as maintenance costs increase with higher levels of production. The expenditures were based on the following scale:

   A) 1 percent of original equipment cost at 1200 tons of production;
   B) 1.5 percent of original equipment cost at 1800 tons of production;
   C) 2 percent of original equipment cost at 2400 tons of production.

4) The principal and interest expense was estimated based on a 12 percent interest rate for 7 years on the total cost of purchasing and installing the building and equipment.

5) Fuel usage in the Heil drying system was estimated based on the plant operating at 65 percent of capacity and a 10 percent reduction in fuel usage due to the incorporation of a vapor recycling duct. The estimates for the remaining units are based on manufacturers' specifications. These units all have a vapor recycling duct to increase fuel efficiency and reduce emmissions.

6) Fuel oil was projected as the primary fuel source for all units. The fuel cost was estimated at $1.15 per gallon.

7) Hourly production of crab meal was projected at 1.5 tons of finished product from 3.5 tons of crab waste.

8) The Internal Revenue Service replacement schedule was used to determine depreciation costs for the building and equipment. A 20-year schedule was used for the building, 15 years for the manufacturing equipment, and a three-year schedule for the front-end loader.

9) The straight line depreciation method was used to provide depreciation estimates for the various equipment options. The new Accelerated Cost Recovery System depreciation schedules would permit more rapid depreciation of plant and equipment. This method was not used in the analysis because it would tend to distort cash flows in the early years and would require a complete projection of the cash flows over the life of the project. The straight line method permits a projection of constant cash flows from year to year. In addition to accelerated depreciation, Investment Tax Credits would be available to investors at the end of the first year of operation.

10) The preliminary analysis used $100 per ton crab meal as the base price for estimating the operational costs which vary with the level of meal production or sales.

11) Selling expense was estimated to be 3 percent of gross revenues which represents the standard broker's fee in the commodities industry.

12) Electricity cost was estimated by projecting 0.746 KWH/HP ($.08 per KWH) during plant operation. All dryer units have separate estimates of electrical costs based on differing horsepower requirements.

13) All capital was assumed to be borrowed to avoid the necessity of estimating equity contributions. This assumption provides for a return on equity capital equal to that obtained for borrowed capital. The return on equity accounts for the opportunity cost associated with investing in a crab meal plant versus other alternative investments.

14) Land for the plant would be secured by obtaining a long term 40-year lease with the city of Newport News. The lease would be assessed at the rate of $.20 per square foot per year. The plant requires 20,000 square feet of lease area.

15) Office supplies and telephone expenses were assessed at $600 per year.

16) Working capital was estimated at $20,000 per year. This figure will vary according to production levels; however, it may be possible to provide this capital through retained earnings as the operation matures. A rate of 12% was used to calculate the interest expense, assuming that an average of $20,000 will be borrowed for the entire year. This practice permits the working capital account to grow to meet expanded cash requirements during peak production periods and to shrink as the crab harvest declines during the remainder of the year.

17) Insurance for the building and equipment was based on the following assumptions:

A) Building - $3.70/$1,000 of valuation;
B) Personal Property - $6.10/$1,000 up to $25,000; $1.40/$1,000 over $25,000;
C) Liability - $1.70/$1,000 for every $1,000 of sales up to $500,000 of sales annually.

18) Local taxes assessed against the building and equipment were estimated at $2.70/$100 of valuation at 33 percent of the original value for the plant equipment. The tax on the building was calculated by assessing a $1.70/$100 tax on 100 percent of the assessed value.

Table 1
Itemized Fixed Cost Expenditures
(Heil SD 75-22 Dryer)
(Prices - June 1983)

Dryer	55,000
Feeder and Infeed Conveyor	22,750
Hammer Mill	4,750
Rotary Air Lock	4,625
Output and Loading Screw Conveyors	11,050
Vapor Recycling Duct	5,750
Refractory Material	2,650
Total Plant Equipment	106,575
Installation	40,000
Total Drying Unit	146,575
Front End Loader	16,000
Total Equipment & Installation	162,575
Building and Grounds	
60' x 80' x 20' Metal Building 4,800 sq. ft. slab	48,500
20,000 sq. ft. Lease - (40 yrs.)	4,000
Taxes	2,045
Insurance	627
Labor	
Salary and Fringe Benefits (Manager)	20,000
Working Capital	20,000

*Taxes and insurance includes coverage for manufacturing equipment.

Table 2
Itemized Fixed Cost Expenditures
(Aeroglide R1-96-40)
(Prices - June 1983)

Dryer	135,175
Feeder and Infeed Conveyor	22,750
Hammer Mill	4,750
Rotary Air Lock (Included in Dryer Price)	
Output and Loading	
Screw Conveyors	11,000
Vapor Recycling Duct (Included in Dryer Price)	
Refractory Material (Included in Dryer Price)	
Total Plant Equipment	173,675
Installation[1]	10,000
Total Drying Unit	183,675
Front End Loader	16,000
Total Equipment and Installation	199,675
Buildings and Grounds	
60' x 80' x 20' Metal Building and 4,800 sq. ft. concrete slab	48,500
20,000 sq. ft. Lease - (40 yrs.)	4,000
Taxes	2,012
Insurance	679
Labor	
Salary and Fringe Benefits (Manager)	20,000
Working Capital	20,000

1) Installation was estimated by the manufacturer. This installation charge may not be sufficient when compared to charges estimated by other manufacturers of similar equipment.

*Taxes and insurance includes coverage for manufacturing equipment.

Table 3
Itemized Fixed Cost Expenditures
(Rennenburg Rotary Warm Air Dryer)
(Prices - June 1983)

Dryer	
Feeder and Infeed Conveyor	
Hammer Mill	
Rotary Air Lock	
Output and Loading	
Screw Conveyors	
Vapor Recycling Duct	
Refractory Material	
Total Plant Equipment	99,900
Installation	42,960
Total Drying Unit	142,860
Front End Loader	16,000
Total Equipment & Installation	158,860
Buildings and Grounds	
60' x 80' x 20' Metal Building and 4,800 sq. ft. concrete slab	48,500
20,000 sq. ft. Lease - (40 yrs.)	4,000
Taxes	2,012
Insurance	622
Labor	
Salary and Fringe Benefits	20,000
Working Capital	20,000

*Taxes and insurance includes coverage for manufacturing equipment.

Table 4
Itemized Fixed Cost Expenditures
(MEC - Model 624-TN Dryer)
(Prices - June 1983)

Dryer	118,081
Feeder and Infeed Conveyor	9,250
Hammer Mill[1]	29,636
Rotary Air Lock	
Output and Loading	
Screw Conveyor	
Vapor Recycling Duct	
Refractory Duct	
Total Plant Equipment	156,967
Installation	42,000
Total Drying Unit	198,967
Front End Loader	16,000
Total Equipment & Installation	214,967
Buildings and Grounds	
60' x 80' x 20' Metal Building and 4,800 sq. ft. concrete slab	48,500
20,000 sq. ft. Lease - (40 yrs.)	4,000
Taxes	2,517
Insurance	700
Labor	
Salary and Fringe Benefits (Manager)	20,000
Working Capital	20,000

1) Hammer mill expense includes the air lock, vapor recycling duct, and output and loading screw conveyor.

Table 5
Itemized Fixed Cost Expenditures
(Stord Bartz TST-R Dryer)
(Prices - June 1983)

Dryer	132,725
Feeder and Infeed Conveyor	10,955
Hammer Mill	6,742
Rotary Air Lock	1,124
Output and Loading	3,371
Screw Conveyors	
Vapor Recycling Duct	2,875
Refractory Material	
Total Plant Equipment	157,792
Installation	25,000
Transportation	8,000
Total Drying Unit	190,792
Front End Loader	16,000
Total Equipment & Installation*	206,792
Building and Grounds	
60' x 80' x 20' Metal Building and 4,800 sq. ft. slab	48,500
20,000 sq. ft. Lease - (40 yrs.)	4,000
Taxes	2,443
Insurance	689
Labor	
Salary (Manager)	20,000
Working Capital	20,000

*All estimates are subject to change depending on current exchange rates. The exchange ratio used in the analysis is 7.12 Norwegian koronas to the dollar.

Table 6
Annual Costs for Three Levels of
Crab Meal Production
(Heil SD 75-22 Dryer)

Fixed Costs	
Depreciation[1]	17,530
Salary (Manager)	20,000
Principal and Interest	48,648
Insurance and Taxes	2,672
Lease	4,000
Miscellaneous	1,750
Total Fixed Costs	94,600

Variable Costs	Tons of Production		
	1,200	1,800	2,400
Fuel	27,600	41,400	55,200
Repair and Maintenance	1,626	2,439	3,252
Electricity[2]	2,848	4,272	5,728
Selling Expense	3,600	5,400	7,200
Office Supplies	600	600	600
Telephone	600	600	600
Labor	8,400	8,400	8,400
FICA	588	588	588
Unemployment and Workmen's Compensation	336	336	336
Total Variable Costs	46,198	64,035	81,904
Total Costs	140,798	158,635	176,504
Cost Per Ton	117.33	88.13	73.54

Break Even Point = (Fixed Costs + Fixed Variable Costs) ÷ (Price Per Ton - Variable Cost Per Ton)

BEP = (94,600 + 10,524) ÷ (100 - 29) = 1,481 Tons

1) Depreciation = Straight line method; 15 years life for equipment; 20 year life for building and 3 years for Bobcat.

2) Electricity estimated at 0.75 KWH/HPH at 0.081 KWH.

Table 7
Annual Costs for Three Levels
of Crab Meal Production
(Aeroglide R1-96-40)

Fixed Costs	
Depreciation	20,003
Salary (Manager)	20,000
Principal and Interest	56,777
Insurance and Taxes	2,691
Lease	4,000
Miscellaneous	1,750
Total Fixed Costs	105,221

Variable Costs	Tons of Production		
	1,200	1,800	2,400
Fuel	37,529	56,350	75,115
Repair and Maintenance	1,997	2,995	3,993
Electricity[1]	2,504	3,760	5,012
Selling Expense	3,600	5,400	7,200
Office Supplies	600	600	600
Telephone	600	600	600
Labor	8,400	8,400	8,400
FICA	588	588	588
Unemployment and Workmen's Compensation	336	336	336
Total Variable Costs	56,154	79,029	101,844
Total Costs	161,375	184,250	207,065
Cost Per Ton	134.48	102.36	86.27

Break Even Point = (Fixed Costs + Fixed Variable Costs) ÷ (Price Per Ton - Variable Cost Per Ton)

BEP = (105,221 + 10,524) ÷ (100 - 37) = 1,837 Tons

1) 0.746 KWH/HP for 63 HP = 47 KWH/hr.; 47 KWH/hr. x 8¢/KWH = $3.76/hr.

Table 8
Annual Costs for Three Levels
of Crab Meal Production
(Rennenburg Rotary Warm Air Dryer)

Fixed Costs	
Depreciation	17,282
Salary (Manager)	20,000
Principal and Interest	47,834
Insurance and Taxes	2,634
Lease	4,000
Miscellaneous	1,750
Total Fixed Costs	93,500

Variable Costs	Tons of Production		
	1,200	1,800	2,400
Fuel	50,968	76,452	101,936
Repair and Maintenance	1,589	2,383	3,177
Electricity[1]	5,920	8,880	11,760
Selling Expense	3,600	5,400	7,200
Office Supplies	600	600	600
Telephone	600	600	600
Labor	8,400	8,400	8,400
FICA	588	588	588
Unemployment and Workmen's Compensation	336	336	336
Total Variable Costs	72,601	103,639	134,597
Total Costs	166,101	197,139	228,097
Cost Per Ton	138.41	109.52	95.04

Break Even Point = (Fixed Costs + Fixed Variable Costs) ÷ (Price Per Ton - Variable Cost Per Ton)

BEP = (93,500 + 10,524) ÷ (100 - 50) = 2,080 Tons

1) Electricity was estimated at 62 HP x 0.746 KWH/HP = 46.25/KWH/hr. 46.25 x 0.08 = $3.70/hr.

Table 9
Annual Costs for Three Levels
of Crab Meal Production
(MEC - Model 624-TN Dryer)

Fixed Costs	
Depreciation	21,022
Salary (Manager)	20,000
Principal and Interest	60,127
Insurance and Taxes	3,217
Lease	4,000
Miscellaneous	1,750
Total Fixed Costs	110,116

Variable Costs	Tons of Production		
	1,200	1,800	2,400
Fuel	43,511	65,332	87,096
Repair and Maintenance	2,150	3,225	4,299
Electricity[1]	2,438	3,660	4,872
Selling Expense	3,600	5,400	7,200
Office Supplies	600	600	600
Telephone	600	600	600
Labor	8,400	8,400	8,400
FICA	588	588	588
Unemployment and Workmen's Compensation	336	336	336
Total Variable Costs	62,223	88,141	113,991
Total Costs	172,339	198,257	224,107
Cost Per Ton	143.62	110.14	93.38

Break Even Point = (Fixed Costs + Fixed Variable Costs) ÷ (Price Per Ton - Variable Cost Per Ton)

BEP = (110,116 + 10,524) ÷ (100 - 42) = 2,080 Tons

1) Electricity is estimated at 0.746 KWH/HP for 61.5 HP = 45.87 KWH/hr; 45.87 x 8 cents/KWH = $3.66/hr.

Table 10
Annual Costs for Three Levels
of Crab Meal Production
(Stord Bartz TST-R Dryer)

Fixed Costs	
Depreciation	20,477
Salary (Manager)	20,000
Principal and Interest	58,330
Insurance and Taxes	3,132
Lease	4,000
Miscellaneous	1,750
Total Fixed Costs	107,689

Variable Costs	Tons of Production		
	1,200	1,800	2,400
Fuel[1]	27,600	41,400	55,200
Repair and Maintenance	1,828	2,742	3,976
Electricity[2]	4,008	6,012	8,016
Selling Expense	3,600	5,400	7,200
Office Supplies	600	600	600
Telephone	600	600	600
Labor	8,400	8,400	8,400
FICA	588	588	588
Unemployment and Workmen's Compensation	336	336	336
Total Variable Costs	47,560	66,078	84,916
Total Costs	155,249	173,767	192,605
Cost Per Ton	129.37	96.53	80.25

Break Even Point = (Fixed Costs + Fixed Variable Costs) ÷ (Price Per Ton - Variable Cost Per Ton)

BEP = (107,689 + 10,524) ÷ (100 - 31) = 1,713 Tons

1) Fuel usage is estimated at 30 gallons of fuel oil per hour of operation.

2) Electricity is estimated at 62.66 KWH/hr. (84 HP) 62.66 KWH/hr. x 0.08 cents/KWH = $5.01/hr. of operation.

Transportation Analysis

Transportation is a key element in the operation of any crab meal processing plant. The crab waste from each individual crab processing plant must be transported to the meal plant which entails a significant logistical effort and requires substantial capital to purchase/rent and operate the necessary truck(s) and collection equipment.

There are several options available to the prospective owner of a crab meal processing facility to secure adequate transportation. The owner may decide to purchase a new, used, or reconditioned truck or rent a truck under a lease-purchase agreement or a cost-plus basis. In addition, the owner may subcontract to a waste disposal firm to transport the crab scrap to the plant.

The cost to purchase and operate a transportation network was projected to be quite high. It is important to note that fuel and labor accounted for approximately 90 percent of the variable costs and 33 percent of total annual costs of operation. This is an important factor because these costs are not under the control of the plant manager. The plant manager may be able to conserve fuel by routing the truck, but his efforts to do so will depend on the cooperation of the crab processing plants.

The dependence on a reliable transportation network will make it necessary to secure a contingency hauling agreement with a local waste-hauling contractor. This contractor would step in should the truck(s) experience a mechanical failure or if the waste load began to exceed the capacity of the truck(s) in operation. The implications for failure of the transportation system make it imperative that an agreement of this type be secured.

The cost per trip to each plant under each transportation option has been estimated. This cost can be used to compare against current charges for waste removal. It should be noted that per-trip charges are not the best method to assess charges to crab processors. Per-trip charges tend to reflect the importance of fixed costs more than the variable costs of operation.

Under these circumstances, it was difficult to demonstrate a savings when vehicles were routed to minimize fuel consumption while maximizing total waste removed. A better method would be to assess charges based on the total units of waste removed. This strategy would permit the savings realized by effective routing to be reflected in the charges assessed to processors.

There are two primary options available to purchase vehicles to transport crab waste. The first option is to purchase a new, fully equipped truck(s). The advantage to this approach is that the truck is a known commodity for which the operator can expect a high level of reliability and will normally carry an extensive warranty covering all

parts. The primary disadvantage of this option is that the high cost of a new vehicle can be a limiting factor in a marginal operation. The other option available is to purchase a used or reconditioned truck. A reconditioned truck often carries the same type of warranty that is offered with a new truck, but at a considerably lower price.

The transportation function for the crab meal production facility may also be secured by various forms of lease arrangements. There are three basic types of leases available from professional leasing companies and waste disposal firms. These three arrangements are (1) a lease/buy agreement with a leasing company, (2) a contract hauling agreement at a fixed rate per cubic yard (3) and a contract hauling agreement on a cost-plus basis.

The lease/buy concept is a commonly used practice in capital intensive industries. This agreement requires that a group of investors, or a commercial leasing company, purchase the vehicles and/or dumpsters and lease them back to the company that needs the equipment. The lease/buy agreement allows the lessors to take advantage of the tax-sheltering effects of purchasing the equipment (depreciation, investment tax credit, etc.). In return, the company can pass on the savings to the lessee (crab meal plant) in the form of a below-market interest rate. In addition, the lessee will be able to avoid the additional debt or equity that would be required to purchase the transportation equipment. Bankers may favor the lease/buy arrangement over a straight purchase because lease arrangements are subordinate to outstanding debt in the case of a liquidation of the company's assets and would reduce the total capital requirements for a crab meal plant.

In the final analysis, the lease/buy option can provide the crab meal operation with a method to purchase the necessary transportation assets while minimizing the equity requirements of the plant during the early stages of operation.

Another form of lease is a contract hauling agreement. This type of arrangement can take two distinct forms. The first is to contract for a specific price-per-cubic-yard of waste removed. The agreement will stipulate a charge for the removal of waste material on a per cubic yard basis. Currently crab processors are using dumpsters which handle approximately four cubic yards of waste. A representative from a local firm estimates that the material could be removed for a fee of $12 per dumpster (Motzinger, P.C., 1983). This figure would be negotiated each year, and the contract might have clauses allowing for surcharges if fuel costs rise significantly in the interim. This approach offers flexibility to crab processors because it allows the service to be performed on an as-needed basis. The deliveries would have to be closely coordinated to allow the meal plant to operate at peak efficiency. The plant manager would have to be able to exercise some control over how much waste is delivered within a given time span to operate the plant efficiently.

The other option available under a contract-hauling agreement is to have the waste removal contracted on a cost-plus basis. This arrangement allows the contractor to receive an negotiated return on investment above his costs to buy and operate the necessary equipment.

The various lease options outlined above offer many opportunities to reduce the initial investment and operating costs of a new meal processing plant. It permits the plant to provide transportation without committing a great deal of capital, reduces total operating risk and could result in crab meal production at a lower per unit cost.

Another positive benefit resulting from the establishment of a lease agreement would be the chance to evaluate the costs and benefits of owning the transportation system without assuming the risk during the initial start-up period. If management decides that it is profitable to purchase and manage the equipment, they can assume this responsibility at the end of the lease period. Leasing offers many opportunities with very few negative effects. Depending upon the personal tax needs of potential investors, leasing may be the most favored option for providing the transportation required to deliver the crab waste to the plant site.

Assumptions for the Transportation Analysis

1) Trucks average 5 miles per gallon of gasoline consumed.

2) The fuel cost was projected at $1.20 per gallon.

3) Labor was estimated at $7.50 per hour for forty hours with time and one half for overtime. The hourly rate included a 25 percent surcharge for benefits.

4) FICA was estimated at 7 percent. Unemployment and workmen's compensation insurance was estimated at 3 percent.

5) Labor was estimated at 10 hours per day, 5 days per week, for 20 weeks in the peak season for each truck. During the off season, labor was estimated at 8 hours per day, 5 days per week, for 32 weeks.

6) Some form of routing to minimize variable costs will be implemented. The analysis assumed that four large crab processing plants would be serviced 2 times per day during the peak season and once a day during the remainder of the year. The eight smaller plants would be serviced by establishing routes to meet their needs.

7) Each independently serviced plant would require a 20-mile round trip 2 times per day for each of four plants. This corresponds to 160 miles per day during the peak season and 80 miles per day during the off season.

8) Each route between the smaller plants would require 40 miles of travel 2 times per day. This corresponds to 80 miles per route or 160 miles per day in the peak season and 80 miles per day during the off season.

9) Maintenance and repair expenses were estimated at 5 percent of the purchase price on an annual basis for a new truck and 10 percent for a reconditioned truck.

10) Personal property tax on the vehicles was estimated at $5 per hundred of valuation. The insurance was calculated with the following coverages:

    A) $500,000 liability;
    B) $500,000 uninsured motorist;
    C) $250 deductible on the comprehensive coverage;
    D) $500 deductible on the collision coverage.

    License and tags for the vehicles were estimated at $400 per year.

11) Principal and interest was estimated using an interest rate of 12 percent over 4 years at $90,000 for a new truck and $65,000 for a reconditioned truck.

12) Depreciation was estimated using the straight line method for 4 years.

13) Miscellaneous costs were estimated at 1 percent of the sales price for a new truck.

14) Thirty eight dumpsters, each capable of containing 4 cubic yards (1 ton) of crab waste, at a cost of $350 each would be needed to service the waste disposal needs of the 12 Hampton/Newport News area plants.

15) The contract rate was estimated at $3 per cubic yard of waste removed from the picking plants to the drying facility.

16) The dumpsters would be leased by paying a 12 percent annual fee on the total capital required to purchase the dumpsters.

17) The vehicles would be leased from a group of investors or a leasing corporation. This arrangement would release the tax advantages to the lessor and enable the crab meal production facility to obtain the vehicles with a lower interest rate. It is estimated that the rate would be approximately 9 percent on an annual basis.

Table 11
Estimated Annual Transportation Costs - Purchase Option
(less than 2400 tons)

Fixed Costs - Truck	New Truck	Reconditioned
Depreciation	$22,500	$16,250
Principal and Interest	29,631	21,400
Insurance, Tags, and Taxes	9,900	5,816
Miscellaneous	900	900
Total Fixed Costs	62,931	44,366
Variable Costs - Truck		
Contract Charge	0	0
Labor	17,850	17,850
Fuel	14,114	14,114
Maintenance and Repair	5,700	6,500
FICA	1,150	1,150
Unemployment and Workmen's Compensation Insurance	535	535
Total Variable Costs	39,349	40,149
Fixed Costs - Dumpster		
Depreciation	4,433	4,433
Principal and Interest	5,537	5,537
Total Fixed Costs	9,970	9,970
Total Costs - Transportation	112,250	94,485
Management Fee (15%)	0	0
Total Adjusted Costs	112,250	94,485
Cost Per Trip - One Truck (5,040 Trips)	22.27	18.74
Cost Per Trip - Two Trucks (5,040 Trips)	38.63	31.43

Table 12
Annual Transportation Costs - Lease Option
(less than 2400 tons)

Fixed Costs - Truck	Contract Haul	Cost Plus	Lease/Buy
Depreciation			
Principal and Interest		29,631	29,631
Insurance, Tags, and Taxes		9,900	9,900
Miscellaneous		900	900
Total Fixed Costs	0	40,431	40,431
Variable Costs - Truck			
Contract Charge	50,112	0	0
Labor		17,850	17,850
Fuel		14,114	14,114
Maintenance and Repair		5,700	5,700
FICA		1,150	1,150
Unemployment and Workmen's Compensation Insurance		535	535
Total Variable Costs	50,112	39,349	39,349
Fixed Costs - Dumpster			
Depreciation			
Principal and Interest	5,537	5,537	5,255
Total Fixed Costs	5,537	5,537	5,255
Total Costs - Transportation	55,649	85,317	85,035
Management Fee (15%)	0	12,797	0
Total Adjusted Costs	55,649	98,115	85,035
Cost Per Trip - One Truck (5,040 Trips)	11.04	19.46	16.87
Cost Per Trip - Two Trucks (5,040 Trips)	11.04*	33.14	24.83

*Conversations with local waste disposal companies indicate that if two trucks are necessary to handle peak loads they can be reassigned to meet the need at no additional cost.

Explanation of the Preliminary Analysis

The preceeding analysis was performed to differentiate between the various equipment manufacturers according to both fixed costs and variable costs of operation. The analysis focused only on the financial aspects of the equipment and does not account for ease of operation or any other intangible items. Nevertheless, after careful review of the various equipment options, each dryer is relatively similar in its operation and manpower requirements and should be sufficient to handle the crab waste disposal needs in Hampton Roads.

The analysis indicated that the Heil SD 75-22 dryer was more profitable at each level of production than the equipment presented by other manufacturers, as its cost per ton is lower at each level of production. In addition, its break-even point was approximately 340 tons below the nearest competitor. The Aeroglide R1-96-40 and the Stord Bartz TST-R dryers have operating efficiencies which permit them to achieve significant decreases in their costs of production as the level of product processed increases. Because of these characteristics we have chosen to analyze the Heil, Aeroglide, and Stord Bartz systems for their expected return on investment and their ability to fit into an integrated transportation and production network.

The preliminary analysis indicated that the inclusion of two trucks in the transportation network would result in a high level of fixed costs which would make it difficult to cover the costs of operation without implementation of a pickup charge. In addition, the cost-plus method of leasing resulted in the second highest cost per ton without the depreciation benefits associated with the new vehicle purchase option. For this reason, the integrated analysis focused on the use of a single truck under the buy options, the lease/buy option, and contract hauling alternative.

The Integrated Transportation and Production Analysis

The integrated analysis provides estimates of the return on assets (ROA) for three processing units selected for their cost effectiveness from the results of the preliminary analysis. Before- and after-tax returns on asset projections are provided for two separate crab meal price levels. The before-tax results are indicative of the returns a meal plant organized on a cooperative basis, through a limited partnership arrangement, or as a Subchapter S Corporation, would expect to have available for distributon to its members. The integrated analysis permits investors to evaluate the investment potential of the meal processing machinery separately from the transportation network. In addition, those investors who are considering a fully integrated transportation and production system, can evaluate the impact of various transportation options on total return on investment.

Table 13
Projected Meal Production and Recent Prices (1982-83)

	Tons[1]	$/Ton[2]	Total Revenue
August	397	108.29	42,991.13
September	276	101.57	28,033.32
October	259	99.97	25,892.23
November	120	107.52	12,902.40
December	228	111.42	25,403.76
January	146	113.60	16,585.60
February	110	125.50	13,805.00
March	77	128.64	9,905.28
April	130	122.88	15,974.40
May	199	119.17	23,714.83
June	254	112.83	28,658.82
July	288	124.80	35,942.40
	2,484		$279,804.00

Price Per Ton = $279,804/2,484 = $113.50/Ton (rounded)

[1]Based upon the estimates provided in case study I of the Hampton area (Murray and DuPaul, 1981).

[2]Mean monthly estimated F.O.B. crab meal prices based on actual 1982-83 values.

Table 14
Annual Transportation Costs
(Production of 2,400 Tons)

Option	Buy(New)	Buy (Recond.)	Lease/ Buy	Contract Haul
Fixed Costs - Truck				
Depreciation	22,500	16,250		
*Principal and Interest	29,631	21,400	27,780	
Insurance, Tags, and Taxes	9,900	5,816	9,900	
Miscellaneous	900	900	900	
Total Fixed Costs	62,931	44,366	38,580	0
Variable Costs - Truck				
Contract Charge	0	0	0	
Labor	17,850	17,850	17,850	
Fuel[1]	16,128	16,128	16,128	
Maintenance and Repair[2]	6,840	7,800	6,840	
FICA	1,150	1,150	1,150	
Unemployment and Workmen's Compensation Insurance	535	535	535	
Total Variable Costs	42,503	43,463	42,503	66,816[3]
Fixed Costs - Dumpster				
Depreciation	4,433	4,433		
Principal and Interest	5,537	5,537	5,255	5,537
Total Fixed Costs	9,970	9,970	5,255	5,537
Total Costs	115,404	97,779	86,338	72,353
Cost Per Ton of Meal	48.09	40.75	35.97	30.15
Cost Per Plant Visit (6,960 Trips)	16.58	14.05	12.40	10.39

1) Fuel was estimated for 3 trips per location per day during the peak production periods.

2) Maintenance and repair expenses were adjusted to reflect the additional wear on the vehicle at this level of operation.

3) The total cost to move the waste material was projected at $3/cubic yard. There are approximately 4 cubic yards per ton of waste. One ton of finished product for every 2.32 tons of waste.

4) Several variable costs are expected to increase at the 1800 to 2400 ton production level. For this reason fuel and maintenance and repair costs were adjusted upward to reflect a higher level of use.

Table 15
Evaluation of Return
on Manufacturing and Transportation System
(Heil Drying System - $100/Ton)

Manufacturing		
Total Manufacturing Assets		211,075
Production Level		2,400 Tons
Revenue ($100/Ton)		240,000
Total Fixed Costs	94,600	
Total Variable Costs	81,904	
Total Costs		176,504
Net Profit Before Tax		63,496
Return on Assets - Before Tax		30.0%
Return on Sales - Before Tax		26.5%
State Tax		3,810
Federal Tax		11,625
Total Taxes		15,435
Net Profit After Tax		48,061
Return on Assets - After Tax		22.8%
Return on Sales - After Tax		20.0%

Transportation

	Buy(N)	Buy(R)	Lease/ Buy	Contract Haul
Total Assets*	314,375	289,375	211,075	211,075
Net Profit - Manufacturing	63,496	63,496	63,496	63,496
Total Costs - Transportation	115,404	97,779	86,338	72,353
Net Profit Before Tax	(51,908)	(34,303)	(22,842)	(8,857)
Return on Assets - Before Tax	--	--	--	--
Return on Sales - Before Tax	--	--	--	--
State Tax	0	0	0	0
Federal Tax	0	0	0	0
Total Tax	0	0	0	
Net Profit After Tax	(51,908)	(34,303)	(22,842)	(8,857)
Return on Assets - After Tax	--	--	--	--
Return on Sales - After Tax	--	--	--	--
Total Cost Per Ton	121.6	114.3	109.5	103.7
Projected Per Ton Surcharge to Break Even	21.63	14.29	9.52	3.69

*Total asset figure includes the cost of purchasing and installing manufacturing equipment, constructing the building, purchasing a truck, and purchasing dumpsters.

Table 16
Cash Flow Statement
(Hail Drying System - $100/Ton Meal)

Total Manufacturing Assets	211,075
Net Profit Before Taxes	63,496
Depreciation	17,530
Total Cash Flow Before Tax	81,026
Payback Period Before Tax	2.60 yrs.

Net Profit After Taxes	48,061
Depreciation	17,530
Total Cash Flow After Tax	65,591
Payback Period After Tax	3.21 yrs.

	Buy(N)	Buy(R)	Lease/ Buy	Contract Haul
Total Assets	314,375	289,375	211,075	211,075
Net Profit Before Taxes	(51,908)	(34,303)	(22,842)	(8,857)
Depreciation	44,463	38,213	17,530	17,530
Total Cash Flow Before Tax	(7,445)	3,910	(5,312)	8,673
Payback Before Tax	--	74.0 yrs.	--	24.33 yrs.
Net Profit After Taxes	(51,908)	(34,303)	(22,842)	(8,857)
Depreciation	44,463	38,213	17,530	17,530
Total Cash Flow After Tax	(7,445)	3,910	(5,312)	8,673
Payback After Tax	--	74.0 yrs.	--	24.33 yrs.
Investment Tax Credit				
Manufacturing Equipment	21,108	21,108	21,108	21,108
Truck & Dumpsters	10,330	7,830	0	0
Total	31,438	28,938	21,108	21,108

Table 17
Evaluation of Return
on Manufacturing and Transportation System
(Heil Drying System - $113.50/Ton)

Manufacturing

Total Manufacturing Assets		211,075
Production Level		2,400 Tons
Revenue		272,400
Total Fixed Costs	94,600	
Total Variable Costs	81,904	
Total Costs		176,504
Net Profit Before Tax		95,896
Return on Assets - Before Tax		45.43%
Return on Sales - Before Tax		35.20%
State Tax		5,754
Federal Tax		22,307
Total Tax		28,061
Net Profit After Tax		67,835
Return on Manufacturing Assets - After Tax		32.14%
Return on Sales - After Tax		24.90%

Transportation

	Buy(N)	Buy(R)	Lease/ Buy	Contract Haul
Total Assets	314,375	289,375	211,075	211,075
Net Profit - Manufacturing	95,896	95,896	95,896	95,896
Total Costs - Transportation	115,404	97,799	86,338	72,353
Net Profit Before Tax	(19,508)	(1,903)	9,558	23,543
Return on Assets - Before Tax	--	--	4.5%	11.5%
Return on Sales - Before Tax	--	--	3.5%	8.65%
State Tax	0	0	574	1,413
Federal Tax	0	0	1,348	3,320
Total Tax	0		1,922	4,733
Net Profit After Tax	(19,508)	(1,903)	7,636	18,810
Return on Assets - After Tax	--	--	3.6%	8.91%
Return on Sales - After Tax	--	--	2.8%	6.90%
Total Cost Per Ton	121.6	114.3	109.5	103.7
Projected Per Ton Surcharge to Break Even	8.13	.79	-	-

Table 18
Cash Flow Statement
(Heil Drying System - $113.50/Ton Meal)

Total Manufacturing Assets	211,075
Net Profit Before Taxes	95,896
Depreciation	17,530
Total Cash Flow Before Tax	113,426
Payback Period Before Tax	1.86 yrs.
Net Profit After Tax	67,835
Depreciation	17,530
Total Cash Flow After Tax	85,365
Payback Period After Tax	2.47 yrs.

	Buy(N)	Buy(R)	Lease/ Buy	Contract Haul
Total Assets	314,375	289,375	211,075	211,075
Net Profit Before Tax	(19,508)	(1,903)	9,558	23,543
Depreciation	44,463	38,213	17,530	17,530
Total Cash Flow Before Tax	24,955	36,310	27,088	41,073
Payback Period Before Tax	12.59 yrs.	7.96 yrs.	7.79 yrs.	5.14 yrs.
Net Profit After Tax	(19,508)	(1,903)	7,636	18,810
Depreciation	44,463	38,213	17,530	17,530
Total Cash Flow After Tax	24,955	36,310	25,166	36,340
Payback Period After Tax	12.59 yrs.	7.96 yrs.	8.39 yrs.	5.80 yrs.
Investment Tax Credit				
Manufacturing Equipment	21,108	21,108	21,108	21,108
Truck	10,330	7,830	0	0
Total	31,438	28,938	21,108	21,108

Table 19
Evaluation of Return
on Manufacturing and Transportation System
(Aeroglide Drying System - $100/Ton)

Manufacturing		
Total Manufacturing Assets		248,175
Production Level		2,400 Tons
Revenue ($100/Ton)		240,000
Total Fixed Costs	105,221	
Total Variable Costs	101,844	
Total Costs		207,065
Net Profit Before Tax		32,935
Return on Assets - Before Tax		13.3%
Return on Sales - Before Tax		13.7%
State Tax		1,976
Federal Tax		5,132
Total Tax		7,108
Net Profit After Tax		25,827
Return on Assets - After Tax		10.4%
Return on Sales - After Tax		10.8%

Transportation

	Buy(N)	Buy(R)	Lease/ Buy	Contract Haul
Total Assets	351,475	326,475	248,175	248,175
Net Profit - Manufacturing	32,935	32,935	32,935	32,935
Total Costs - Transportation	115,404	97,799	86,338	72,353
Net Profit Before Tax	(82,469)	(64,864)	(53,403)	(39,418)
Return on Assets - Before Tax	--	--	--	--
Return on Sales - Before Tax	--	--	--	--
State Tax	0	0	0	0
Federal Tax	0	0	0	0
Total Tax	0	0	0	0
Net Profit After Tax	(82,469)	(64,864)	(53,403)	(39,418)
Return on Assets - After Tax	--	--	--	--
Return on Sales - After Tax	--	--	--	--
Total Cost Per Ton	134.4	127.0	122.3	116.4
Projected Per Ton Surcharge to Break Even	34.36	27.02	22.25	16.42

Table 20
Cash Flow Statement
(Aeroglide Drying System - $100/Ton Meal)

Total Manufacturing Assets	248,175	
Net Profit Before Tax	32,935	
Depreciation	20,003	
Total Cash Flow Before Tax	52,938	
Payback Period Before Tax	4.69	yrs.
Net Profit After Tax	25,827	
Depreciation	20,003	
Total Cash Flow After Tax	45,830	
Payback Period After Tax	5.42	yrs.

	Buy(N)	Buy(R)	Lease/ Buy	Contract Haul
Total Assets	351,475	326,475	248,175	248,175
Net Profit Before Tax	(82,469)	(64,864)	(53,403)	(39,418)
Depreciation	46,936	40,686	20,003	20,003
Total Cash Flow Before Tax	(35,533)	(24,178)	(33,400)	(19,415)
Payback Period Before Tax	--	--	--	--
Net Profit After Tax	(82,469)	(64,864)	(53,403)	(39,418)
Depreciation	46,936	40,686	20,003	20,003
Total Cash Flow After Tax	(35,533)	(24,178)	(33,400)	(19,415)
Payback Period After Tax	--	--	--	--
Investment Tax Credit				
Manufacturing Equipment	24,820	24,820	24,820	24,820
Truck & Dumpsters	10,330	7,830	0	0
Total	35,150	35,650	24,820	24,820

Table 21
Evaluation of Return
on Manufacturing and Transportation System
(Aeroglide Drying System - $113.50/Ton)

Manufacturing		
Total Manufacturing Assets		248,175
Production Level		2,400 Tons
Revenue ($113.50/Ton)		272,400
Total Fixed Costs	105,221	
Total Variable Costs	101,844	
Total Costs		207,065
Net Profit Before Taxes		65,335
Return on Assets - Before Tax		26.30%
Return on Sales - Before Tax		23.98%
State Tax		3,920
Federal Tax		12,175
Total Tax		16,095
Net Profit After Tax		49,241
Return on Assets - After Tax		19.84%
Return on Sales - After Tax		18.08%

Transportation	Buy(N)	Buy(R)	Lease/ Buy	Contract Haul
Total Assets	351,475	326,475	248,175	248,175
Net Profit - Manufacturing	65,335	65,335	65,335	65,335
Total Costs - Transportation	115,404	97,799	86,338	72,353
Net Profit Before Tax	(50,069)	(32,464)	(21,003)	(7,018)
Return on Assets - Before Tax	--	--	--	--
Return on Sales - Before Tax	--	--	--	--
State Tax	0	0	0	0
Federal Tax	0	0	0	0
Total Tax	0	0	0	0
Net Profit After Tax	(50,069)	(32,464)	(21,003)	(7,018)
Return on Assets - After Tax	--	--	--	--
Return on Sales - After Tax	--	--	--	--
Total Cost Per Ton	134.4	127.0	122.3	116.4
Projected Per Ton Surcharge to Break Even	20.86	13.53	8.75	2.92

Table 22
Cash Flow Statement
(Aeroglide Drying Equipment - $113.50/Ton Meal)

Total Manufacturing Assets	248,175
Net Profit Before Tax	65,335
Depreciation	20,003
Total Cash Flow Before Tax	85,338
Payback Period Before Tax	2.91 yrs.
Net Profit After Tax	49,241
Depreciation	20,003
Total Cash Flow After Tax	69,244
Payback Period After Tax	3.58 yrs.

	Buy(N)	Buy(R)	Lease/ Buy	Contract Haul
Total Assets	351,475	326,475	248,175	248,175
Net Profit Before Tax	(50,069)	(32,464)	(21,003)	(7,018)
Depreciation	46,936	40,686	20,003	20,003
Total Cash Flow Before Tax	(3,133)	8,222	(1,000)	12,985
Payback Period Before Tax	--	39.70 yrs.	--	19.11 yrs.
Net Profit After Tax	(50,069)	(32,464)	(21,003)	7,018
Depreciation	46,936	40,686	20,003	20,003
Total Cash Flow After Tax	(3,133)	8,222	(1,000)	12,985
Payback Period After Tax	--	39.70 yrs.	--	19.11 yrs.
Investment Tax Credit				
Manufacturing Equipment	24,820	24,820	24,820	24,820
Truck & Dumpsters	10,330	7,830	0	0
Total	35,150	35,650	24,820	24,820

Table 23
Evaluation of Return
on Manufacturing and Transportation System
(Stord Bartz TST-R Dryer - $100/Ton)

Manufacturing		
Total Manufacturing Assets		255,292
Production Level		2,400 Tons
Revenue ($100/Ton)		240,000
Total Fixed Costs	107,689	
Total Variable Costs	84,916	
Total Costs		192,605
Net Profit Before Tax		47,395
Return on Assets - Before Tax		18.6%
Return on Sales - Before Tax		19.7%
State Tax		2,844
Federal Tax		7,715
Total Tax		10,559
Net Profit After Tax		36,836
Return on Assets - After Tax		14.4%
Return on Sales - After Tax		15.3%

Transportation	Buy(N)	Buy(R)	Lease/ Buy	Contract Haul
Total Assets	358,592	333,592	255,292	255,292
Net Profit - Manufacturing	47,395	47,395	47,395	47,395
Total Costs - Transportation	115,404	97,799	86,338	72,353
Net Profit Before Tax	(68,009)	(50,804)	(38,943)	(24,958)
Return on Assets - Before Tax	--	--	--	--
Return on Sales - Before Tax	--	--	--	--
State Tax	0	0	0	0
Federal Tax	0	0	0	0
Total Tax	0	0	0	0
Net Profit After Tax	(68,009)	(50,804)	(38,943)	(24,958)
Return on Assets - After Tax	--	--	--	--
Return on Sales - After Tax	--	--	--	--
Total Cost Per Ton	128.3	121.0	116.2	110.4
Projected Per Ton Surcharge to Break Even	28.33	21.17	16.23	10.40

Table 24
Cash Flow Statement
(Stord Bartz TST-R Dryer - $100/Ton Meal)

Total Manufacturing Assets	255,292
Net Profit Before Tax	47,395
Depreciation	20,477
Total Cash Flow Before Tax	67,872
Payback Period Before Tax	3.76 yrs.
Net Profit After Tax	36,836
Depreciation	20,477
Total Cash Flow After Tax	57,313
Payback Period After Tax	4.45 yrs.

	Buy(N)	Buy(R)	Lease/ Buy	Contract Haul
Total Assets	358,592	333,592	255,292	255,292
Net Profit Before Tax	(68,009)	(50,404)	(38,943)	(24,958)
Depreciation	47,410	41,160	20,477	20,477
Total Cash Flow Before Tax	(20,599)	(9,244)	(18,466)	(4,481)
Payback Period Before Tax	--	--	--	--
Net Profit After Tax	(68,009)	(50,404)	(38,943)	(24,958)
Depreciation	47,410	41,160	20,477	20,477
Total Cash Flow After Tax	(20,599)	(9,244)	(18,466)	(4,481)
Payback Period After Tax	--	--	--	--
Investment Tax Credit				
Manufacturing Equipment	25,529	25,529	25,529	25,529
Truck & Dumpsters	10,330	7,830	0	0
Total	35,859	33,359	25,529	25,529

Table 25
Evaluation of Return
on Manufacturing and Transportation System
(Stord Bartz TST-R Dryer - $113.50/Ton Meal)

Manufacturing

Total Manufacturing Assets		255,292
Production Level		2,400 Tons
Revenue ($113.50/Ton)		272,400
Total Fixed Costs	107,689	
Total Variable Costs	84,916	
Total Costs		192,605
Net Profit Before Tax		79,795
Return on Assets - Before Tax		31.26%
Return on Sales - Before Tax		29.29%
State Tax		4,788
Federal Tax		16,253
Total Tax		21,041
Net Profit After Tax		58,754
Return on Assets - After Tax		23.01%
Return on Sales - After Tax		21.57%

Transportation

	Buy(N)	Buy(R)	Lease/ Buy	Contract Haul
Total Assets	358,592	333,592	255,292	255,292
Net Profit - Manufacturing	79,795	79,795	79,795	79,795
Total Costs - Transportation	115,404	97,799	86,338	72,353
Net Profit Before Tax	(35,609)	(18,004)	(6,543)	7,442
Return on Assets - Before Tax	--	--	--	2.9%
Return on Sales - Before Tax	--	--	--	2.7%
State Tax	0	0	0	447
Federal Tax	0	0	0	1,049
Total Tax	0	0	0	0
Net Profit After Tax	(35,609)	(18,004)	(6,543)	5,946
Return on Assets - After Tax	--	--	--	2.3%
Return on Sales - After Tax	--	--	--	2.2%
Total Cost Per Ton	128.3	121.0	116.2	110.4
Projected Per Ton Surcharge to Break Even	14.84	7.50	2.73	--

Table 26
Cash Flow Statement
(Stord Bartz TST-R Dryer - $113.50/Ton Meal)

Total Manufacturing Assets	255,292
Net Profit Before Tax	79,795
Depreciation	20,477
Total Cash Flow Before Tax	100,272
Payback Period Before Tax	2.55 yrs.
Net Profit After Tax	58,754
Depreciation	20,477
Total Cash Flow After Tax	79,231
Payback Period After Tax	3.22 yrs.

	Buy(N)	Buy(R)	Lease/ Buy	Contract Haul
Total Assets	358,592	333,592	255,292	255,292
Net Profit Before Tax	(35,609)	(18,004)	(6,543)	7,442
Depreciation	47,410	41,160	20,477	20,477
Total Cash Flow Before Tax	11,801	23,156	13,934	27,919
Payback Period Before Tax	30.38 yrs.	14.40 yrs.	18.3 yrs.	9.14 yrs.
Net Profit After Tax	(35,609)	(18,004)	(6,543)	5,946
Depreciation	47,410	41,160	20,477	20,477
Total Cash Flow After Tax	11,801	23,156	13,934	26,423
Payback Period After Tax	30.38 yrs.	14.40 yrs.	18.3 yrs.	9.66 yrs.
Investment Tax Credit				
Manufacturing Equipment	25,529	25,529	25,529	25,529
Truck & Dumpsters	10,330	7,830	0	0
Total	35,859	33,359	25,529	25,529

Discussion

The primary component of the transportation and production system was the crab meal-processing equipment. Of the three units evaluated, the Heil system provided the potential investor with the best before- and after-tax return on assets. At $100 per ton (low price, 1983), before and after-tax returns on assets were 30 percent and 26.5 percent respectively. Using $113.50 per ton (average price, 1983) the before-tax return on assets increased to 45.43 percent and the after-tax return increased to 32.14 percent. The estimates for the Stord Bartz system, provided a before and after-tax return on assets of 18.6 percent and 14.4 percent respectively at $100 per ton. These figures increased to 31.26 percent and 23.01 percent at an average price of $113.50 per ton.

The estimated return on assets for the Heil system was, at a minimum, 11 percent higher than the Stord Bartz equipment. As the price of meal increased, this gap increased due to the lower fixed cost of investment associated with the Heil equipment.

Payback analysis can provide an indication of the level of risk an investor faces because it estimates the length of time necessary to "pay back" the initial investment in plant and equipment. The before tax payback period for the Heil equipment ranged from a low of 1.86 years ($113.50/ton) to high of 2.60 years ($100/ton). The after-tax payback period, progressed from a low of 2.47 years ($113.50/ton) to a high of 3.21 years ($100/ton). The Stord Bartz equipment consistently took longer to recoup the fixed cost of investment than the Heil equipment at both $100 and $113.50 per ton.

Once the transportation component is added to the system, the return to the business investor decreased significantly. The integrated estimates provided in the analysis were calculated based upon the assumption that no pick-up fees would be assessed against the crab-picking houses to defray transportation costs. This scenario provides an accurate estimate of the expected return available to a cooperative. This type of arrangement has been discussed by members of the seafood community in Hampton Roads for some time; therefore, it was deemed important to construct the analysis in this manner.

Since the Heil system provided the largest profits and greatest return on investment at all levels of production, the discussions relevant to the impact of transportation on the overall project profitability are confined to this equipment. At $100 per ton, all transportation options produced net losses. The contract-haul option produced the most favorable transportation option with a net loss of $22,842.

The cash flow statement provides additional insight into the effect transportation has on the net operating position of a crab meal plant. At $100 per ton, the contract-haul option had the largest positive cash flow of the four transportation strategies evaluated.

Nevertheless, the purchase of a reconditioned truck also generated a positive cash flow indicating that depreciation contributes greatly to the losses declared for income tax purposes. The new purchase option revealed a negative cash flow position, but it is only marginally negative at $7,441 each year. The implication of this projection is important for members of a cooperative or limited partnership because members would have to contribute only $7,441 each year to meet the costs of operation. Nevertheless, depreciation was created as a means to allow companies to save tax dollars to replace old capital equipment. If the truck cannot be used beyond its useful depreciable life, investors would have to contribute additional capital to purchase a new truck after 4 years.

At $113.50 per ton the buy-reconditioned transportation option generated sufficient positive cash flows, with a nominal amount of new investment, to replace all equipment as it reaches the end of its useful life. This option also generated positive cash flows, even at $100 per ton. The $3,910 annual cash surplus at this price level would leave approximately $15,600, including any salvage value available to purchase another reconditioned vehicle at the end of 4-year expected life of the vehicle. The buy-new option does not provide enough positive cash flow to justify the cost differential between a new and reconditioned vehicle. In addition, the lease/buy option is not attractive since the vehicle received at the end of the lease period may have to be replaced as a result of the extensive wear and tear it would experience during its 4-year expected life. All decisions regarding the purchase of vehicles should be evaluated for their impact on profitability at $100 per ton because crab meal prices have a tendency to fluctuate wildly as grain prices increase or decrease. If the investor is satisfied with the profit situation at this lower price level, he will clearly be satisfied at higher crab meal price levels.

If the cost of transportation is included, without the introduction of additional fees to help cover such costs, the risk exposure of the operation increases significantly. At $100 per ton the Heil system has a before-tax payback period of 2.60 years. However, the implementation of the contract-hauling option, the lease costly transportion strategy, lengthens the projected pay-out period to 24.33 years. The other transportation options are considerably less attractive under these same conditions. This scenario indicates that a fee-based pick-up system may have to be implemented if the transportation component is provided as a part of the total crab meal operation. The size of this fee would be determined by the type of organization that is formed to provide this service as in a cooperative, the goal is to provide the service at the lowest possible cost. In a privately owned company, the goal may be to achieve a particular return on investment. This fee could be assessed on a per-trip, per-ton, or per-cubic-yard basis. The impact of these fees can be estimated using the information contained in this report.

The analysis indicates that it is possible to achieve a modest before-tax return on assets by owning a crab meal plant and contracting for the removal of crab waste with a commercial waste-hauling firm. In addition, the Heil drying system provided the lowest cost per ton at all levels of production; therefore, it is the equipment best suited for crab meal production. At an average price of $113.50 per ton, the contract haul option operated in synchronization with the Heil system provided a before-tax return on assets of 11.15%. This indicates that a private firm could initiate a contract-hauling agreement with a local waste-hauling firm without implementing any pick up fees and still realize a modest before-tax return on assets. Should an investor require a more substantial return, each crab house could be assessed a fee to cover transportation costs. All transportation options, other than the contract-hauling strategy, provide marginal or negative rates of return and would be useful only if implemented on a cooperative basis or in conjunction with a fee-based, pick-up system.

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