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Milk Processing and Distribution Costs: The Maine Model

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Milk Processing and Distribution Costs: The Maine Model

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CONTENTS

INTRODUCTION

This study was conducted for the Maine Milk Commission (MMC) of the Maine Department of Agriculture, Food and Rural Resources. The MMC is a non-industry commission responsible for implementing Maine's milk-related rules and regulations. One of the commission's responsibilities involves establishing minimum wholesale and retail milk prices. This study was conducted to accurately estimate the minimum wholesale price (cost of processing and distribution) of fluid milk products in Maine. Previous studies of this nature, done for the MMC, were based on research done by the University of Minnesota and revised by the University of Maine (Kezis, Anderson, and Buitenhuys 1983). By using the information provided in the Minnesota study, a model adjusted to "Maine conditions" was established. This model was updated twice, in 1986 (Anderson) and 1989 (Criner, Anderson, and Jacobs). Recently, a concern arose that the model plant technology in the Minnesota study was dated and that the accuracy of the adjusted model was not sufficient to meet the MMC's needs. The plant design for the Minnesota model, and most of the plant equipment, were based on 1977 technology.

The University of Maine, Agricultural and Resource Economics Department contracted with the MMC to conduct a study to update the technology and all costs used in the milk-pricing model. An engineering firm familiar with current dairy processing practices was subcontracted with to provide the technical knowledge necessary for designing a dairy processing plant. Three such firms were contacted and JAI Engineers was chosen.

The study includes two processing plant scenarios. One is a plant that produces a "full line" of milk products and fruit drinks in a variety of container sizes, and the other is a "white-milk" plant limited to processing and packaging milk in plastic gallon and half-gallon containers.

This report identifies the methods and criteria used in estimating the costs for each of these two plants. The models constructed for this study are discussed, in the following sections. For clarity, the full-line plant is discussed in detail, and the white-milk plant is discussed separately in an appendix. A brief explanation of cost modelling theory appears in the *Economic-Engineering Methodology* section. The full-line facility's physical description and operational parameters can be found in the *Facility Construction and Cost Data* section. An overview of the cost allocations used in the processing models appears in the *Cost Allocation Methodology* section. The section *Full-Line Plant Processing Costs* identifies the sources

and calculations used in establishing processing costs. The modelling of distribution costs is discussed in the section *Model Distribution Costs*. And lastly, the *Summary of Cost* section combines the results of the full-line processing model and the distribution model to reveal per unit processor cost for all white-milk package types.

OBJECTIVES

The objective of this study is to estimate the theoretically lowest achievable costs of processing and distributing milk in Maine. Costs are estimated for two state-of-the-art processing plants. The first plant produces and distributes a full line of products, including white milk, chocolate milk, orange juice, buttermilk, etc., and distributes additional products such as cheeses and yogurts. The other plant produces a limited line of products which includes white milk packaged in plastic gallon and plastic half-gallon containers only. Both hypothetical plants are assumed to be located in the Portland, Maine, area.

ECONOMIC-ENGINEERING METHODOLOGY

Economic-engineering models are mathematical representations of a production and/or marketing process where engineering and economic information are combined. The engineering information includes the specifics of building (or facility) layout and equipment and inputs such as labor, utilities, and supplies. The economic component of the model involves determining costs for all plant inputs (labor wages and supply costs, for example) and conducting cost allocations based on logical allocation rules. Economic-engineering models are particularly useful in allocating costs to different stages of production and then to the various items produced. Cost allocations are based primarily upon utilization; arbitrary allocations are kept to a minimum. For example, if a laborer works exclusively with one product, then that laborer's gross wages are allocated to that product's cost.

Two factors that can complicate an economic analysis of this nature are inflation and the cost of money. Inflation is the general increase in prices, and the cost of money is the interest rate at which money is borrowed. The complication occurs since the annual costs of capital items are fixed (as determined by the useful life and interest rate) while revenues and operation and maintenance (O&M) costs usually go up over time (due to inflation). In some economic analyses all O&M costs and revenues are individually inflated. To make such an adjustment, however, one would need a detailed analysis of past and expected inflation for all O&M costs and revenues. Unfortunately, such an analysis and correction is beyond the scope of this study.

When O&M costs and revenues inflate at the same rate, a correction to the analysis can be made by determining annual capital costs using a "real" interest rate. The real interest rate is the observed interest rate less the inflation. A cursory look at milk price and O&M cost trends reveals that O&M costs have kept pace with the general level of inflation, while milk prices have not increased significantly. Since it is expected that milk prices are not going to inflate as quickly as O&M costs, adjusting the interest rate downward would be inappropriate. Given this, the authors suggest that 12% is the most appropriate interest rate. Nonetheless, the results shown in the *Summary of Costs* section reveal processing costs produced with a variety of interest rates.

FACILITY CONSTRUCTION AND COST DATA

Plant Operation Specifications

The model plant is designed to have a weekly capacity to process and package 400,000 gallons of white milk. This volume was specified by the MMC, and based on previous plant analysis that suggests a plant of this size is the most efficient blend of economy of size and milk transportation costs (Kezis, Anderson, and Buitenhuys 1983). In accordance with current Maine production, another 13.1% of white-milk volume, in the form of by-products (chocolate and buttermilk, fruit drinks and orange juice, and creams and nogs), is also packaged. This brings the plant's average weekly processing volume up to 452,000 gallons. A variety of package sizes and types, ten in all, are packaged in volumes that approximate the Maine market (Tables 1 & 2).

Raw milk and by-product liquids are received on a seven-day basis. There are three drive-through tank truck receiving bays for unloading the trucks. Two of the bays are needed for white milk, and a third is needed for by-products. Clean in place (CIP) units are capable of flushing the tank trucks before the trucks leave the receiving area. Raw milk is pumped out of the trucks, cooled by a 300-gallon-per-minute (GPM) plate cooler and

Table 1. White-Milk Packaging Volume in Gallons per Week

Container Type	Percentage of Volume	Whole Milk	Low Fat Milk	Skim Milk	Total Gallons
		53.3%	*39.1%*	*6.6%*	*100.0%*
Plastic Gallon	*50.0%*	108,600	78,200	13,200	200,000
Plastic Three-Quart	*1.9%*	4,126	2,972	502	7,600
Plastic Half-Gallon	*18.2%*	39,530	28,465	4,805	72,800
Paper Half-Gallon	*10.4%*	22,588	16,266	2,746	41,600
Paper Quart	*5.1%*	11,078	7,976	1,346	20,400
Paper Pint	*3.1%*	6,734	4,848	818	12,400
Paper Ten-Ounce	*0.2%*	434	313	53	800
Regular Half-Pint*	*0.8%*	1,738	1,251	211	3,200
Small Half-Pint*	*7.3%*	15,856	11,417	1,927	29,200
Five-Gallon Bulk	*3.0%*	6,516	4,692	792	12,000
Total Gallons	*100.0%*	217,200	156,400	26,400	400,000

SOURCE: Container volume percentages obtained from MMC records.
**Regular and Small refer to container's cross sectional size.*

Table 2. By-Product Packaging Volume in Gallons per Week

Container Type	Percentage of Volume	Fruit Drinks	Chocolate Milk	Creams & Nogs	Total Gallons
		50.4%	*34.4%*	*15.2%*	*100.0%*
Plastic Gallon	*53.0%*	13,992	9,540	4,240	27,772
Plastic Half-Gallon	*27.0%*	7,128	4,860	2,160	14,148
Paper Pint	*9.0%*	2,376	1,620	720	4,716
Small Half-Pint	*11.0%*	2,904	1,980	880	5,764
Total Gallons	*100.0%*	26,400	18,000	8,000	52,400

stored in any one of three 50,000-gallon milk silos. Three 8,000-gallon silos exist for liquid sweeteners, and one 7,000-gallon tank is available for orange juice concentrate.

The processing and packaging of products occurs five days per week (these operations are not performed on Wednesdays or Sundays). Pasteurization of raw milk and by-products is performed by two High Temperature, Short Time (HTST) pasteurizers. The pasteurized milk is blended with the proper amount of butterfat and piped to any of three 20,000-gallon pasteurization surge tanks. Likewise, by-products are pasteurized and pumped to one of two, 2,000-gallon surge tanks or one of two 6,000-gallon surge tanks. From these surge tanks, the product is piped to the appropriate filler. Six fillers are required to package the various sizes and types of containers examined in this study (Table 3).

In-plant blow molding equipment casts plastic gallon and half-gallon containers. Two gallon and one half-gallon molders supply the necessary number of containers to feed the fillers. Resin for the containers is stored in an 80,000-lb capacity tank outside of the plant structure. Incomplete or defective containers are shredded, and the plastic is re-used. Paper containers are purchased in bulk and stored in the dry storage area of the plant. Also purchased are plastic three-quart and five-gallon bulk containers. The three-quart containers are assumed to be stored in the trailer in which they are shipped to the plant.

Milk cases are cleaned by an overhead case washer and sent to the fillers on conveyors. The packaged products are placed in cases and then travel by conveyor to the cooler for palletizing or loadout production. Table 4 elaborates on the number of packages processed and cased per week.

Table 3. Filling Machine Packaging Rates

Filling Machine	Container Types Filled	Containers Filled per Minute
Plastic Gallon	Gallon	75
Plastic Half-Gallon	Three-Quart	54
	Half-Gallon	54
Paper Half-Gallon	Half-Gallon	75
Paper Quart	Quart	120
	Pint	120
	Ten-Ounce	120
	Regular Half-Pint	120
Paper Half	Small Half-Pint	170
Bag n' Case	Five-Gallon Bulk	2

In addition to selling milk and by-products, the model facility also purchases products from outside producers for re-sale. These products are referred to as outside purchases and include such items as cheese, butter, and yogurt. Outside purchases are received at the plant's cooler and repackaged into milk cases for preparation of delivery. Outside purchases account for 12% of total cased products.

A series of circular conveyors, called the production carousel, is used to accumulate assorted products into cases to meet customer orders. Two-thirds of all cased products are loaded onto straight body trucks in

Table 4. Number of Containers and Cases Packaged Weekly

	White-Milk			By-Products		
Package Type	Gallons Packaged	Number Packaged	Number of Cases	Gallons Packaged	Number Packaged	Number of Cases
Plastic Gallon	200,000	200,000	50,000	27,772	27,772	6,943
Plastic Three-Qt	7,600	10,133	1,689			
Plastic Half-Gallon	72,800	145,600	16,178	14,148	28,296	3,144
Paper Half-Gallon	41,600	83,200	9,244			
Paper Quart	20,400	81,600	5,100			
Paper Pint	12,400	99,200	3,100	4,716	37,728	1,179
Paper Ten-Ounce	800	10,240	320			
Regular Half-Pint	3,200	51,200	1,067			
Small Half-Pint	29,200	467,200	6,229	5,764	92,224	1,230
Five-Gallon Bulk	12,000	2,400	2,400			
Totals	400,000	1,150,773	95,327	52,400	186,020	12,496

stacks, five high. The remaining cases are placed on pallets and loaded onto short and long trailers. Product distribution is on a six-day schedule. Daily case distribution activity is approximated by Table 5.

Table 5. Cases Shipped by Day for an Average Week

Day of Week	Percent of Cases	Number of Cases
Monday	17%	18,330
Tuesday	13%	14,017
Wednesday	14%	15,095
Thursday	22%	23,721
Friday	19%	20,486
Saturday	15%	16,173
Total	100%	107,823

Plant Structures

JAI Engineers was responsible for defining the structures required and the general construction criteria, as well as for providing an estimate of construction cost. In doing so, JAI examined the costs of two newly constructed milk-processing facilities that are similar to the model facility. Each facility had three major structures; the Plant, Corporate Office, and Truck Service buildings. Average cost per square foot was estimated from the two facilities and was adjusted for inflation and geographical location using "Means Construction Cost Data" (Mahoney 1989). Besides the construction cost, a cost of $197,000 for the project staff and construction trailer, over an 18-month period, was also included in the total square foot cost. Table 6 shows the resulting cost breakout per square foot for the construction of the three buildings. A description of each of the cost components listed in Table 6 can be found in Appendix A.

Plant layout is designed to specifically fit the needs of the model plant. Allocation of building cost to the model's cost centers is based on the total square footage of related areas. Table 7 lists the square footage of each of these areas and the associated construction cost based on the square foot cost described above.

Table 6. Building Square Foot Construction Cost Breakout

Construction Category	Cost per Square Foot
Site & General Construction	$43.85
Mechanical Trades	25.80
Refrigeration	11.85
Electrical	6.69
Rigging	1.48
Services	4.25
Contingency	1.00
Project Staff & Construction Trailer	2.35
Total	$97.27

Table 7. Facility Construction Cost by Area

General Area	Square Feet	Cost
Receive & Process	11,232	$1,092,555
Blow Molding	4,420	429,941
Dry Storage	6,120	595,303
Case Storage/Cleaning	5,724	556,783
Filling & Packing	7,140	694,520
Cooler	18,144	1,764,897
Corporate Office	8,500	826,809
Truck Service	9,300	904,627
Miscellaneous & Overhead	13,190	1,283,013
Total	83,770	$8,148,448

Facility Equipment

An attempt has been made to include all the equipment required to operate this facility according to design specifications. Most of the equipment costs (which include taxes, freight, start-up, and training) and their useful lives are from JAI Engineers. Equipment capacities were based on plant packaging quantity and on an average daily run-time of 12 hours. Equipment was selected to meet the peak processing volume, which represents an 11.5% increase in average processing volume, and equipment was oversized under the assumption that it would be operated at approximately 90% efficiency.

Certain pieces of equipment, such as fillers, product tanks, pasteurizers, etc., have the added cost of piping. JAI Engineers arrived at an average piping cost per unit of equipment by examining the piping cost

for three similar projects. The average cost of piping was then added to the original cost of the equipment.

A yearly cost for equipment was calculated according to the quantity, cost, life, and interest rate for the item. Appendix C lists this information by cost center for all of the facility's equipment.

Labor

Plant labor requirements were supplied by JAI Engineers. A five-day, two-shift schedule is assumed for the process employees and a seven-day, single-shift schedule, for milk receiving. Employees in the corporate office and truck service work on a five-day, single-shift schedule. All employees are assumed to work a regular 40-hour week. Given these assumptions, the number of employees required for each job is derived based on estimates of "on-job" time required for the shifts and the 40-hour work week assumption.

In order to establish employee pay rates, a survey of Maine dairy processors was conducted. From the survey, pay rates for a variety of dairy facility jobs were obtained. An average pay rate for a dairy process operator in Cumberland County, Maine, was obtained from the Maine Department of Labor, Economic Analysis and Research and was used to adjust the survey's pay rates to Cumberland County equivalents. Jobs were then placed into one of four classes, according to pay rate, and a weighted average pay rate for each class was determined. A fifth class was created to account for the corporate president's salary which was based on published data and quotes from professional sources. Table 8 presents the five classes, typical workers under each classification, and the applicable weekly gross pay.

Additional costs of taxes and insurance benefits for the employees were also included in labor costs. Employee benefits include full coverage health insurance for the worker and one dependent. Workers' compensation insurance, FICA tax, and unemployment compensation tax are calculated and applied appropriately. Appendix D lists all of the facility's employees along with their classification.

Electricity

In order to properly allocate electrical usage by type of container packaged, it was necessary to estimate approximate kilowatt-hour (kWH) usage for container specific machinery. In particular, this includes the

Table 8. Employee Classifications and Pay Rates

Classification	Typical Position	Weekly Pay Rate
Class 1	Sanitation Worker Dock Worker	$294
Class 2	Maintenance Worker Process Operator Secretary/Clerk	$329
Class 3	Management Assistant Supervisor Engineer	$396
Class 4	Department Head Manager	$601
Class 5	Corporate President	$1,538

plastic blow molders and the product fillers. Remaining electricity usage was accounted for with the following cost centers; Receive & Process, Case Storage, Cold Storage, Overhead (plant offices and corporate office), and Truck Service. JAI Engineers supplied estimates of weekly kWH usage for all these items and also the expected kilo-var (kvar) demand for summer and winter months (see Table 9).

Fuel Oil

Fuel oil is used to heat the buildings and to heat water for processing and sanitation. An average of 3,600 gallons of fuel per week is required to meet these needs. Estimates of the percentage of fuel used for heating the Plant, Corporate Office, and Truck Service were 20.6%, 1.9%, and 3.2%, respectively. Fuel required for Processing represents 38.4%, and the remaining 35.9% is needed for the clean-in-place systems.

Water, Sewer, and Product Loss

Large quantities of water would be consumed by the plant for product processing and equipment cleansing. JAI estimates that 339,300 gallons of water would be consumed weekly. Water would be obtained through the Portland Water District and wastewater discharged through the Westbrook sewer facilities. The basic sewer rate would be governed by

Table 9. Weekly Electrical Consumption

Equipment	Kilowatt Hours per Week
Receive & Process	30,200
Blow Molders	52,500
Filling Machines:	
Plastic Gallon	858
Plastic Half-Gallon	1,074
Paper Half-Gallon	2,681
Quart	3,631
Half-Pint	3,594
Bulk	162
Case Storage	3,800
Cold Storage	14,300
Plant Offices	1,000
Corporate Office	1,800
Truck Service	2,100
Total	117,700

water consumption.

In addition to the basic sewer rate, a surcharge for pounds of Biological Oxygen Demand (BOD) would also be assessed. To minimize this cost, returns and dated products would not be disposed of in the sewer. Instead, they would be dumped into a dedicated tank truck and transported to a swine farmer. BOD, however, still would enter the sewer through product loss (equipment wash, spillage, etc.) Expected shrinkage of 0.5% of total process volume. A BOD surcharge was calculated based on the rule that each gallon of shrinkage represents approximately one pound of BOD.

The loss of 0.5% of total volume processed leads to an additional cost associated with the loss of the physical product. Milk cost per cwt was obtained from the Maine Milk Commission and used to calculate the cost of milk product loss.

Operating Capital

A certain amount of capital (cash) is required to cover the business expenses between the time that expenses are paid and revenues are received. Since this money is not collecting a return, the interest lost represents a business expense. The expense is equivalent to a nominal interest rate

applied to the operating capital for the length of the deferral time (i.e., time between expenses paid and revenues received).

COST ALLOCATION METHODOLOGY

Constructing a cost model begins by defining the project parameters. This represents the formulation and design of plant specifications, regulatory requirements, facility engineering, supplies, etc. Once the project parameters have been defined, the cost of capital items and the expense of operation and maintenance are determined (Figure 1).

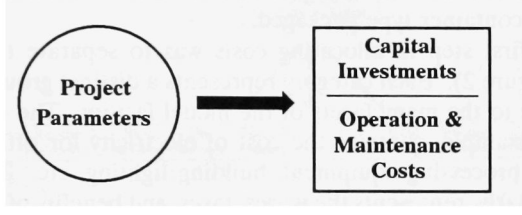

Figure 1 - Accumulating Facility Costs from Project Parameters

Capital investment costs represent the expense of items that normally have a useful life of a year or more. Since the investment in capital assets requires the commitment of money over time, part of the investment cost is the "cost of the money," or interest. An investment cost must be included since the money for the investment has either been withdrawn from an interest-bearing account, or borrowed at an interest rate. Capital assets include items such as buildings, equipment, and land.

To put all costs on an annual basis, for the purpose of analysis, it is necessary to determine the annual cost of a capital expense. Converting a capital expenditure to annual costs that include an interest payment is known as amortizing. The procedure is also referred to as the capital recovery method, since the annual payments are equivalent to the acquisition cost of the capital plus the interest cost.

The annual capital cost of a capital item depends on three factors: the interest rate, the useful life of the capital asset (term), and the capital asset acquisition cost. With the exception that payments are determined monthly as opposed to annually, a classic example of the amortization process is the determination of monthly house payments based on length of the payoff period (term), interest rate, and house cost.

Excluded from capital costs are items that are replaced or that must be renewed periodically. These fall into the category of operation and maintenance costs and represent cost of supplies, utilities, labor, etc. Combined, capital investment costs and operation and maintenance costs depict all of the expenses incurred at the facility.

The application and allocation of costs, for this particular economic-engineering model, were done in five steps. Each step further refined the cost allocations, so that the final result revealed the annual milk-processing cost for each container type packaged.

The first step in allocating costs was to separate them into *cost categories* (Figure 2). Each category represents a distinct group of costs that is attributable to the many facets of the model facility. The electricity cost category for example, contains the cost of electricity for office heating/air conditioning, processing equipment, building lighting, etc. The labor cost category, similarly, represents the wages, taxes, and benefits of employees for all tasks (product filling & packing, container blow molding, etc.) involved in the processing of milk.

Once the costs are properly categorized they are further divided into *cost centers* (Figure 3); nine cost centers exist in this model. The cost centers reflect either physical areas of the facility or logical production cost allocations. Seven of the nine cost centers, in this model, represent physical areas of the facility. Blow Molding, Corporate Office, and Dry Storage are examples of physical cost centers. The two non-physical cost centers,

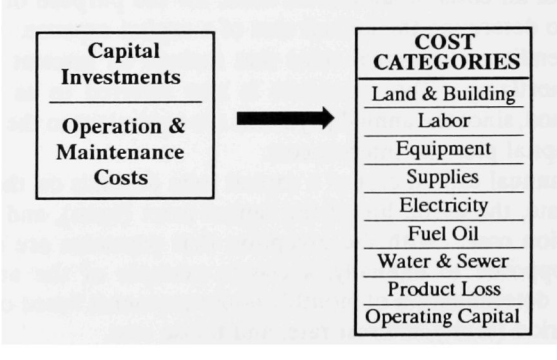

Figure 2 - Separation of Costs into Cost Categories

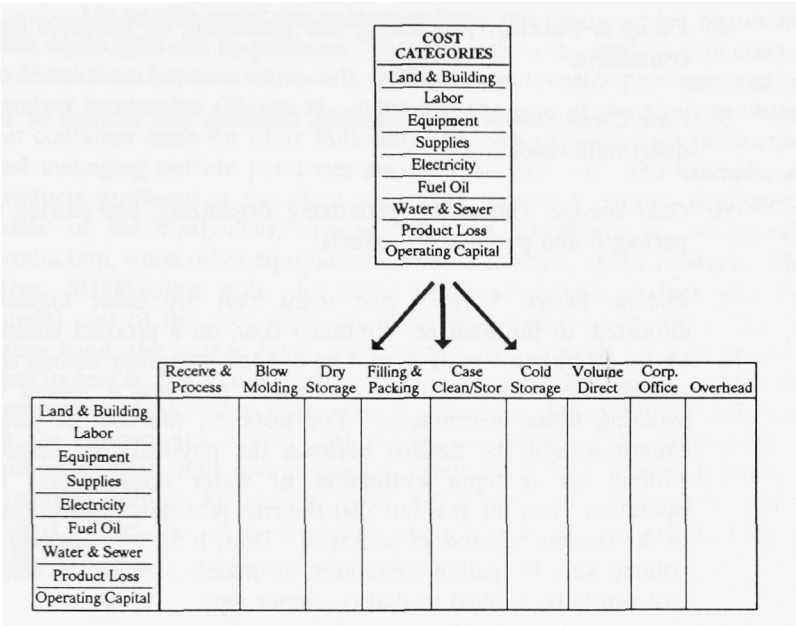

Figure 3 - Sub-dividing Cost Categories Across Cost Centers

Volume Direct and Overhead, are used to logically allocate costs that do not readily conform to any of the physical cost centers. Expenses such as corporate management and product loss do not correspond to any physical cost center. A brief description of each cost center follows:

1. *Receive & Process*. The areas and functions of the plant where raw milk and by-products are received, stored, tested, blended, and pasteurized.

2. *Blow Molding*. The production of plastic gallon and half-gallon containers.

3. *Dry Storage*. The handling and storage of paper containers, by-product mixes, and cleaning chemicals.

4. *Filling & Packing.* The filling and packaging of products into containers.

5. *Case Clean/Storage.* The handling, cleaning, and storage of 16-quart milk cases.

6. *Cold Storage.* The casing, palletizing, organizing, and storing of packaged and purchased products.

7. *Volume Direct.* Various cost items that are most logically allocated, to the final per container cost, on a product volume basis. Since some costs cannot be divided accurately among the physical cost centers, this cost center provides a means of avoiding those inaccuracies. For instance, the cost of water cannot sensibly be divided between the physical cost centers without an in-depth evaluation of water consumption by operation. Instead, it is felt that the cost is closely proportional to the volume of product packaged. Thus, if 50% of packaging volume were for gallon containers, ultimately 50% of the water cost would be applied to that container type.

8. *Corporate Office.* All costs involved in the corporate accounting, marketing, billing, etc. A separate building, the Corporate Office resides on the facility grounds. The cost of the structure, land, equipment, and employees are allocated here.

9. *Overhead.* Any cost incurred by the processing plant that does not correspond with any of the above cost centers are considered overhead expenses. Salaries of plant management and the cost of operating capital are examples.

Allocations to the cost centers are based primarily on utilization. Building costs are distributed according to square footage allotted; electricity cost is assigned according to usage by area and sometimes by individual electrical requirements of equipment. The details of allocations performed to each cost center are discussed in Appendix B-1.

Up to this point the analysis reflects the total cost for processing both white milk and by-products. The next step in the allocation of costs is to divide them between white-milk production and outside purchases and by-product production (Figure 4). Since it is the goal of this study to obtain per container costs for white milk only, the costs of by-product production and managing outside purchases must be factored out. For example, all products produced at the plant utilize the receive & process equipment. Some of the equipment, however, is used specifically for white-milk production, while other equipment is used specifically for by-products. The large, 20,000-gallon milk silos contain only white-milk product, thus the annual cost of the silos is allocated directly to white-milk costs. On the other hand, the orange juice concentrate tank is strictly for a by-product, thus its cost is allocated directly to by-product costs. Equipment, such as the pasteurizers, is shared by white-milk production and by-product production, so the equipment's annual cost is split according to the percentage of volume of white-milk and by-product production. This process is done, in a similar fashion, for each element within the cost category/cost center matrix. The allocation algorithms used in this process are detailed in Appendix B-2.

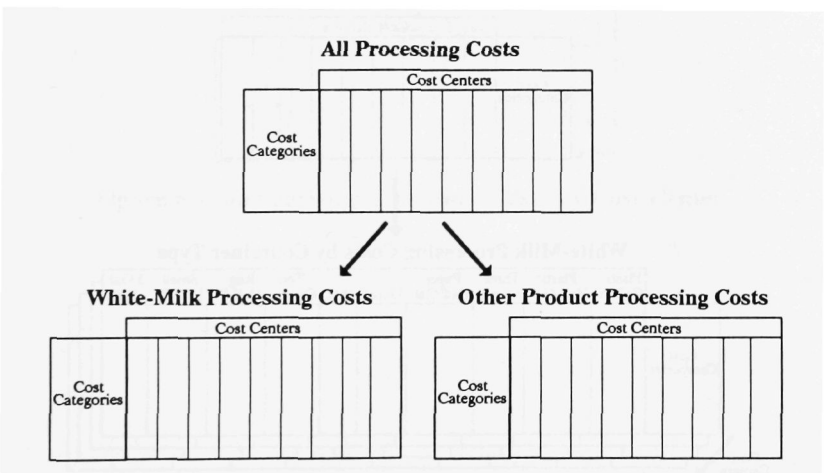

Figure 4 - Dividing Processing Costs between White Milk and Other Products

Since this study is concerned only with white-milk processing costs, the analysis of by-product and outside purchases is not carried further. The next step is to allocate white-milk production costs to the ten container types (Figure 5). The result is nine matrices; each matrix represents a single cost center where the columns contain costs by container type and the rows contain costs by cost category. This process is most easily understood as taking each column of cost center values and distributing each of its elements across the ten container types. This allocation breaks the costs into the finest detail possible by the model. For instance, the annual cost of labor in the dry storage room, for any particular container type, is identifiable. The method used for making these allocations varies for each cost center and cost category. For example, the annual cost of equipment for filling & packing consists of six different filling machines and the associated installation costs. For the plastic gallon container the annual cost of the gallon filler is known and applied to the plastic gallon container type. Some of the product fillers, however, are more diverse and require further analysis. The quart filler is a good example since it is used to fill quart, pint,

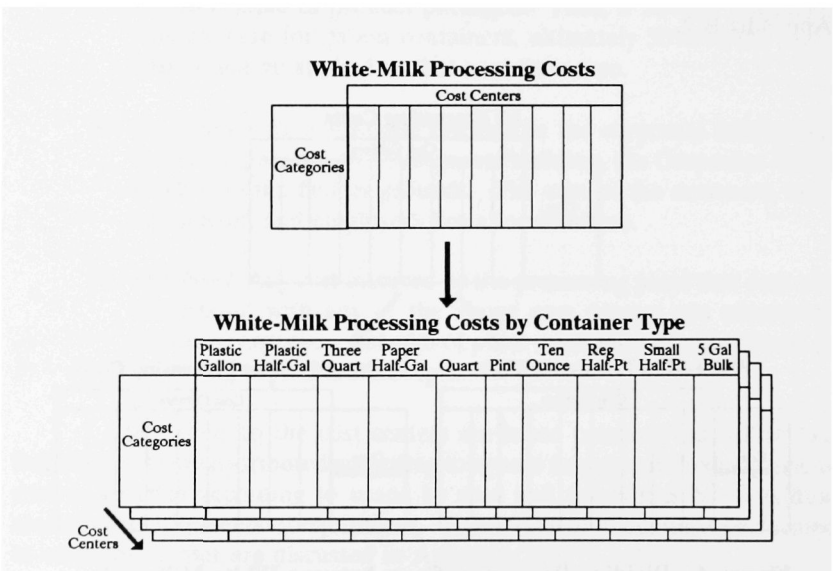

Figure 5 - Allocation of Costs to Container Types

ten-ounce, and regular cross-section half-pints. In this instance the equipment's annual cost is split among the four associated container types based on approximate filler run-time for each type of container. A complete description of each container cost allocation made can be found in Appendix B-3.

The last step in the allocation process involves eliminating cost categories, resulting in annual processing cost by container type by cost center (Figure 6). The process simply entails summing the container's cost for each cost category on each of the cost center matrices. The row of totals derived from each cost center matrix are then combined to obtain the final matrix, Container Costs by Cost Center.

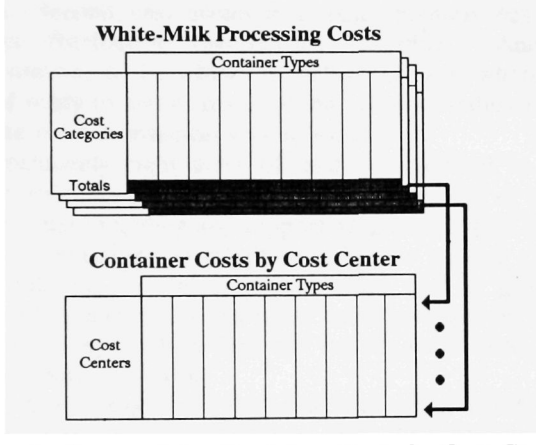

Figure 6 - Summarizing Container Costs by Cost Center

FULL-LINE PLANT PROCESSING COSTS

Most of the costs incorporated in the model reflect 1989 prices for the Portland, Maine, area. The plant, in theory, resides in the town of Westbrook, adjacent to Portland. Property tax and water and sewer charges are based on current Westbrook rates. A description of costs by cost category follows.

Land & Building

In part, the location of the facility was restricted to meet three basic criteria. First, based on prior studies, the facility was to be located in the Portland area. Second, easy access to a major highway was necessary to make product distribution theoretically plausible. And third, the construction site was to be within an industrial park, where the land is developed and ready to accept construction. Several industrial parks exist in the area, the most economical was in Westbrook.

Approximately eight acres of land are required to support the facility. From estimates provided by JAI Engineers, 50% of the acreage is allocated to the plant building and supporting grounds, 40% is occupied by the truck service building and distribution vehicle parking areas, and the final 10% is allotted for the corporate office and its grounds. Land investment costs are assigned to the three buildings based on their assigned portion of total acreage. Three land cost factors are derived, one for each building, on a square foot basis.

Land & building costs included land costs, construction costs, construction interest, taxes, and insurance. With the exception of land costs, all of the above components are allocated to each of the three buildings based on their portion of combined building square footage. Land costs were assigned to each of the three buildings based on land requirements of each building.

A construction cost per square foot of area was developed by JAI Engineers (as discussed in the section *Facility Construction and Cost Data*). Construction of the entire facility would be expected to take 18 months. During this time, costs would be incurred for a construction staff, trailer, and capital. The cost of the construction staff and trailer were added to the original construction square foot cost. The cost of construction capital represents interest paid on money lent for purchase of the land and

equipment, and the construction of the building. A total of nearly $16 million would be required to complete the project. At the suggestion of JAI Engineers, it was assumed that the money would be spent equally over the 18-month period. With this investment and an interest rate of 12%, the cost of construction capital was derived. Put into a square foot basis, the cost of construction capital was added to the square foot construction cost. Using this cost with an expected useful plant life of 33.3 years and a nominal interest rate of 12%, a cost per year per square foot for facility construction was calculated.

Two additional costs, that re-occur annually, are added to the facility construction annual cost. These costs are property tax and fire and liability insurance. Property tax is based on total property value (the worth of land, buildings, and equipment). Current Westbrook rates were used to calculate annual property tax. The total was divided by total facility square footage and added to the annual square foot cost. A cost for fire and liability insurance was established based on MMC records of four Maine milk plants. The cost for each of these plants was increased by the ratio of the model plant milk volume (400,000 gallons per week) to each plant's milk volume. These four adjusted insurance costs were then averaged and converted to a cost per square foot. The insurance cost per square foot was then added to the building annual square foot cost.

The resulting annual square foot cost was applied to each of the three square foot land costs to give yearly land & building cost per square foot for each of the three buildings. From these factors, and each building's square footage, a total yearly cost for land and buildings was generated.

Labor

A total of 85 employees are required for product processing and corporate management. Total labor costs include wages, vacation and sick time, taxes, and benefits. Appendix D lists all of the jobs and wages related with the processing plant and corporate office. Wages were based on a five level pay scale (as discussed in the section, *Facility Construction and Cost Data*). Each employee works 40 hours per week and was allotted an average of two weeks paid vacation and an average of 5% of working hours as sick time.

Taxes to be paid include FICA and unemployment compensation tax. FICA tax is calculated as 7.51% of employee wages on up to $48,000

of earnings. All of the plant employees, except the corporate CEO, make less than $48,000 per year.

Unemployment compensation tax, for a new employer, is calculated as 2.6% of the first $7,000 of an employee's earnings. The percentage rate of the tax varies according to layoff and tax history of the company. For a new employer, this is based on Maine's average rate for the previous year. The rate is then updated annually to reflect the company's layoff and tax history.

Employee benefits consist of workers' compensation insurance and a full coverage health insurance plan. Worker's compensation insurance averaged $10.46 per $100 of earnings for the milk-processing industry.

The employee health insurance is through Blue Cross/Blue Shield. It provides 100% medical coverage with a $100 deductible for the employee and one dependent. The cost to the employer is $81.25 weekly, per employee.

Supplies

A large portion of supply cost results from the purchase of product packages. Paper container prices vary according to the volume purchased and the number of colors with which they are printed. Effective use of the plant's dry storage area allows for higher volume purchases and thus, a lower cost per container. By examining the distribution of weekly container packaging and the available capacity of dry storage, purchasing quantities were calculated. Container prices were obtained from International Paper Company, based on the quantities calculated and a two color print. Shipping costs were estimated to be $500 per tractor-trailer load (based on conversation with a Maine dairy employee). A trailer is capable of hauling 20 pallets, thus an estimated shipping cost of $25 per pallet. Final shipping price for each type of container was calculated based on the number of containers per pallet.

The plastic three-quart containers are purchased in tractor-trailer-sized quantities (19,000 containers). The containers remain on the trailers until used for processing, rather than being moved into dry storage. An estimated price for the container was provided by a container manufacturer and the prices of foil-lined caps and product labels were added.

The only remaining container that is purchased is the five-gallon bulk container (bag n' case). A price quote for the container was obtained through a manufacturer, and a shipping cost was added in separately.

Both the plastic gallon and half-gallon containers are blow molded with the in-plant facilities. Required supplies are plastic resin pellets, foil-lined caps, and product labels. The cost for resin was based on a quote from a plastics supplier and includes shipping to the facility. The amount of resin used to mold a container was suggested by JAI Engineers and set at 55 grams for the gallon and 40 grams for the half-gallon containers. The cost of caps and labels were obtained from the same sources as for the three-quart container.

An additional cost, due to container damage, was included in the calculation of container costs. A 2% damage rate, suggested by JAI Engineers, applies to all containers.

Another supply cost is for milk cases. These are considered supplies because of the high replacement factor (approximately 25% annually). Costs were obtained from a manufacturer located in New Hampshire and include shipping. Three case weights or case qualities were available; the least expensive was used for this study.

A few remaining supply costs were also accounted for, such as Cleaning and Maintenance supply costs, which were estimated by JAI Engineers. Supplies for the Corporate Office (paper, forms, mailings, etc.) were derived from MMC records for Maine Dairies.

Electricity

Central Maine Power would be the provider of electrical service for a facility located in the Greater Portland area. Several rate structures exist, and vary primarily in accordance with the peak demand required. For this facility, CMP's large general service primary system rates apply. Within this rate structure, charges exists for kWH usage, peak kW demand, and reactive demand (based on kVARs). Time of day and time of year also influence this rate.

Electrical usage and demand figures were provided by JAI Engineers (See the section *Facility Construction and Cost Data*, page 13). Choosing the proper electricity rate, according to time of day, used the assumption that the plant was operating at the "on-peak" period for 70% of the time, and at

the "shoulder" period for the remainder. Time of year rates were simply applied as 8 months for summer and 4 months for winter.

Water, Sewer, and Product Loss

An estimated 45,000 cubic feet of water would be used weekly by the processing plant. Of this, 12,000 cubic feet are expected to be flushed down the sewer. Water for Westbrook is obtained through the Portland Water District, and Portland water rates apply. Both water and the basic sewer charges are based on the quantity of water consumed. The rate applied to discharge of BOD in Westbrook is determined strictly on a "cost per pound" basis, not on effluent concentration. If BOD levels exceed 1,000 lbs over the course of a quarter, then a charge of $188 per 1,000 lbs is accessed. For the model plant, each gallon of product loss represents approximately 1 lb of BOD discharged. Product loss is rated at 0.5% of total process volume, which brings BOD discharge levels well above the 1,000 lbs/quarter cutoff.

Damaged and returned products are not dumped into the sewer because of the excessive cost of BOD disposal. Instead, products are dumped into a tank truck and hauled daily, to a swine farm. The truck is considered to have a value of $10,000 and an expected life of 5 years. Annual truck maintenance, fuel and driver costs were based on information provided by Oakhurst Dairy.

Operating Capital

Calculation of operating capital for this model assumes a four-week lag between the time that expenses are paid and receivables are received. All expenses involved in the processing of products (supplies, taxes, insurance, labor, utilities, etc.) were summed, and the operating capital for a four-week period was calculated. An appropriate interest rate was applied to the operating capital to arrive at the interest lost on operating capital.

MODEL DISTRIBUTION COSTS

The model distribution costs include the expenses associated with delivering packaged products and maintaining a transportation fleet. As in the processing model, the intent here is to obtain a theoretically minimum cost. Assumptions concerning the size of a distribution route (miles, number of stops, etc.) are consistent with those used in previous minimum cost distribution studies completed for the Maine Milk Commission.

The model examines the distribution of products in four "route" environments. Two of the routes are "drop-shipment," while the other two are "full-service." In terms of the model, the major difference between these route types is the amount of time the driver spends at each stop (the full-service stops require extra time for the driver to stock the products in the store coolers). Each of the two route types is subdivided into metropolitan and non-metropolitan routes; thus there are four different routes. The primary difference between the metropolitan and non-metropolitan routes is the number of stops involved. Table 10 lists the distribution characteristics for all four route types.

A fleet of trucks is required to make the distribution of products possible. A survey of Maine milk processors revealed general background information on the size and number of trucks used in the state. From this, three truck classes were identified; long tractor-trailer, long straight body, and short straight body. The survey also provided insight into the percentage of product carried on each type of truck. Using this information and the "Cases per Load," derived in the distribution characteristics table, the proper truck size for each route was determined. In addition, using an estimate of peak day shipping demand, the number of trucks required in the distribution fleet was calculated (see Table 11).

Determination of distribution costs was based heavily on the information given above. Most of the costs applied directly to a particular route (ex: driver wage, truck cost, fuel, etc.). Other costs, however, (land and building, utilities, service equipment, etc.) could not be allocated directly and are referred to as overhead costs. An indirect allocation of total overhead costs was made to the whole distribution fleet through total fleet mileage.

Table 10. Distribution Route Characteristics

	Drop-Shipment		Full-Service	
	Metro	Non-Metro	Metro	Non-Metro
Route Time (hours)	8	10	9	11
Time to 1st Stop (min)	20	25	10	15
Non-Driving Time per Case (min)	0.40	0.75	0.85	1.10
Driving Time Between Stops (min)	15	20	12	15
Time to Return to Plant (min)	20	25	10	15
Route Length (miles)	75	95	90	110
Number of Stops	6	10	16	25
Cases per Stop	152	49	25	10
Cases per Load	913	493	400	245

Table 11. Fleet Characteristics

	Drop-Shipment		Full-Service	
	Metro	Non-Metro	Metro	Non-Metro
Vehicle Type	T/T	Long	Short	Short
Percent of Cases Distributed	32%	48%	6.67%	13.37%
Number of Trucks in Fleet	10	27	5	15

Direct costs were calculated in three main areas and standardized on a per route basis. The three areas are vehicle, fuel and service, and driver costs.

Vehicle costs include the cost of the truck, trailer/body, and reefer unit. In addition to these costs, taxes, registration, and insurance are included. All costs were obtained through Maine truck dealers and large truck fleet operators.

Fuel and service costs cover operation and maintenance costs associated with a vehicle. Truck miles per gallon and reefer gallons per hour were provided by Maine truck dealers and used to estimate route fuel usage. Vehicle service was determined for the life of a vehicle based on actual service records provided by a fleet operator. Service cost includes parts, oil, and outside services only. Most repairs would be handled within the milk facility's own service garage. A separate cost was derived for retreading of tires based on a truck life of 350,000 miles (average of 50,000 miles per year for seven years).

Truck driver hourly wages were supplied by the Maine Department of Economic Analysis and Research, for heavy and light-duty trucks. Appropriate taxes and insurance were included (as in the processing model) along with an additional cost for uniforms.

Overhead costs were derived for four areas: land and building, service equipment, service labor, and service utilities and supplies. The total annual cost of overhead was calculated and then allocated to a particular route based on annual route mileage.

The cost of land and building was derived in the processing model (see page 10). This cost includes construction of the truck service area, land, property taxes, etc.

Service equipment represents the tools required to perform vehicle maintenance. This includes such items as jacks and hoists, compressors, hand tools, etc. As with equipment costs in the processing plant, the annual cost of the service equipment was determined using the new cost, expected useful life of the equipment, and the interest rate (see page 11).

Estimates of the required labor for the truck service were provided by a Maine trucking fleet supervisor. The roster includes four mechanics, a parts manager, a secretary/clerk, and one service supervisor. Wages, taxes, and insurance costs were calculated in the same manner as for the processing plant labor. An additional cost for employee uniforms was included.

Lastly, the cost of utilities and supplies are added into total overhead cost. These items represent the cost of electricity, heating fuel,

water and sewer, waste disposal, and the investment of capital in parts inventory. Electricity and heating costs were based on information provided by JAI Engineers. Water and sewer costs reflect water usage for truck washing.

Combining the route direct and route overhead costs provides a final distribution cost by route. A cost for distribution per case is derived to determine minimum distribution cost. As can be seen in Table 12, there is a large variation in distribution cost per case by route, with the drop-shipment metro route being the lowest.

Table 12. Distribution Cost Summary by Route

	Drop-Shipment		Full-Service	
	Metro	Non-Metro	Metro	Non-Metro
Vehicle	$101.50	$49.72	$43.43	$43.43
Fuel & Service	106.84	127.67	119.77	145.10
Driver	102.69	82.09	80.31	83.88
Overhead	27.16	34.41	32.60	39.84
Totals	$338.19	$293.89	$276.11	$312.25
Cost per Case	$0.371	$0.596	$0.690	$1.263

SUMMARY OF COSTS

A summary of processor costs for the Maine Milk Model are given in Table 13. The processing costs are results taken from the full-line plant model and represent a theoretical lowest achievable cost. Purchase price of the raw milk product and the cost of applicable taxes were obtained from the MMC. To arrive at the lowest achievable cost, the lowest cost distribution scheme, the drop-shipment, metropolitan route, was used. The distribution model derived this cost on a case basis; dividing this cost by the number of containers packed per case results in distribution cost per container.

Table 13. Summary of Costs by Container Type

Container Type	Processing	Raw Milk	Distribution	Total
Plastic Gallon	$0.266	$1.508	$0.093	$1.867
Plastic Three-Quart	0.389	1.131	0.062	1.582
Plastic Half-Gallon	0.174	0.754	0.041	0.969
Paper Half-Gallon	0.220	0.754	0.041	1.015
Paper Quart	0.123	0.377	0.023	0.523
Paper Pint	0.083	0.189	0.012	0.284
Paper Ten-Ounce	0.088	0.118	0.012	0.218
Regular Half-Pint	0.058	0.094	0.008	0.160
Small Half-Pint	0.044	0.094	0.005	0.143
Five-Gallon Bulk	1.743	7.542	0.372	9.657

To test the stability of the processing cost results, several sensitivity analyses were performed. The effects of changing the costs of five major contributors of total processing cost were examined. The cost of wages, health insurance, building construction, facility equipment, and supplies were independently varied by 10%, and the per unit cost variance was recorded. In absolute terms, the 10% change to the five costs varies total annual processing cost by $142,451, $27,038, $77,139, $107,901, and $380,896, respectively. Table 14 lists the percentage of variance in per unit cost for each container type, while Table 15 lists the absolute variance in cents per unit.

Generally, the fluctuations in cost are minimal; however, the 10% change in supply costs does have a notable effect. Supplies consist of paper containers, plastic resin, milk cases, office paper, etc. A large portion of

Table 14. Percentage Change in Processing Costs from a 10% Change in Five Major Cost Items

Container Type	Wages	Health Insurance	Building Construction	Facility Equipment	Supplies
Plastic Gallon	2.14%	0.41%	1.20%	1.65%	3.16%
Plastic Three-Quart	1.40	0.25	0.55	0.48	7.69
Plastic Half-Gallon	1.89	0.34	0.98	1.61	4.02
Paper Half-Gallon	1.68	0.32	0.91	1.50	6.01
Paper Quart	1.62	0.32	0.81	0.97	6.82
Paper Pint	1.45	0.24	0.72	1.08	7.11
Paper Ten-Ounce	1.60	0.34	1.03	1.60	6.27
Regular Half-Pint	1.55	0.34	0.86	1.38	6.54
Small Half-Pint	1.38	0.23	0.69	0.92	7.34
Five-Gallon Bulk	2.41	0.48	1.18	1.61	4.59

Table 15. Change in Processing Costs from a 10% Change in Five Major Cost Items

Container Type	Wages	Health Insurance	Building Construction	Facility Equipment	Supplies
Plastic Gallon	0.57¢	0.11¢	0.32¢	0.44¢	0.84¢
Plastic Three-Quart	0.56	0.10	0.22	0.19	3.07
Plastic Half-Gallon	0.33	0.06	0.18	0.28	0.70
Paper Half-Gallon	0.37	0.07	0.20	0.33	1.32
Paper Quart	0.20	0.04	0.10	0.12	0.84
Paper Pint	0.12	0.02	0.06	0.09	0.59
Paper Ten-Ounce	0.14	0.03	0.09	0.14	0.55
Regular Half-Pint	0.09	0.02	0.05	0.08	0.38
Small Half-Pint	0.06	0.01	0.03	0.04	0.32
Five-Gallon Bulk	4.20	0.84	2.05	2.81	8.00

Note: Variances listed in the tables above are positive when costs are increased by 10% and negative when costs are decreased by 10%. Magnitudes remain unchanged.

supply costs (over 80%) are accountable to product packaging (containers, resin, caps, and labels). With the exception of the three-quart container (which is relatively expensive), Table 14 reveals that the smaller package sizes have the largest change in supply cost. This is because the product packaging represents a larger portion of the products' processing cost; 50% of the small half-pint processing cost is devoted to the cost of the container

as compared to 30% for the plastic gallon. Thus, a change in supply cost has a noticeable influence on processing cost.

Tables 14 and 15 also provide insight into the effect that building and equipment salvage value may have on processing costs. When determining annual capital costs, this study assumed a zero salvage value for the buildings and all equipment. The zero salvage value was used primarily because some equipment is expected to have no salvage value, or in some cases, a financial cost for removal. The salvage value and removal costs represent the selling price, or the disassembly and disposal cost for plant buildings and equipment when they are considered no longer useful to the facility. Rather than attempt to evaluate a salvage value for each building and equipment item, it was decided to report the impact on processing costs if the buildings and equipment were assumed to have a salvage value of 10%. The resulting decrease in processing costs are visible in the columns **Building Construction** and **Facility Equipment** of Tables 14 and 15. The plastic gallon container has the highest percentage difference in processing cost (2.85% for building and equipment salvage), yet still demonstrates a minimal effect on per unit processing cost (less than a penny per unit).

An additional analysis was performed to view the impact of varying the capital investment interest rate. As suggested in the *Economic-engineering Methodology* section of this document, processing costs were calculated with the interest rate set at 12%. The choice of an interest rate is a topic of discussion without universal agreement. For this reason and because of the natural variations in interest rates over time, several interest rates were applied to the processing model and the results recorded (see Table 16). In general, there is not a tremendous impact on per unit cost.

Table 16. Per Unit Processing Cost at Various Capital Interest Rates

	Capital Interest Rate					
Container Type	**7%**	**9%**	**11%**	**12%**	**13%**	**15%**
Plastic Gallon	$0.242	$0.251	$0.261	$0.266	$0.271	$0.282
Plastic Three-Quart	0.377	0.381	0.386	0.389	0.392	0.398
Plastic Half-Gallon	0.160	0.166	0.171	0.174	0.177	0.184
Paper Half-Gallon	0.205	0.210	0.216	0.220	0.223	0.230
Paper Quart	0.117	0.119	0.122	0.123	0.124	0.128
Paper Pint	0.079	0.080	0.082	0.083	0.084	0.086
Paper Ten-Ounce	0.081	0.084	0.086	0.088	0.090	0.092
Regular Half-Pint	0.054	0.056	0.057	0.058	0.059	0.061
Small Half-Pint	0.041	0.042	0.043	0.044	0.044	0.045
Five-Gallon Bulk	1.595	1.651	1.712	1.743	1.776	1.843

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APPENDIX A

Description of Building Square Foot Cost

Site & General Construction

The site cost component includes the earthwork required to shape the site for roads and drainage; storm water drains and piping to street service; concrete pavement at truck ramps, heavy duty asphalt for truck drives, and light duty asphalt for auto drives and parking; and property fencing plus landscaping and grass around office and visitor areas.

General construction of the buildings includes concrete foundations, compacted fill, concrete floors, and precast concrete structure including columns, beams, and roof structure. Class A roof assembly with 3" insulation over general areas and 6" over coolers. Cooler walls are 4" metal-faced, urethane-insulated, factory-made panels.

Exterior walls are precast concrete with 2" backup insulation (urethane). Interior walls are concrete block.

Acid proof brick floors are used in all process areas and in part of tank truck receiving. Quarry tile used in rest rooms, halls, and lunch room. Offices have asphalt tile. Fork truck areas include Anviltop along docks and at palletizers, and in remaining areas, metallic hardeners such as Masterplate 200[1]

Process areas include stainless steel doors and frames. Other areas include painted steel doors and frames, except cold storage doors used in coolers and freezer. Process area ceilings are epoxy finish on concrete structure. All walls that do not have tile or cold storage panels are painted.

Mechanical Trades, Refrigeration, and Electrical

This cost component includes the cost of heating ducts, plumbing, ventilation, cooling system, and electrical wiring.

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[1]*Any mention of particular brand names were supplied by JAI Engineers and are given as examples only.*

Rigging

Rigging includes the cost of receiving, unloading, uncrating and setting in place all dairy machinery and equipment.

Services

This component includes surveying, soil and concrete testing as well as engineering and architectural design services.

Contingency

Contigency is a cost assumed to take care of small changes in scope of work.

APPENDIX B-1

Allocation of Cost Categories to Cost Centers

Land & Building

The annual cost of owning land, constructing the facility, plus the annual cost of the completed facility are distributed across the physical cost centers based on associated cost center square footage. The cost of miscellaneous areas, such as in-plant offices, rest rooms, hallways, and the lunchroom, are assigned to the overhead cost center.

Labor

Employee costs are allocated to the physical cost centers based solely on each individual's job description. Those employees who work with the filling machines have their wages accounted for in the filling & packing cost center. Certain employees were assigned to the overhead cost center if their contribution to the operation was not specifically related to any particular physical cost center.

Equipment

Equipment annual costs are either assigned to the appropriate physical cost center, or if they do not coincide with any one cost center, they are allocated to the overhead cost center.

Supplies

The cost of supplies includes paper containers, three-quart containers, resin for blow molding, plastic caps, container labels, milk cases, and cleaning and maintenance materials. The cost of paper containers, three-quart containers, and the required amount of caps and labels is allocated to the filling & packing cost center. The cost of resin and the cost of caps and labels are applied to the blow molding cost center. The cold storage cost center is assigned the cost of purchasing and replacing milk cases. Lastly, cleaning and maintenance supply costs are placed in the overhead cost center.

Electricity

Electricity requirements were derived based on the needs of specific plant areas and thus are ready to be allocated to the appropriate physical cost centers. The electrical requirements for the in-plant offices are included under the overhead cost center.

Fuel Oil

Fuel oil is used for building heating, product processing, and equipment cleaning. The cost of heating the in-plant offices and rooms is assigned to the overhead cost center. Heating cost for the corporate office is assigned to the corporate office cost center. Lastly, the cost of fuel oil for processing and cleaning is assigned to the volume direct cost center.

Water and Sewer

The costs of water and sewer are assigned to the volume direct cost center since water usage is associated with volume processed.

Product Loss

The cost of product loss is allocated to the volume direct cost center.

Operating Capital

The interest lost on operating capital is assigned to the overhead cost center.

APPENDIX B-2

Allocations between White Milk and By-Products (Full Line Plant Only)

Land & Building

Receive & Process. Area used specifically for by-product production (orange juice freezer, blend room, etc.) is allocated directly to by-product receive & process (R&P) area. The remaining areas of R&P are shared by white milk and by-product's (process room, pasteurization tank hall, etc.). These areas are apportioned based on volume processed; if approximately 13% of processing volume is by-products, then 13% of the shared R&P square footage is allocated to by-products. The total square footage allocated to white milk is the total R&P area less the calculated area of by-product R&P. Costs are assigned to white milk and by-products based on the cost of land & building per square foot.

Blow Molding. Three blow molders exist in the plant, each occupying one third of the blow molding area. From the number of containers blown on each machine, and the number of those containers that were used for by-products, the respective areas can be derived for white-milk and by-product blow molding. Land & building costs are then applied according to cost per square foot.

Dry Storage. By-product and white-milk dry storage area is spilt on a simple percentage of space basis. Through observations of existing milk plants and discussions with JAI Engineers, by-product ingredients and supplies occupy approximately 50% of the dry storage floor space. Thus, the cost of the land & building for the dry storage area is split equally between white milk and by-products.

Filling & Packing. The cost of the filling & packing area shared by both milk and by-products is split based on portion of total volume packaged.

Case Clean/Storage. Allocation of land & building cost is based on number of cases used. By-products include the additional number of cases for any outside purchases that are repacked into cases.

Cold Storage. Allocation of cold storage land & building cost is based on the number of cases held in cold storage. By-products receive the cost of the additional area used to store outside purchases.

Corporate Office and Overhead. The method of allocation of corporate office and overhead costs is consistent across all cost categories (land & building, labor, equipment, etc.). Simply put, the costs are split between white milk and by-products according to the total costs assigned to white milk and by-products for this cost category. In this particular instance (the land & building cost category), costs have been split between white milk and by-products for all of the physical cost centers, except "corporate office." If 30% of those costs where allocated to by-products, then 30% of the corporate office and overhead costs would be added to land & building by-products cost. The remaining 70% would be applied to land & building white-milk costs.

Labor

Receive & Process. The cost of by-product-specific labor (ex: product blending) is assigned directly to by-product labor cost. The remaining R&P labor cost is divided between white milk and by-products based on portion of volume processed.

Blow Molding. Labor cost for blow molding is allocated based on the number of containers blown for white milk and by-products.

Dry Storage. The cost of dry storage labor is split according to percentage of space allotted to white milk and by-products.

Filling and Packing. Approximate hours of filling time spent to fill white-milk and by-product packages is used to split filling and packing labor cost.

Case Clean/Storage. Labor cost for case clean/storage is split based on number of cases used for white milk versus by-products. By-products are also allocated the labor cost associated with handling cases used for outside purchases.

Cold Storage. Labor cost is split based on number of cases stored. By-products include the cost for storing cases of outside purchases.

Corporate Office and Overhead. Cost is split according to total cost of labor assigned to white milk and by-products from the previous cost center allocations.

Equipment

Receive & Process. By-product-specific equipment cost is assigned directly to by-product cost. White-milk-specific equipment cost is assigned directly to white-milk cost. The remaining receive & process equipment cost is shared between white milk and by-products according to volume processed.

Blow Molding. Gallon and half-gallon molder equipment cost is shared between white milk and by-products based on number of containers cast for each.

Dry Storage. The dry storage equipment cost is divided between white milk and by-products based on the portion of space occupied.

Filling & Packing. Equipment cost for filling and packing is allocated according to approximate hours of run-time for white milk and by-products. Note: Only the gallon, quart, and small half-pint fillers are used for by-product packaging.

Case Clean/Storage. Equipment cost is split based on number of cases used. By-products share of this cost also includes cases used for outside purchases.

Corporate Office and Overhead. Cost is split according to total cost of equipment assigned to white milk and by-products from the previous cost center allocations.

Supplies

Blow Molding. Blow molding supplies represent the costs of resin, caps, and labels. This is divided between white milk and by-products on a container basis.

Filling & Packing. The cost of purchased containers are accounted for under filling & packing supplies. This is divided between white milk and by-products on a container basis.

Cold Storage. The cost of initially purchasing and future replacement of milk cases is allocated to cold storage. This cost is split between white milk and by-products based on cases of each stored.

Volume Direct. Cleaning and maintenance supply costs are distributed according to volume processed for white milk and by-products.

Corporate Office and Overhead. Cost is split according to total cost of supplies assigned to white milk and by-products from the previous cost center allocations.

Electricity

Receive & Process. Electricity cost for receive & process is distributed between white milk and by-products based on volume processed.

Blow Molding. Electricity cost for blow molding is split according to number of containers blown for white milk and by-products.

Filling & Packing. For those fillers that fill both white milk and by-products, the electricity cost is split according to filler run-time.

Case Clean/Storage. The cost is split based on number of cases used. By-product's share of cost also includes outside purchases.

Corporate Office and Overhead. Cost is split according to total cost of electricity assigned to white milk and by-products from the previous cost center allocations.

Fuel Oil

Volume Direct. The cost of fuel oil in processing milk is assigned to white milk and by-products on a percentage of processing volume basis.

Corporate Office and Overhead. Cost is split according to the total cost of fuel oil assigned to white milk and by-products from the previous cost center allocations.

Water and Sewer
Volume Direct. Water, sewer, and waste disposal costs are divided between white milk and by-products on a percentage of processing volume basis.

Product Loss
Volume Direct. The cost of product loss is divided between white milk and by-products on a percentage of processing volume basis.

Operating Capital
Overhead. Cost is distributed between white milk and by-products according to total process cost for the total of all cost categories.

APPENDIX B-3

White Milk Cost Center Allocations to Containers

Receive & Process

The cost of receive & process cost center is based primarily on the volume throughput. For this reason packages are allocated a portion of the receive & process cost based on the packaged volume.

Blow Molding

Blow molding costs apply only to the plastic gallon and half-gallon packages. Three blow molders are used in the full-line plant; two are for casting gallon containers and the other for half-gallon containers. Because of this, two-thirds of the land & building, labor, and electricity costs are allocated to the gallon packages. Equipment cost for each type of molder is known, so annual cost is applied to the each package accordingly. The cost of resin is allocated to the packages, according to the amount of resin needed to produce them.

Dry Storage

Paper containers, plastic caps, and product labels are kept in dry storage on pallets. From the number of containers on hand and the number of containers per pallet, the relative amount of dry storage space occupied by paper containers is calculated. Space allocated to plastic caps and labels is set at 11% of dry storage space, based on information provided by JAI Engineers. By utilizing these space allocations, the cost of land & building and equipment are allocated to the packages respectively. Since the three-quart container is assumed to be stored in a tractor-trailer, no dry storage space is allocated for that package.

The labor included in dry storage represents unloading trucks and feeding the fillers with the containers. This cost is allocated based on the space utilizations of each container type.

Filling & Packing

All of the fillers occupy approximately the same amount of floor space, except for the bulk filler. From the plant floor plan, it was estimated that 1/12 of the filling & packing area was occupied by the bulk filler. The

five other fillers were assigned an equal portion of the remaining floor area. Thus, land & building cost was allocated to the packages based on the percentage of area occupied.

Labor cost was assigned to the packages according to filler run-time.

The individual cost of each filler is known; thus the equipment is annual cost is assigned to the respective packages. Those fillers that fill more than one type of package have the cost split according to filler run-time for those packages.

Filling & packing supplies account for the purchasing price of the paper and plastic three-quart containers. The cost is assigned to the packages respectively.

Approximate power utilization for each of the fillers was given by JAI. This allows for a reasonable breakdown of electricity cost to fillers and then, based on filler run-time, to each of the packages.

Case Cleaning/Storage

All costs associated with case cleaning/storage are distributed across the package types according to the number of cases used by each.

Cooler

All costs associated with the cooler are distributed across the package types according to the number of cases used by each.

Volume Direct

This cost center is apportioned according to total product volume packaged for each container type.

Corporate Office and Overhead

The total cost allocated to each container type, from the cost centers discussed above, is used to apportion the total costs of the corporate office and overhead cost centers.

APPENDIX C

Full-Line Plant Equipment List

Receive & Process	Qty	Cost	Life	Depr/Yr
Raw Milk Silo (50,000g)	3	$191,520	30	$23,776
Orange Juice Shell (7,000g)	1	$28,980	30	$3,598
Cream Silo (6,000g)	2	$53,760	30	$6,674
Past. Surge tank (20,000g)	3	$121,275	30	$15,056
Past. Surge tank (6,000g)	2	$53,760	30	$6,674
Past. Surge tank (2,000g)	2	$42,210	30	$5,240
Milk Reclaim Refrg (2,000g)	1	$21,105	30	$2,620
Blend System Insul (2,000g)	2	$37,380	30	$4,640
Sweetener Tank (8,000g)	3	$98,280	30	$12,201
Cream Surge (800g)	1	$20,160	30	$2,503
Buttermilk (1,500g)	2	$60,900	30	$7,560
Powder Mixer (25 HP)	1	$20,160	20	$2,699
Vacuum Reclaim	1	$18,690	20	$2,502
Raw Milk Plate Cool (300GPM)	1	$21,315	20	$2,854
HTST Balance Tank	2	$8,400	20	$1,125
HTST Plate (6,000 GPH)	1	$54,075	20	$7,239
HTST Plate (3,000 GPH)	1	$39,900	20	$5,342
Homogenizer (6,000 GPH)	1	$80,325	20	$10,754
Homogenizer (3,000 GPH)	1	$60,900	20	$8,153
Separator (6,000 GPH)	1	$233,100	20	$31,207
Holding Tube (6,000 GPH)	1	$5,250	20	$703
Holding Tube (3,000 GPH)	1	$3,675	20	$492
Cream Plate Cooler (600 GPH)	1	$22,680	20	$3,036
Blend Room Concentrate Pump	1	$6,000	12	$969
Blend Room Conveyor		$4,000	12	$646
Blend Room Platform		$3,000	12	$484
Piping				
Receiving	3	$117,180	20	$15,688
Orange Juice Piping	1	$39,060	20	$5,229
Raw Tank Hall	6	$234,360	20	$31,376
Past. Tank Hall	7	$273,420	20	$36,605
HTST	2	$78,120	20	$10,459
Homogenizer	2	$78,120	20	$10,459
Separator	1	$39,060	20	$5,229
Buttermilk	2	$78,120	20	$10,459
Reclaim System	1	$39,060	20	$5,229

Receive & Process (con't)	Qty	Cost	Life	Depr/Yr
Blend Room	4	$156,240	20	$20,917
Laboratory				
Benches & Cabinets		$28,000	10	$4,956
Farm Sample Refrigerator		$5,800	10	$1,027
Refrigerator		$600	10	$106
Freezer		$900	10	$159
Autoclave		$3,800	10	$673
Incubator	2	$8,000	10	$1,416
Babcock Tester		$2,500	10	$442
Mojoinier Tester		$21,000	10	$3,717
Computer Terminal		$4,000	10	$708
Calculator		$300	10	$53
Glassware		$1,000	10	$177
Total Receive & Process		$2,519,440		$333,829

Blow Molding	Qty	Cost	Life	Depr/Yr
Uniloy 6 head (1 Gal)	1	$480,000	20	$64,262
Uniloy 4 head (1 Gal)	1	$430,000	20	$57,568
Uniloy 8 head (1/2 Gal)	1	$480,000	20	$64,262
Grinder	2	$36,000	15	$5,286
Scrap fan & duct	3	$12,000	15	$1,762
Empty Bottle Conv. (1 Gal)		$82,000	15	$12,040
Empty Bottle Conv. (1/2 Gal)		$55,000	15	$8,075
Resin Tank & Piping (80,000 lb)		$85,000	15	$12,480
Total Blow Molding		$1,660,000		$225,734

Dry Storage	Qty	Cost	Life	Depr/Yr
Flow racks ($315/pallet)	336	$105,840	15	$15,540
Fixed racks ($60/pallet)	48	$2,880	15	$423
Dock Leveler	2	$8,000	7	$1,753
Dock Seal/Bumper	2	$5,000	7	$1,096
Total Dry Storage		$121,720		$18,811

Case Storage/Clean	Qty	Cost	Life	Depr/Yr
Stack Conveyor ($250/LF)	246	$61,500	15	$9,030
Overhead Conveyor ($125/LF)	312	$39,000	15	$5,726
Topout Unstacker	3	$69,000	15	$10,131
Stack pusher	2	$7,000	15	$1,028
Topdown Stacker	1	$23,000	15	$3,377
Case Washer	1	$30,000	15	$4,405
Pallet Washer	1	$12,000	15	$1,762
Pusher at Filler	5	$15,000	15	$2,202
Dock Seal/Bumper	4	$10,000	7	$2,191
Total Case Storage/Clean		$266,500		$38,852

Filling & Packing	Qty	Cost	Life	Depr/Yr
Stack Conveyor ($250/LF)	252	$63,000	15	$9,250
Stacker	6	$120,000	15	$17,619
Caser (Plastic)	2	$44,000	15	$6,460
Caser (Paper)	3	$114,000	15	$16,738
Bottle Conveyor ($165/LF)	350	$57,750	15	$8,479
Combiner	2	$6,000	15	$881
Accumulator	5	$20,000	15	$2,936
Plastic Filler	2	$234,000	12	$37,776
Paper Filler - 1/2 Gal	1	$332,000	12	$53,597
Paper Filler - Quart	1	$328,000	12	$52,951
Paper Filler - 1/2 Pint	1	$317,000	12	$51,175
Bag in Case Filler	1	$38,000	12	$6,135
Filler Piping	6	$234,360	20	$31,376
Total Filling & Packing		$1,908,110		$295,374

Cold Storage	Qty	Cost	Life	Depr/Yr
Palletizer	1	$105,000	15	$15,417
Unitizer	1	$55,000	15	$8,075
Stack Sorter	1	$9,000	15	$1,321
Pusher	5	$17,500	15	$2,569
Stack Conveyor ($250/LF)	738	$184,500	15	$27,089
Accum Conveyor ($400/LF)	336	$134,400	15	$19,733
Flow Rack ($325/Pallet)	723	$234,975	15	$34,500
Fixed Rack ($70/Pallet)	222	$15,540	15	$2,282

Cold Storage (con't)	Qty	Cost	Life	Depr/Yr
Aluminum Pallets	1000	$131,000	5	$36,341
Truck Leveler	3	$27,000	7	$5,916
Dock Leveler	3	$12,000	7	$2,629
Dock Seal/Bumper	6	$15,000	7	$3,287
Total Cold Storage		$940,915		$159,160

Corporate Office	Qty	Cost	Life	Depr/Yr
Desk	25	$12,500	10	$2,212
Chair	25	$5,625	10	$996
Conference Table & Chairs	1	$2,000	10	$354
File Cabinet	20	$4,000	10	$708
Telephone	25	$17,500	5	$4,855
Calculator	20	$2,000	5	$555
Waste Basket	25	$1,750	10	$310
Corporate Computer	1	$100,000	7	$21,912
Photo Copier	1	$10,000	5	$2,774
Facsimile	1	$1,000	5	$277
Safe	1	$1,000	10	$177
Lunch Table	4	$800	10	$142
Lunch Chair	16	$1,600	10	$283
Clock	15	$750	10	$133
Total Corporate Office		$160,525		$35,687

Miscellaneous	Qty	Cost	Life	Depr/Yr
Hydraulic Power Units	3	$30,000	15	$4,405
Hydraulic Piping		$38,000	15	$5,579
Dump Milk Tank (3,000g)	1	$29,610	30	$3,676
Desk	15	$7,500	10	$1,327
Chair	15	$3,750	10	$664
Ref. Table	10	$2,600	10	$460
Computer Terminal	7	$28,000	5	$7,767
Calculator	15	$1,500	5	$416
Photocopier	2	$3,000	5	$832
Lunch Table	4	$800	10	$142
Lunch Chair	16	$1,600	10	$283
Locker	120	$9,600	10	$1,699

Miscellaneous (con't)	Qty	Cost	Life	Depr/Yr
Waste Basket	20	$1,400	10	$248
File	15	$3,000	10	$531
Telephone	12	$8,400	5	$2,330
Intercom	12	$4,800	5	$1,332
TV Monitor	8	$12,000	5	$3,329
Time Clock	3	$3,000	5	$832
Detection System		$15,000	5	$4,161
Cold Return Dock Leveler	2	$8,000	7	$1,753
Cold Return Dock Seal/Bump	2	$5,000	7	$1,096
Cold Return Container Grinder	1	$40,000	15	$5,873
Truck Scale	1	$65,000	15	$9,544
Trash Compactor	1	$32,000	7	$7,012
Fork-Lift Truck	4	$160,000	7	$35,059
Total Miscellaneous		$513,560		$100,349

APPENDIX D

Full-Line Plant List of Employees

This appendix lists the employees required for the full-line facility.

Cooler	Number of Employees	Class	Weekly Wages	Taxes & Benefits	Weekly Total
Load Routes at Night					
Truck Jockey	1	1	$294	$138	$432
Inside Truck	0.75	1	$221	$103	$324
Select High Volume	0.75	1	$221	$103	$324
Select Low Volume	2.5	1	$736	$344	$1,080
Supervisor	1	3	$396	$156	$551
Load Trailers Daytime					
Fork Truck & Truck Jockey	0.75	1	$221	$103	$324
Select High Volume	0.75	1	$221	$103	$324
Select Low Volume	1.5	1	$442	$206	$648
Incoming Product					
Purchased Items	1	1	$294	$138	$432
Production First Shift	1.5	1	$442	$206	$648
Production Second Shift	1	1	$294	$138	$432
Cooler Supervisor	1	3	$396	$156	$551
Total Cooler	13.5		$4,177	$1,895	$6,071

Cases & Returns	Number of Employees	Class	Weekly Wages	Taxes & Benefits	Weekly Total
Feed Production 1st Shift	1	1	$294	$138	$432
Feed Production 2nd Shift	1	1	$294	$138	$432
Unload Trucks 1st Shift	0.5	1	$147	$69	$216
Unload Trucks 2nd Shift	1	1	$294	$138	$432
Returns and Dumps	1	1	$294	$138	$432
Total Cases & Returns	4.5		$1,325	$619	$1,944

Blow Mold	Number of Employees	Class	Weekly Wages	Taxes & Benefits	Weekly Total
First Shift	2	2	$658	$288	$946
Second Shift	1	2	$329	$144	$473
Total Blow Mold	3		$988	$432	$1,419

Milk Receiving (7 days)	Number of Employees	Class	Weekly Wages	Taxes & Benefits	Weekly Total
Receive Raw Milk	1.5	1	$442	$206	$648
Total Milk Receiving	1.5		$442	$206	$648

Laboratory	Number of Employees	Class	Weekly Wages	Taxes & Benefits	Weekly Total
Lab & Q.C.	3	1	$883	$413	$1,296
Total Laboratory	3		$883	$413	$1,296

Processing	Number of Employees	Class	Weekly Wages	Taxes & Benefits	Weekly Total
HTST (1 per shift)	2	2	$658	$288	$946
Blend (1 shift only)	1	2	$329	$144	$473
Total Processing	3		$988	$432	$1,419

Filling & Packing	Number of Employees	Class	Weekly Wages	Taxes & Benefits	Weekly Total
One Gal Plastic	1.5	2	$494	$216	$710
Half Gal Plastic	1.5	2	$494	$216	$710
Half Gal Paper	0.5	2	$165	$72	$237
Quart Paper	1.5	2	$494	$216	$710
Half Pint Paper	1.5	2	$494	$216	$710
Bag in Case	0.5	2	$165	$72	$237
Total Filling & Packing	7		$2,304	$1,007	$3,312

Dry Storage	Number of Employees	Class	Weekly Wages	Taxes & Benefits	Weekly Total
Receive & Feed Operations	2	1	$589	$275	$864
Total Dry Storage	2		$589	$275	$864

Maintenance	Number of Employees	Class	Weekly Wages	Taxes & Benefits	Weekly Total
Chief Engineer	1	3	$396	$156	$551
On Floor Each Shift	2	2	$658	$288	$946
Lubrication	0.5	2	$165	$72	$237
Preventive Maintenance	2	2	$658	$288	$946
Boilers & Refrig.	0.5	2	$165	$72	$237
Total Maintenance	6		$2,042	$875	$2,917

Sanitation	Number of Employees	Class	Weekly Wages	Taxes & Benefits	Weekly Total
CIP Lines	1	1	$294	$138	$432
CIP Fillers	1	1	$294	$138	$432
Janitor (1 per shift)	2	1	$589	$275	$864
Waste Recycling	0.5	1	$147	$69	$216
Total Sanitation	4.5		$1,325	$619	$1,944

Corporate Office	Number of Employees	Class	Weekly Wages	Taxes & Benefits	Weekly Total
Corporate Management					
Chief Executive Officer	1	5	$1,538	$315	$1,853
CEO Assistant	1	3	$396	$156	$551
Finance & Accounting					
Department Head	1	4	$601	$193	$794
Dept. Head Assistant	1	3	$396	$156	$551
Secretary/Clerk	4	2	$1,317	$576	$1,892
Computer Operator/Analyst	1	3	$396	$156	$551

Corporate Office (con't)	Number of Employees	Class	Weekly Wages	Taxes & Benefits	Weekly Total
Sales & Marketing					
Department Head	1	4	$601	$193	$794
Dept. Head Assistant	1	3	$396	$156	$551
Sales Person	3	3	$1,187	$468	$1,654
Supermarket Contact	1	3	$396	$156	$551
Route Check-in/Cashier	1	2	$329	$144	$473
Route Organizer	1	3	$396	$156	$551
Route Supervisor	1	3	$396	$156	$551
Ordering Staff	2	2	$658	$288	$946
Secretary/Clerk	1	2	$329	$144	$473
Human Resource					
Department Head	1	4	$601	$193	$794
Dept. Head Assistant	1	3	$396	$156	$551
Secretary/Clerk	2	2	$658	$288	$946
Total Corporate Office	25		$10,986	$4,047	$15,032
Grand Total	85		$30,813	$12,695	$43,508

APPENDIX E

White-Milk Plant Processing Cost Analysis

This analysis was performed to identify whether or not a limited product line plant reduces per unit milk-processing costs. The results of this determined the path of study concentration, since our objective was to find minimum processing costs. The analysis involved creation of a second model plant. JAI Engineers provided all construction and equipment costs and labor requirements. Operating supplies, taxes, utilities, etc., were adjusted down from the full-line plant to reflect the reduced requirements of the facility.

The white-milk spreadsheet model paralleled the full-line model design; however, several quantitative differences did apply:

Product packaging was limited to plastic gallon and half-gallon containers. The processing volumes for these containers were set according to the ratio between gallon and half-gallon volumes for the full-line model. The white-milk-processing volume was still set at 400,000 gallons per week.

Facility supply costs varied mostly by usage, as is the case for items such as resin and container labels. Cleaning and office supplies were adjusted to meet expected requirements of the smaller plant.

Property and property costs varied according to the reduction in required acreage and property value.

Fire and liability insurance cost was reduce in relation to the decrease in property value.

Electricity, fuel oil, water, and sewer usage were re-estimated for the smaller plant by JAI Engineers.

Hauler costs for product returns were reduced based on the lower plant volume and solid waste disposal cost was cut in half to reflect the absence of paper container packaging.

The final results of the white-milk model proved that per unit processing costs (for plastic gallon and half-gallon white milk) increased slightly. Analysis of intermediate results within the two models (white milk and full line) identified that the difference in per unit costs, for most of the

cost centers, were negligible. The overriding factors that increased white-milk plant per unit costs were the corporate office and plant overhead cost centers. Combined, these cost centers were 30% more costly per unit processed. Examination of the total annual cost for the corporate office and plant overhead cost centers for the two plants showed that the full-line plant cost was higher by 22%, while the plant's total case output increased by 37% over the white-milk plant; thus, a decrease in per unit cost. Final per unit costs for the gallon and half-gallon containers in the white-milk plant rose approximately by only 1% and 3% respectively.

APPENDIX F

White-Milk Plant Equipment List

Receive & Process	Qty	Cost	Life	Depr/Yr
Raw Milk Silo (50,000g)	3	$191,520	30	$23,776
Cream Silo (6,000g)	2	$53,760	30	$6,674
Past. Surge tank (30,000g)	2	$103,320	30	$12,827
Past. Surge tank (10,000g)	1	$33,600	30	$4,171
Milk Reclaim Refrg (2,000g)	1	$21,105	30	$2,620
Cream Surge (800g)	1	$20,160	30	$2,503
Vacuum Reclaim	1	$18,690	20	$2,502
Raw Milk Plate Cool (300GPM)	1	$21,315	20	$2,854
HTST Balance Tank	1	$4,200	20	$562
HTST Plates (6,000 GPH)	1	$54,075	20	$7,239
Homogenizers (6,000 GPH)	1	$80,325	20	$10,754
Separator (6,000 GPH)	1	$233,100	20	$31,207
Holding Tube (6,000 GPH)	1	$5,250	20	$703
Cream Plate Cooler (600 GPH)	1	$22,680	20	$3,036
Piping				
Receiving	1	$39,060	20	$5,229
Raw Tank Hall	6	$234,360	20	$31,376
Past. Tank Hall	3	$117,180	20	$15,688
HTST	1	$39,060	20	$5,229
Homogenizer	1	$39,060	20	$5,229
Separator	1	$39,060	20	$5,229
Reclaim System	1	$39,060	20	$5,229
Laboratory				
Benches & Cabinets		$28,000	10	$4,956
Farm Sample Refrig.		$5,800	10	$1,027
Refrigerator		$600	10	$106
Freezer		$900	10	$159
Autoclave		$3,800	10	$673
Incubator	2	$8,000	10	$1,416
Babcock Tester		$2,500	10	$442
Mojoinier Tester		$21,000	10	$3,717
Computer Terminal		$4,000	10	$708
Calculator		$300	10	$53
Glassware		$1,000	10	$177
Total Receive & Process		$1,485		$198,072

Blow Molding	Qty	Cost	Life	Depr/Yr
Uniloy 6 head (1 Gal)	2	$960,000	20	$128,524
Uniloy 8 head (1/2 Gal)	2	$960,000	20	$128,524
Grinder	2	$36,000	15	$5,286
Scrap fan & duct	4	$16,000	15	$2,349
Empty Bottle Conv. (1 Gal)		$82,000	15	$12,040
Empty Bottle Conv. (1/2 Gal)		$76,000	15	$11,159
Resin Tank & Piping (80,000 lb)		$85,000	15	$12,480
Total Blow Molding		$2,215,000		$300,360

Dry Storage	Qty	Cost	Life	Depr/Yr
Fixed rack ($60/pallet)	213	$12,780	15	$1,876
Dock Leveler	1	$4,000	7	$876
Dock Seal/Bumper	1	$2,500	7	$548
Total Dry Storage		$19,280		$3,301

Case Storage/Clean	Qty	Cost	Life	Depr/Yr
Stack Conveyor ($250/LF)	100	$25,000	15	$3,671
Overhead Conveyor ($125/LF)	224	$28,000	15	$4,111
Topout Unstacker	2	$46,000	15	$6,754
Topdown Stacker	1	$23,000	15	$3,377
Case Washer	1	$30,000	15	$4,405
Pushers at Filler	2	$6,000	15	$881
Palletizer/Depalletizer	1	$145,000	15	$21,290
Dock Seal/Bumper	4	$10,000	7	$2,191
Total Case Storage/Clean		$313,000		$46,679

Filling & Packing	Qty	Cost	Life	Depr/Yr
Stack Conveyor ($250/LF)	200	$50,000	15	$7,341
Stacker	2	$40,000	15	$5,873
Caser (Plastic)	2	$44,000	15	$6,460
Bottle Conveyor ($165/LF)	132	$21,780	15	$3,198
Accumulator	2	$8,000	15	$1,175

Filling & Packing (con't)	**Qty**	**Cost**	**Life**	**Depr/Yr**
Plastic Filler	2	$234,000	12	$37,776
Filler Piping	2	$78,120	20	$10,459
Total Filling & Packing		$475,900		$72,282

Cold Storage	**Qty**	**Cost**	**Life**	**Depr/Yr**
Palletizers	1	$105,000	15	$15,417
Stack Conveyor ($250/LF)	104	$26,000	15	$3,817
Flow Racks ($325/Pallet)	552	$179,400	15	$26,340
Aluminum Pallets	700	$91,700	5	$25,438
Dock Leveler	4	$16,000	7	$3,506
Dock Seal/Bumper	4	$10,000	7	$2,191
Total Cold Storage		$428,100		$76,710

Corporate Office	**Qty**	**Cost**	**Life**	**Depr/Yr**
Desk	25	$12,500	10	$2,212
Chair	25	$5,625	10	$996
Conference Table & Chairs	1	$2,000	10	$354
File Cabinet	20	$4,000	10	$708
Telephone	25	$17,500	5	$4,855
Calculator	20	$2,000	5	$555
Waste Basket	25	$1,750	10	$310
Corporate Computer	1	$100,000	7	$21,912
Photocopier	1	$10,000	5	$2,774
Facsimile	1	$1,000	5	$277
Safe	1	$1,000	10	$177
Lunch Table	4	$800	10	$142
Lunch Chair	16	$1,600	10	$283
Clock	15	$750	10	$133
Total Corporate Office		$160,525		$35,687

Miscellaneous	**Qty**	**Cost**	**Life**	**Depr/Yr**
Hydraulic Power Unit	2	$20,000	15	$2,936

Miscellaneous (con't)	Qty	Cost	Life	Depr/Yr
Hydraulic Piping		$22,000	15	$3,230
Dump Milk Tank (3,000g)	1	$29,610	30	$3,676
Desk	13	$6,500	10	$1,150
Chair	13	$2,925	10	$518
Ref. Table	9	$2,340	10	$414
Computer Terminal	6	$24,000	5	$6,658
Calculator	15	$1,500	5	$416
Copier	2	$3,000	5	$832
Lunch Table	4	$800	10	$142
Lunch Chair	16	$1,600	10	$283
Locker	100	$8,000	10	$1,416
Waste basket	18	$1,260	7	$276
File	13	$1,300	10	$230
Telephone	22	$15,400	5	$4,272
Intercom	12	$4,800	5	$1,332
TV Monitor	8	$12,000	5	$3,329
Time Clock	3	$3,000	5	$832
Detection System		$15,000	5	$4,161
Cold Return Dock Leveler	2	$8,000	7	$1,753
Cold Return Dock Seal/Bump	2	$5,000	7	$1,096
Cold Return Container Grinder	1	$40,000	15	$5,873
Truck Scale	1	$65,000	15	$9,544
Trash Compactor	1	$32,000	7	$7,012
Fork-Lift Truck	4	$160,000	7	$35,059
Total Miscellaneous		$485,035		$96,439

APPENDIX G

White-Milk Plant List of Employees

This appendix lists the employees for the white-milk facility.

Cooler	Number of Employees	Class	Weekly Wages	Taxes & Benefits	Weekly Total
Load Trailers					
Fork Truck & Truck Jockey	3	1	$883	$413	$1,296
Incoming Product					
Production First Shift	1.5	1	$442	$206	$648
Production Second Shift	1.5	1	$442	$206	$648
Cooler Supervisor	1	3	$396	$156	$551
Total Cooler	7		$2,162	$982	$3,144

Cases & Returns	Number of Employees	Class	Weekly Wages	Taxes & Benefits	Weekly Total
Feed Production 1st Shift	0.5	1	$147	$69	$216
Feed Production 2nd Shift	0.5	1	$147	$69	$216
Unload Trucks 1st Shift	0.5	1	$147	$69	$216
Unload Trucks 2nd Shift	0.5	1	$147	$69	$216
Returns and Dumps	1	1	$294	$138	$432
Total Cases & Returns	3		$883	$413	$1,296

Blow Mold	Number of Employees	Class	Weekly Wages	Taxes & Benefits	Weekly Total
First Shift	2	2	$658	$288	$946
Second Shift	1	2	$329	$144	$473
Total Blow Mold	3		$988	$432	$1,419

Milk Receiving (7 days)	Number of Employees	Class	Weekly Wages	Taxes & Benefits	Weekly Total
Receive Raw Milk	1.5	1	$442	$206	$648
Total Milk Receiving	1.5		$442	$206	$648

Laboratory	Number of Employees	Class	Weekly Wages	Taxes & Benefits	Weekly Total
Lab & Q.C.	3	1	$883	$413	$1,296
Total Laboratory	3		$883	$413	$1,296

Processing	Number of Employees	Class	Weekly Wages	Taxes & Benefits	Weekly Total
HTST (1 per shift)	2	2	$658	$288	$946
Total Processing	2		$658	$288	$946

Filling & Packing	Number of Employees	Class	Weekly Wages	Taxes & Benefits	Weekly Total
One Gal Plastic	2	2	$658	$288	$946
Half Gal Plastic	1.5	2	$494	$216	$710
Total Filling & Packing	3.5		$1,152	$504	$1,656

Dry Storage	Number of Employees	Class	Weekly Wages	Taxes & Benefits	Weekly Total
Receive & Feed Operations	0.5	1	$147	$69	$216
Total Dry Storage	0.5		$147	$69	$216

Maintenance	Number of Employees	Class	Weekly Wages	Taxes & Benefits	Weekly Total
Chief Engineer	1	3	$396	$156	$551
On Floor Each Shift	2	2	$658	$288	$946
Lubrication	0.5	2	$165	$72	$237
Preventive Maintenance	1	2	$329	$144	$473
Boilers & Refrig.	0.5	2	$165	$72	$237
Total Maintenance	5		$1,712	$731	$2,444

Sanitation	Number of Employees	Class	Weekly Wages	Taxes & Benefits	Weekly Total
CIP Lines	0.5	1	$147	$69	$216
CIP Fillers	0.5	1	$147	$69	$216
Janitor (1 per shift)	2	1	$589	$275	$864
Waste Recycling	0.5	1	$147	$69	$216
Total Sanitation	3.5		$1,030	$482	$1,512

Corporate Office	Number of Employees	Class	Weekly Wages	Taxes & Benefits	Weekly Total
Corporate Management					
Corporate President/CEO	1	5	$1,538	$315	$1,853
CEO Assistant	1	3	$396	$156	$551
Finance & Accounting					
Department Head	1	4	$601	$193	$794
Dept. Head Assistant	1	3	$396	$156	$551
Secretary/Clerk	2	2	$658	$288	$946
Computer Operator/Analyst	1	3	$396	$156	$551
Sales & Marketing					
Department Head	1	4	$601	$193	$794
Dept. Head Assistant	1	3	$396	$156	$551
Sales Person	3	3	$1,187	$468	$1,654
Supermarket Contact	1	3	$396	$156	$551
Route Check-in/Cashier	1	2	$329	$144	$473
Route Supervisor	1	3	$396	$156	$551
Ordering Staff	1	2	$329	$144	$473

Corporate Office (con't)	Number of Employees	Class	Weekly Wages	Taxes & Benefits	Weekly Total
Secretary/Clerk	1	2	$329	$144	$473
Human Resources					
Department Head	1	4	$601	$193	$794
Dept. Head Assistant	1	3	$396	$156	$551
Secretary/Clerk	1	2	$329	$144	$473
Total Corporate Office	20		$9,273	$3,315	$12,588

Miscellaneous	Number of Employees	Class	Weekly Wages	Taxes & Benefits	Weekly Total
Manager	1	4	$601	$193	$794
Assistant Manager	1	4	$601	$193	$794
Manager & Purchase	1	4	$601	$193	$794
Secretary/Clerk	2	2	$658	$288	$946
Vacation (2 weeks/person)	2	2	$658	$288	$946
Relief & Absent (5%)	3	2	$988	$432	$1,419
Total Miscellaneous	10		$4,108	$1,586	$5,694

Grand Total	62		$23,439	$9,420	$32,860