CANADIAN DAIRY COMMISSION

UPDATE OF THE
COSTS OF PROCESSING INDUSTRIAL MILK
INTO BUTTER AND SKIM MILK POWDER
MAY, 1988
May 20, 1988

Mr. Roch Morin
Chairman
Canadian Dairy Commission
2197 Riverside Drive
Ottawa, Ontario
K1A 0Z2

Dear Mr. Morin:

We are pleased to submit our report entitled "Update of the Costs of Processing Industrial Milk into Butter and Skim Milk Powder". This document consolidates the findings of our study, which have been previously presented to the Canadian Dairy Commission and to the National Dairy Council and the participating processors.

This report first presents an introduction to our study, followed by the objectives and the approach and methodology of our work program. We then present the results of our processor cost survey and describe the recommended cost model and update methodology for the maintenance of the cost base in the future.

As this report represents the completion of our work, we would like to take this opportunity to thank the staff of the Canadian Dairy Commission for their comments during the conduct of the study. We also wish to thank the processors who participated in this study. Their cooperation throughout the study has been instrumental in successfully completing this update to the costs of processing.

Touche Ross is pleased to have undertaken this study on behalf of the Commission. Should you have any further questions or issues you wish clarified, please do not hesitate to contact us. We look forward to having an opportunity to work with you again in the future.

Sincerely,

TOUCHE ROSS
MANAGEMENT CONSULTANTS

Robert V. Brouillard, FCMC
Partner
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I. INTRODUCTION

The Canadian Dairy Commission's principal objectives, as stated in its Act, are "to provide efficient producers of milk and cream with the opportunity of obtaining a fair return for their labour and investment" and "to provide consumers of dairy products with a continuous and adequate supply of high quality dairy products". The Commission's role in the implementation of federal dairy policy includes such dairy support programs as calculating the National Target Return for industrial milk as well as support prices for butter and skim milk powder.

In response to concerns expressed in the industrial milk support price system in 1983, the Commission wished to establish a more accurate basis for deriving the Assumed Processors' Margin. As a result, Touche Ross Management Consultants was engaged to undertake a study to determine the costs of processing industrial milk into butter and skim milk powder. The recommended cost model was implemented in 1983. One of the study recommendations was that a cost survey be conducted every four to five years to recompute the base cost and to reflect any changes in the economic structure of the industry. Accordingly, early in 1988, Touche Ross was selected to assist the Commission in undertaking an update study because of our prior involvement in the 1983 cost of processing study and our familiarity with the plants involved.

This document is our final report. In it, we review the study objectives and describe the approach and methodology undertaken. We then present the results of the processor cost survey and describe the cost model. The recommended methodology for updating the cost model concludes the report. A list of the plants surveyed and an illustration of detailed calculations of updating the cost model are included as appendices to this document.
The basic objective of this study was:

. to update the estimate of the minimum cost of processors to manufacture industrial milk into butter and skim milk powder for tender to the Canadian Dairy Commission.

More specifically, four objectives were identified:

. to review the currently implemented cost model in terms of model components, implementation considerations, and industry comments;

. to update the cost base from 1983 to 1988;

. to review and modify, as appropriate, the model maintenance procedures; and,

. to examine and comment on changes in the dairy industry economics which may affect the cost model.
III. APPROACH AND METHODOLOGY

This study was executed according to the work program presented in our proposal. Broadly speaking, the same study approach as in the 1983 survey was utilized except that the industry participants were much more involved both before and after the survey phase than in 1983. The following paragraphs discuss the key steps in the work program and how each was executed.

PHASE I - PROJECT START-UP

The initial Phase of the work program included the tasks concerned with the start-up of the project. At the outset, we met with the Commission to review and confirm the detailed work program. We then met with the National Dairy Council (NDC) to discuss the work program and to arrange and confirm plant cooperation. The decision to undertake a greater level of industry consultation was made at that time.

In order to ensure that all issues discussed during the conduct of the original study were considered, we reviewed the 1983 study in detail. This review included particular focus on the cost structure, the model design, the comments made by the NDC at that time, the manner in which the model was implemented, the impact of industry trends within the past five years, and the model maintenance procedures utilized. We summarized this review by identifying any potential modifications to the model.

At the request of the NDC and with the concurrence of the Commission, we held an initial meeting with the processors and Commission representatives. Our study's Terms of Reference and timetable were presented and relevant costing policy issues were discussed in this session.
PHASE II - SURVEY PREPARATION

Phase II included all tasks necessary for the planning and preparation of the plants visits. First, we updated the questionnaire. The questionnaire was designed to act as a guide for the field survey team in conducting the plant visits and as a vehicle for collecting information that subsequently formed the basis of the survey findings. We reviewed the 1983 questionnaire in the context of both the experience gained in 1983 and the current potential model modifications identified in Task B. Appropriate changes were made to capture better both quantitative and supporting qualitative information and the questionnaire was finalized.

The plant selection criteria were defined to include: plants who tendered Plan A butter to the Commission in 1987; plants who tendered skim milk powder to the Commission in 1987; and, within a multi-plant organization, plants which may not have had any production in 1987, yet were maintained in an operational state for receiving industrial milk for the production of butter and skim milk powder (balancing plants). In addition, it was decided that the survey team would collect cost data for butter processing from all plants visited because of the opportunity to enhance cost data for butter from those plants who tendered skim milk powder.

The Commission provided to the consultants a list of all industrial milk plants from across Canada, which tendered product to the Commission in 1987. Twenty-four plants from this list, plus two balancing plants were surveyed. Of these twenty-six plants, only one plant did not have any cost data relevant to butter; all twenty-six plants had cost data relevant to skim milk powder. Appendix A presents a list of the plants surveyed.

The final activities in preparing for the survey included structuring the field survey timetable, establishing a plant visits schedule, conducting a field team briefing
session and contacting the plants to confirm timing, plant participants and availability of records. All interview arrangements were made centrally at the outset, so that the field team had a confirmed survey schedule prior to beginning field visits. The field team briefing session ensured that each member of the team understood fully the details and implications of the questionnaire requirements.

PHASE III - DATA COLLECTION AND ANALYSIS

Within this Phase of the work program, cost and production data were collected, analyzed and compiled, and the update model was finalized.

Data Collection

In collecting processing costs and other plant data, as in 1983, the field team encountered several different approaches among the plants in the structure of their cost records. At one extreme were formal computerized production and accounting reporting systems; at the other, part-time clerical staff manually prepared simple cost records. In all cases, however, the data collected was validated by the field team with reference to general ledgers, payroll ledgers, production reports and financial statements of some type. Where the organization's financial year-end was other than December 31, 1987, appropriate portions of fiscal years were combined so that all processing costs and production data collected would relate to the same twelve month period in 1987.

The survey concentrated on capturing only those processing costs related to the two products which were tenderable to the Commission. Therefore, costs associated with any other product such as fluid milk, or costs of other operations such as commercial packaging and selling of butter and powder, were excluded. All cost data collected were checked to ensure that they accurately reflected the production volume recorded. For example, where costs
associated with reworking butter were identifiable in company records, they were excluded as was the corresponding rework butter volume. At the completion of a plant visit, each member of the survey team summarized from the questionnaire the pertinent cost and production data of the plant into a summary analysis format.

Data Analysis

Following the field visits, data in summary analysis format were reviewed against the questionnaires for accuracy, consistency, completeness and reliability, prior to inclusion in the final tabulation of results. Simultaneously, data validation was done using extensive cross-checking procedures. Where necessary, plants were contacted by telephone and facsimile to resolve any data weaknesses.

Where costs were not applied directly to butter or powder, the processor frequently had made an allocation between the two products. In those cases where other products were also produced, the allocation may have been across all products, such as for insurance or property taxes. In all allocation situations, the allocation based used was reviewed for reasonableness. Where the method used by the plant appeared inequitable and in situations where no allocations had been made between butter and powder, the interviewer obtained complete details of the underlying raw data. Then upon analysing the results of all the plants surveyed, the consultants and plant management developed defensible and objective allocation procedures and applied these where required. In general, where it was necessary for the consultants to develop and apply allocation methodologies, these approaches closely resembled those employed by those other processors who had made their own allocations.
Assembly of Results

After data analysis and validation were completed, unit costs by component were calculated for each processor. This provided another level for reasonableness testing of individual processor results. Each plant's data were then reviewed with the plant's management to confirm that the cost data to be used as input to the industry model were accurate. Some of these reviews were conducted in person; others were completed by telephone. Prior to the development of the updated model, the consultants and the plant management agreed that the data were accurate and reasonable.

The individual component cost data were then aggregated into total plant processing costs. With total plant processing costs for butter and for skim milk powder now stated for each plant, weighted average figures for each cost component were calculated for each product. The weighting factor used in each case was the proportion which each processor's production represented of the total production from the plants surveyed. The overall results for each product by cost component and in total are presented and discussed in the next section of this report.

Development of Model

The study team then addressed each of the policy issues identified in Task B in the context of the 1987 cost survey. In essence, the updated model presented in Section V of this report was based on the experience gained in the 1983 study, a review of the implementation of the original cost model, and the survey of 1987 costs. Fixed cost factors were then adjusted by utilizing production volume normalization factors specific to butter and skim milk powder. The consultants then reviewed, and revised as necessary, a series of index mechanisms to maintain the cost base on a current basis. The recommended methodology for maintaining the cost model is described in Section VI.
PHASE IV - REPORTING

This study included several presentations and discussions with the Commission and processors prior to the development of the final report. The first presentation of results was made to the Commission and representatives of Agriculture Canada. At that meeting, consolidated survey results by cost component and updated model results were presented. The second presentation of consolidated results and underlying policies was made to the participating processors. Questions raised by the processors led to an agreement to hold a third meeting, at which some modifications to the results and relevant policy issues were introduced. These meetings were representative of the effective communications undertaken by the Commission, the processors and the consultants throughout the conduct of the study. Following these meetings, this final report was produced.
IV. RESULTS OF THE COST SURVEY

This section of the report contains three parts. First, we present a review and discussion of relevant costing policies. Second, a description is provided of each of the components of processing cost included in the cost statement and a discussion of how it was treated in this analysis. Third, we present the actual costs as consolidated from the survey results.

A. A REVIEW OF COSTING POLICIES

As described previously, the study methodology included extensive review and discussion of relevant costing policies. Specific tasks included:

- review of the 1983 Study;
- industry consultations;
- development of updated model results; and
- industry presentations and consultations.

During this process, three categories of issues were identified:

* were certain costs to be included or not included in the scope of the study?;

* did certain costs require alternate methods of valuation compared to the values collected for these costs in the survey?; and,

* how was the process of normalization of fixed costs to be performed?
Some of these issues were identified by the consultants, others by the processors. Certain policy issues, such as the process of normalization or the method of valuation of assets or certain costs, affect the development of the cost model. These are discussed in the next section of this report. The following paragraphs, however, address those policy issues relevant to the actual survey of costs.

To Be Included or Not

Three issues were identified that required study to determine whether they should be included or not in the scope of costs collected:

- costs of selling to the Commission;
- premiums for raw milk supply; and,
- plant supply quotas.

Costs of Selling to the Commission

All activities associated with administering sales of butter and powder to the Commission are conducted primarily by administrative staff. Hence, as in the 1983 study, the related costs are included in the Administration cost component and no additional allowance for such costs was deemed appropriate.

Premiums for Raw Milk Supply

The costs associated with milk in excess of that purchased under quota at the provincially established industrial milk price have been included in the Interbranch Haulage cost component. These costs were excluded from the cost base in the 1983 study, as they were deemed technically to be a raw product cost rather than a cost of processing. However, as this study intends to define more completely the Assumed Processors' Margin, these premiums have now been included. This issue is relatively insignificant, as there was a very low level of incidence of surplus to quota milk purchases in 1987.
Plant Supply Quotas

Costs of supply quota have never been considered as part of the allowable returns of producers or processors operating under supply management. To that end, plant supply quotas were not included in the 1983 study. Our review of this issue concluded that no change in this policy was warranted. Accordingly, plant supply quotas have again been excluded from this study's cost base.

Methods of Valuation

For two cost components, methods of determining the cost other than by using plants' books of account were necessary. The cost components affected by this type of issue were:

- packaging; and,
- distribution.

Packaging

Most plants' books of account do not segregate the costs of packaging butter and powder for tender to the Commission from all other packaging costs. Therefore, it was necessary to utilize actual unit costs for CDC 25 kg packages obtained from invoices at the individual plants, as was done in the 1983 study.

Distribution

As with packaging costs, distribution costs related to CDC tendered product are not identifiable in the plants' accounts. Where actual unit costs of delivery to a CDC basing point can be obtained from invoices, these were used; otherwise a quotation from a public transporter was utilized. This methodology is the same as was used in 1983.
B. DESCRIPTION OF THE COST COMPONENTS

Variable Costs

1. Interbranch Haulage

At all plants, raw milk is delivered F.O.B. plant. Some plants receive and process farm separated cream. In most cases it is the plant's cost to pick up this product; related costs, such as fuel and labour have been captured in such cost components as variable plant costs and indirect labour. Certain plants also transferred raw product between branches to improve plant operating efficiencies. Since management's rationale for effecting such transfers is normally to reduce the resulting costs of processing, it was deemed appropriate to include such transfer costs since the offsets are presumably recorded elsewhere in the cost of processing statement. Therefore, the portion of interbranch haulage costs which related to raw product used for butter and skim milk powder production was included in the costs of processing. Although relatively insignificant to the industry, this cost component also includes any premiums paid for raw milk supply.

2. Direct Labour

Direct labour at production points after raw milk separation was generally specific to individual products, and allocated to those products by the processors. Where various types of butter and powder were produced, there was generally no allocation of direct labour among them. In these instances, the total direct labour for the products was allocated by the study team among the products based on the relative number of kilograms produced. All labour costs include fringe benefits.
3. Variable Plant Costs

Included in this cost component were such costs as equipment repair and maintenance expenses, cleaning supplies, lab and other supplies, ingredients, and water and sewage. Except for ingredients, a relatively minor amount, these costs were frequently not allocated to individual products. Therefore, allocations of plant costs were often required. To do so as equitably as possible, the variable portion of plant costs was generally allocated based on the production volume of butter and powder. In this way, the general plant costs were treated consistently.

4. Energy

Different energy sources are used at plants located in the various different regions of Canada. Within plants, rarely did the study team find individual meters to permit direct cost identification to product. The plants that made allocations between products generally did so using methods which were based on engineering estimates or management estimates, or on kilograms produced. Such allocations were reviewed and most were accepted as reasonable.

5. Packaging

As described previously, where plants had segregated packaging costs related to CDC production, the consultants used these costs. In most instances, however, only one packaging account existed for each product line, with no distinction made between formats and varieties of product produced. In these cases, the consultants disregarded the costs recorded, and determined a standard 1987 unit cost for that plant based on a review of actual invoices from the year.
6. Distribution

Having established that only rarely did plants segregate distribution costs specific to CDC production, to accurately reflect the costs of delivering CDC product to the nearest authorized warehouse the consultants used per unit transport rates from actual invoices at the plant when available. If these were not available, outside transport company 1987 haulage rates were used both for butter and for skim milk powder at each plant. These standard costs were used instead of the cost data contained in the books of account.

Fixed Costs

7. Indirect Labour

Plant labour which was classified as indirect labour included employees connected with the boiler room, laboratory, loading dock, maintenance and security, the supervision, and the fieldmen. As with direct labour, fringe benefits were included. Indirect labour was frequently found to be allocated between butter and powder by the plants based on the production of each. This allocation basis was adopted as reasonable because indirect labour tasks are primarily related to overall plant production.

8. Fixed Plant Costs

The major costs within this component include building repair and maintenance expenses, property taxes, and insurance. The allocation method for these costs generally used by the plants was based on the square footage required for each product line.
9. Depreciation

Seldom did plants have depreciation charges allocated to specific products; those that did, generally used relative investment estimates. For each plant which made no depreciation allocation among products, the consultants and plant management first isolated the portion of the total plant depreciation charge which related to butter and powder, based on an estimate of utilization for the equipment portion and square footage utilized for the building and land portion. To further allocate these charges between butter and powder, square footage utilized was applied to the land and building depreciation and plant management's estimate of utilization was generally applied to equipment depreciation.

10. Administration

The majority of plants surveyed were part of larger organizations and therefore incurred a head office charge in addition to local administrative expenses. A variety of approaches were encountered for allocating the head office charge to each plant. Some plants apply full cost recovery policy for allocating such costs to plants; others charge an estimate of senior management's time applicable to that plant. The most widely used practice for allocating administrative expenses between products was based on product revenues. In all cases, the method used was found to be reasonable. Our treatment of the administrative cost component involved several additional steps. First, we excluded selling expenses as unrelated to CDC tendering. Then we ensured that no implicit interest or profit repatriation was included in the administrative costs. Finally, we reviewed existing product allocations for consistency and allocated costs where required, according to product revenues, the most common industry practice noted.
11. Interest

Very few of the plants surveyed had undertaken direct financing independently; generally, financing was provided by the head office, and then only rarely was a distinction made between funds provided for short or long term purposes. The interest charge levied by the head offices was allocated to plants on a variety of bases, most commonly relative asset valuations.

At the plant level, seldom were there allocations of the interest cost between products. Accordingly, the consultants and plant management made the necessary allocations based primarily on sales.

Fixed Asset Base

The establishment of an investment cost base for purposes of returns requires that the base be valued such that it provides for the ongoing viability of the business. As in 1983, our study's investment base is valued at full historic cost, which provides for some replacement of plant and equipment over time without introducing the concept of replacement cost.

The fixed asset base includes the three type of fixed assets found at the plants surveyed, namely land, buildings and equipment. Land and buildings were allocated to butter and powder primarily on the basis of the square footage of the building utilized by each product. The gross historical cost for equipment common to products was allocated on the basis of production. The common costs allocated to butter
and powder were added to the product-specific equipment investment to arrive at total historical cost of equipment for butter and powder. Vehicles are not considered as an element of the fixed assets as the costs associated with raw milk are F.O.B. plant and the costs associated with final product delivery are provided for in the Distribution cost component.

C. COST SURVEY RESULTS

The 1987 weighted average costs of processing butter and skim milk powder are presented in Exhibit 1. From this exhibit it will be seen that the 1987 weighted average cost of processing butter and skim milk powder tenderable to the CDC was 43.80 cents per kilogram for butter and 48.50 cents per kilogram for skim milk powder.

These costs also can be expressed in terms of the cost of processing a hectolitre of raw milk. Using the standard yield factors of 4.32 kg. of butter and 8.24 kg. of powder from each hectolitre of raw milk, the product costs presented in Exhibit 1 equate to a cost \$5.89 per hectolitre.

It should be noted that these costs reflect the actual level of capacity utilization which occurred in 1987. Moreover, no provision for profit, return on investment or income taxes is included in the results presented above. These factors and others will be addressed as part of the model development presented in the next section of this report.
### 1987 Costs of Processing by Component Per Survey

<table>
<thead>
<tr>
<th>Cost Component</th>
<th>Butter</th>
<th>Powder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interbranch Haulage</td>
<td>1.08</td>
<td>1.08</td>
</tr>
<tr>
<td>Direct Labour</td>
<td>8.13</td>
<td>7.17</td>
</tr>
<tr>
<td>Variable plant costs</td>
<td>4.52</td>
<td>5.10</td>
</tr>
<tr>
<td>Energy</td>
<td>2.71</td>
<td>8.00</td>
</tr>
<tr>
<td>Packaging</td>
<td>3.42</td>
<td>2.62</td>
</tr>
<tr>
<td>Distribution</td>
<td>1.78</td>
<td>1.68</td>
</tr>
<tr>
<td>Fixed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indirect Labour</td>
<td>5.39</td>
<td>6.27</td>
</tr>
<tr>
<td>Fixed plant costs</td>
<td>1.25</td>
<td>1.93</td>
</tr>
<tr>
<td>Depreciation</td>
<td>1.77</td>
<td>3.57</td>
</tr>
<tr>
<td>Administration</td>
<td>9.31</td>
<td>7.66</td>
</tr>
<tr>
<td>Interest</td>
<td>4.44</td>
<td>3.67</td>
</tr>
<tr>
<td><strong>Total Costs</strong></td>
<td><strong>43.80¢/kg</strong></td>
<td><strong>48.50¢/kg</strong></td>
</tr>
</tbody>
</table>

**Expressed in terms of the cost of processing a hectolitre of raw milk:**

(Based on yield factors of 4.32 kgs. butter and 8.24 kgs. powder)

**Total Costs = $5.89 per hectolitre**

<table>
<thead>
<tr>
<th>Fixed Asset Base</th>
<th>Butter</th>
<th>Powder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land</td>
<td>0.69</td>
<td>0.94</td>
</tr>
<tr>
<td>Buildings</td>
<td>10.06</td>
<td>14.98</td>
</tr>
<tr>
<td>Equipment</td>
<td>27.78</td>
<td>42.17</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>38.53¢/kg</strong></td>
<td><strong>58.09 ¢/kg</strong></td>
</tr>
</tbody>
</table>
V. DESCRIPTION OF THE COST MODEL

A model, by definition, is a facsimile or copy of some reality, in this case an industrial milk processing operation producing butter and skim milk powder. The data collected in the current survey of processor costs, combined with the 1983 cost model, were used to develop an updated cost model of this industry. The survey costs themselves do not constitute the whole of the model; nor can all cost components be used exactly as calculated in the survey. To build a suitable updated cost model for butter and powder processing, the following industry economic characteristics must be addressed:

* economic measure of depreciation;
* financing costs; and,
* varying production levels.

Each of these is discussed below, following which we present the model results.

A. ECONOMIC MEASURE OF DEPRECIATION

Although most processing costs collected in the survey reflected actual cash outflows and therefore can be thought of as economic as well as accounting costs, depreciation expenses reported represent non-cash accounting entries only. Several different depreciation principles were used by processors and the 1987 costs of processing as presented in the previous section include the costs of depreciation as recorded by each processor. However, in developing an accurate processing cost model, these depreciation costs must be standardized to reflect a uniform approach and must be adjusted to reflect the economic life of the plant and equipment.
Adjustment to Depreciation Cost Component

To develop a representative depreciation charge, the estimated useful lives for both buildings and equipment were determined. As in 1983, the estimated useful life of buildings from the survey data was found to be forty years, regardless of the current ages of buildings. However, the estimated useful life of the average equipment in place was determined to be fifteen years; in the 1983 study, the estimated useful life of the average equipment had been found to be twenty years. The annual depreciation rates which correspond to the economic lives of the buildings and equipment, on a straight line basis, are 2.5% and 6.67% respectively. These rates were then applied to the average value of the original investment in buildings and equipment as determined from the survey to yield a depreciation cost for use in the model.

The following table presents the investment in buildings and equipment as reported in the survey, along with the adjusted depreciation costs based on the methodology described above:

<table>
<thead>
<tr>
<th></th>
<th>Butter</th>
<th>Powder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buildings</td>
<td>10.06¢/kg</td>
<td>14.98¢/kg</td>
</tr>
<tr>
<td>Equipment</td>
<td>27.78</td>
<td>42.17</td>
</tr>
<tr>
<td>TOTAL</td>
<td>37.84¢/kg</td>
<td>57.15¢/kg</td>
</tr>
<tr>
<td>Adjusted Depreciation</td>
<td>2.10¢/kg</td>
<td>3.19¢/kg</td>
</tr>
</tbody>
</table>
B. FINANCING COSTS

The only components of the model not yet described are the interest costs and the processor allowance for income taxes and return on investment. Unlike in the 1983 study, the interest charges from the plants' books of account were generally found to be unreasonable in relation to the fixed asset base. Therefore, the interest charges in the survey were discarded and an alternate method of calculating an interest charge as well as an appropriate return on investment was developed.

Calculation of Total Capital Base

To develop these values, we first determined the total capital base. The first part of the capital base, the plant's investment in fixed assets, had already been determined from the survey. The second part, the plant's investment in working capital, or the current funds required for daily operations, was not determined from the survey but was calculated according to a formula.

Working capital was defined for model purposes as consisting of three components, namely:

- accounts receivable less accounts payable;
- payroll financing; and,
- inventory carrying costs.

The survey indicated that the timing of cash receipts coincided approximately with the timing of cash disbursements other than payroll, so no provision for net accounts receivable was required. For payroll financing, an average of four weeks' wages for both products was deemed the appropriate level of payroll to be provided in the model. The survey findings also indicated an average two week inventory holding period for CDC butter and three weeks for CDC skim milk powder, due to the administrative requirements with respect to obtaining grade certificates and CDC
warehouse space. The costs associated with holding inventory include the unit processing costs from the survey and the raw milk costs associated with the inventory for tender to the Commission. The related investment in working capital can be calculated using this information.

The following table presents the working capital and fixed asset components of the capital base used to determine the interest costs and returns in the cost model:

<table>
<thead>
<tr>
<th>TOTAL CAPITAL BASE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BUTTER</strong></td>
</tr>
<tr>
<td>Payroll</td>
</tr>
<tr>
<td>Inventory</td>
</tr>
<tr>
<td>Total:</td>
</tr>
<tr>
<td>Fixed Assets</td>
</tr>
<tr>
<td>Land</td>
</tr>
<tr>
<td>Buildings</td>
</tr>
<tr>
<td>Equipment</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

The allocation of the total capital base as between debt and equity was done using the weighted average debt/equity ratio of the surveyed plants. An appropriate rate of interest was then applied to the debt portion to calculate the interest costs and an appropriate before-tax rate was applied to the equity portion to calculate the returns component.
Calculation of the Interest Cost Component

The debt portion of the total investment base was first calculated by applying the industry's debt/equity ratio (41/59) to the capital base. The average long-term corporate bond yield for 1987 (10.71%), was deemed to fairly represent the interest rate for 1987. This rate was then applied to the debt portion of the capital base. Thus, the interest costs to be used in the updated cost model for butter and powder are as follows:

<table>
<thead>
<tr>
<th>Total Capital Base</th>
<th>Debt Portion</th>
<th>Interest Rate</th>
<th>Interest Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butter 59.02¢/kg</td>
<td>x .41</td>
<td>x 10.71%</td>
<td>= 2.59¢/kg</td>
</tr>
<tr>
<td>Powder 75.85¢/kg</td>
<td>x .41</td>
<td>x 10.71%</td>
<td>= 3.33¢/kg</td>
</tr>
</tbody>
</table>

Calculation of the Allowance for Income Taxes and Returns

In calculating the returns component, it was recognized that a processor's returns should reflect the cost of money and a return for risk to the processor, as well as providing for an allowance for income taxes. In this study, as in the 1983 study, processor risk related to CDC tendered product was deemed negligible due to the existence of a guaranteed market and a guaranteed price for the two products under the offer-to-purchase program. Operating risks (for example, the risk of fire) are provided for through the inclusion of insurance cost in fixed plant costs. Thus, no addition with respect to return for risk was deemed valid. As a result, a proxy of a long-term, low risk investment was used to represent the cost of money. In this regard, the long-term corporate bond yield was chosen as an appropriate proxy. In 1987, it averaged 10.71%.
The 1983 cost base did not include an allowance for income taxes but this issue was given further consideration in this study. Corporate income taxes are considered a valid cost in most regulated industries for the purpose of defining allowable returns. Hence, it was decided to include an allowance for income taxes and combine it with the returns component.

Having determined that an allowance for income taxes was warranted in the model, the weighted average corporate income tax rates for butter and powder were calculated from the actual 1987 experience of the processing plants surveyed. These were determined to be 24.95% for butter and 21.88% for powder. The return rate of 10.71% was then grossed up by the income tax factor to yield a before-tax return rate, as follows:

<table>
<thead>
<tr>
<th></th>
<th>Butter</th>
<th>Powder</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987 After-Tax Rate</td>
<td>10.71%</td>
<td>10.71%</td>
</tr>
<tr>
<td>1987 Before-Tax Rate</td>
<td>10.71%</td>
<td>10.71%</td>
</tr>
<tr>
<td></td>
<td>14.27%</td>
<td>13.71%</td>
</tr>
</tbody>
</table>

These before-tax rates were then applied to the equity portion of the capital base to derive the processor allowance for income taxes and returns, as follows:

<table>
<thead>
<tr>
<th></th>
<th>Total Capital Base</th>
<th>Equity Portion</th>
<th>Allowance Rate</th>
<th>Processor's Allowance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butter</td>
<td>59.02¢/kg</td>
<td>.59</td>
<td>14.27%</td>
<td>4.97¢/kg</td>
</tr>
<tr>
<td>Powder</td>
<td>75.85¢/kg</td>
<td>.59</td>
<td>13.71%</td>
<td>6.14¢/kg</td>
</tr>
</tbody>
</table>
C. VARYING PRODUCTION LEVELS

Fixed costs of processing vary per unit according to volume, at least over a range of volumes which reflect existing capacities and operating practices. For this reason, the cost model must have the capability to adjust to annual volume variations on a controlled basis, so that the pattern of cost adjustment will be somewhat stabilized, while also reflecting real economic changes due to volume fluctuations. As in the 1983 original study, the study team believes that this can best be done by reference to a normalized long term production level.

In the conduct of the study, two issues relevant to the normalization process were identified that required further consideration in developing the updated cost model:

- administrative costs as fixed or variable; and,
- determination of the stabilization factors.

Administrative Costs as Fixed or Variable

Administrative costs were considered as a variable cost in 1983 because the majority of administrative costs were allocated to and within the plants based on sales or level of production. However, following the review of data obtained in our 1987 survey, we confirmed that the plants surveyed have experienced a pattern of relatively fixed administrative costs. Hence, the administration cost component is treated as a fixed cost in this updated model.

Determination of the Stabilization Factors

Given the variations which occur in year-to-year production levels, it would be inappropriate to select any one year as the normative year against which future production levels would be compared in applying the cost
model. Instead, the base costs for determining a processor margin should be derived from longer term patterns established over several years. To that end, an average of the previous five years had been selected as the normalization period in the 1983 study. However, it was suggested that three year stabilization factors would be more responsive to industry trends than the five year factors used in the original study. After review, the three year factors were adopted in this model. In determining the normalized costs, the 1985-1987 three year national average production for butter and powder, as factors of 1987 levels, were calculated. The values were 1.00868 for butter and 1.00417 for skim milk powder. These averages were then used to normalize the 1987 costs and returns by dividing the model fixed costs by these stabilization factors.

D. COST MODEL RESULTS

Exhibit 2, which follows, presents the model cost of processing, for butter and powder. The adjustments made to depreciation costs to reflect the economic useful lives of buildings and equipment have been included. Also, the adjusted interest cost and the processor allowance for income taxes and returns component have been added to the model, in the determination of total costs and returns. From the exhibit it will be seen that total costs and returns for processing butter and powder for tender to the CDC in 1987 were 47.25 cents per kilogram and 53.93 cents per kilogram respectively. When these costs are presented in terms of hectolitres of raw milk using yield factors, the cost becomes $6.48 per hectolitre.
## Exhibit 2

**Model Cost of Processing**

<table>
<thead>
<tr>
<th>Model Component</th>
<th><strong>Butter</strong></th>
<th></th>
<th><strong>Powder</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unadjusted</td>
<td>Adjusted</td>
<td>Unadjusted</td>
<td>Adjusted</td>
</tr>
<tr>
<td><strong>Variable</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interbranch Haulage</td>
<td>1.08¢</td>
<td>1.08¢</td>
<td>0.88¢</td>
<td>0.88¢</td>
</tr>
<tr>
<td>Direct Labour</td>
<td>8.13</td>
<td>8.13</td>
<td>7.17</td>
<td>7.17</td>
</tr>
<tr>
<td>Variable Plant Costs</td>
<td>4.52</td>
<td>4.52</td>
<td>5.10</td>
<td>5.10</td>
</tr>
<tr>
<td>Energy</td>
<td>2.71</td>
<td>2.71</td>
<td>8.00</td>
<td>8.00</td>
</tr>
<tr>
<td>Packaging</td>
<td>3.42</td>
<td>3.42</td>
<td>2.62</td>
<td>2.62</td>
</tr>
<tr>
<td>Distribution</td>
<td>1.78</td>
<td>1.78</td>
<td>1.64</td>
<td>1.64</td>
</tr>
<tr>
<td><strong>Fixed</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indirect Labour</td>
<td>5.39</td>
<td>5.39</td>
<td>6.27</td>
<td>6.27</td>
</tr>
<tr>
<td>Fixed Plant Costs</td>
<td>1.25</td>
<td>1.25</td>
<td>1.93</td>
<td>1.93</td>
</tr>
<tr>
<td>Depression*</td>
<td>1.77</td>
<td>2.10</td>
<td>3.57</td>
<td>3.19</td>
</tr>
<tr>
<td>Administration</td>
<td>9.31</td>
<td>9.31</td>
<td>7.66</td>
<td>7.66</td>
</tr>
<tr>
<td>Interest*</td>
<td>4.44 &lt;--&gt; 2.59</td>
<td>3.67 &lt;--&gt; 3.33</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Costs</strong></td>
<td>43.80</td>
<td>42.28</td>
<td>48.80</td>
<td>47.79</td>
</tr>
<tr>
<td>Allowance for Income Taxes*</td>
<td>4.97</td>
<td></td>
<td>6.14</td>
<td></td>
</tr>
<tr>
<td>and Returns</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td>47.25¢/kg</td>
<td></td>
<td>53.93¢/kg</td>
<td></td>
</tr>
</tbody>
</table>

* Adjusted from cost survey results
Exhibit 3 presents the normalized costs and returns for 1987. From the exhibit, it is seen that normalized fixed processing costs and returns plus the variable processing costs for butter and skim milk powder tenderable to the CDC result in a total cost of 47.03 cents per kilogram and 53.81 cents per kilogram respectively. Converted to the hectolitre basis, these costs represent $6.46 per hectolitre for 1987.

The final characteristic required of the updated cost model is a procedure which will serve to maintain the cost data on a current basis without the need for frequent major cost collection studies. The next section of the report describes the mechanics recommended for maintaining the cost model between cost survey studies.
## NORMALIZED RESULTS

<table>
<thead>
<tr>
<th>Model Component</th>
<th>BUTTER</th>
<th>POWDER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Actual</td>
<td>Actual</td>
</tr>
<tr>
<td>Variable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interbranch Haulage</td>
<td>1.08</td>
<td>0.88</td>
</tr>
<tr>
<td>Direct Labour</td>
<td>8.13</td>
<td>7.17</td>
</tr>
<tr>
<td>Variable Plant Costs</td>
<td>4.52</td>
<td>5.10</td>
</tr>
<tr>
<td>Energy</td>
<td>2.71</td>
<td>8.00</td>
</tr>
<tr>
<td>Packaging</td>
<td>3.42</td>
<td>2.62</td>
</tr>
<tr>
<td>Distribution</td>
<td>1.78</td>
<td>1.64</td>
</tr>
<tr>
<td>TOTAL VARIABLE</td>
<td>21.64</td>
<td>25.41</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fixed</th>
<th>Actual</th>
<th>Normalized</th>
<th>Actual</th>
<th>Normalized</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indirect Labour</td>
<td>5.39</td>
<td>6.27</td>
<td>6.24</td>
<td></td>
</tr>
<tr>
<td>Fixed Plant Costs</td>
<td>1.25</td>
<td>1.93</td>
<td>1.92</td>
<td></td>
</tr>
<tr>
<td>Depreciation</td>
<td>2.10</td>
<td>3.19</td>
<td>3.18</td>
<td></td>
</tr>
<tr>
<td>Administration</td>
<td>9.31</td>
<td>7.66</td>
<td>7.63</td>
<td></td>
</tr>
<tr>
<td>Interest</td>
<td>2.59</td>
<td>3.33</td>
<td>3.32</td>
<td></td>
</tr>
<tr>
<td>Allowance for Income Taxes &amp;</td>
<td>4.97</td>
<td>6.14</td>
<td>6.11</td>
<td></td>
</tr>
<tr>
<td>Returns</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL FIXED</td>
<td>25.39</td>
<td>28.40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>47.03¢/kg</td>
<td>53.81¢/kg</td>
<td>53.81¢/kg</td>
<td></td>
</tr>
</tbody>
</table>

Conversion to hectolitre basis

Total Costs x Yield Factor  
47.03 ¢/kg X 4.32 Kg/hl = 203 $/hl  
53.81¢/kg X 8.24 Kg/hl = 4.43

Equals $/hl  
Assumed Processors' Margin  
2.03       $6.46/Hl

(# 6.46 with variable yields)
VI. METHODOLOGY FOR COST MODEL MAINTENANCE

With the cost base updated as a result of this study, an appropriate reference based methodology is necessary for annual maintenance. Even with appropriate maintenance procedures, major cost surveys are recommended every four to five years to recompute the cost base itself to accurately reflect any changes in the economic structure of the industry.

In order to test the effectiveness of the model maintenance procedures developed in 1983, a comparison was made of the results of the 1987 cost survey to the indexed 1983 original study. The results indicated that the maintenance procedures utilized in the past five years have resulted in costs closely representative of the recent survey results. In fact, ignoring those cost components affected by policy changes, less than 1% difference existed between 1987 combined butter and powder results and indexed 1983 combined butter and powder results. Therefore, the detailed cost index approach recommended in 1983 requires only minor modifications. These maintenance modifications fall into three areas:

- new indices recommended where the previously used indices are no longer available;
- changes within the relative weightings of multiple indices to reflect changes in the content of the cost component; and,
- new indices and calculations for new cost components.
The remainder of this section of the report presents a description of the recommended indices and sources for each cost component. All are Statistics Canada publications, except where otherwise noted. The most recently published quarterly or monthly values should be utilized.

**Variable Costs**

All variable cost components are updated annually by applying a price index to the 1987 base costs. The price index or update factor used is calculated by dividing a statistical indicator for a point in time by the same quarterly or monthly statistical indicator from 1987. The indices to be used for each of the variable cost components are as follows:

**Interbranch Haulage**

- Farm Input Price Index, Catalogue 62-004
- Table 2. Farm Input Price Indexes
- Machinery and Motor Vehicles Operation, Index D 600294

**Direct Labour**

- Employment, Earnings and Hours, Catalogue 72-002
- Table 2.1, Estimated Weekly Earnings
- Average Weekly Earnings (Including overtime); All Employees,
- Dairy Products Industry: 1970 SIC 104
Variable Plant Costs

Industry Price Indexes, Catalogue 62-011
Table 3. Industrial Product Price Indexes, by Industry and Industry Groups
Fabricated Metal Products,
Index D 614089 (weighting of 50%)

Farm Input Price Index, Catalogue 62-004
Table 2. Farm Input Price Indexes
Supplies and Services,
Index D 600832 (weighting of 50%)

Energy

Industry Price Indexes, Catalogue 62-011
Table 6. Electric Power Selling Price Indexes National Total,
Index D 613700 (weighting of 40%)

Industry Price Indexes, Catalogue 62-011
Table 3. Industrial Product Price Indexes, by Industry and Industry Groups
Refined Petroleum and Coal Products Industries,
Index D 614144 (weighting of 60%)

Packaging

Industry Price Indexes, Catalogue 62-011
Table 3. Industrial Product Price Indexes, by Industry and Industry Groups
Paper Box and Bag Industries,
Index D 614072
Fixed Costs

The following steps are required to produce an annual update of the fixed cost components of the cost model:

1. calculate the normalization factor for each product by dividing the most currently available three-year average volume of production by the 1987 production. Appendix B illustrates the calculation of the factors utilized in the normalization process for the 1987 model results;

2. normalize the 1987 cost base by dividing the 1987 fixed cost results for the two products by the appropriate normalization factors; and,

3. update the value for each normalized fixed cost component by using price indices as described for variable costs, as well as other factors as described below where applicable.

The indices to be used for each cost component are as follows:
Indirect Labour

Employment, Earnings and Hours, Catalogue 72-002
Table 2.1, Estimated Weekly Earnings, Average Weekly Earnings (Including overtime); All Employees,
Dairy Products Industry; 1970 SIC 104

Fixed Plant Costs

Industry Price Indexes, Catalogue 62-011
Table 3. Industrial Product Price Indexes, by Industry and Industry Groups
Fabricated Metal Products,
Index D 614089 (weighting of 25%)

Farm Input Price Index, Catalogue 62-004
Table 2. Farm Input Price Indexes
Supplies and Services,
Index D 600832 (weighting of 75%)

Depreciation

Construction Price Statistics, Catalogue 62-007
Table 7.1. Output Price Indexes of Non-residential Construction
Industrial Building (factory),
Index D 477103 (weighting of 20%)

Construction Price Statistics, Catalogue 62-007
Table 16.1. Machinery and Equipment Price Indexes, by Industry of Purchase
Food and Beverages,
Index D 639718 (weighting of 80%)
Administration

Employment, Earnings and Hours, Catalogue 72-002
Table 2.1, Estimated Weekly Earnings
Average Weekly Earnings (including overtime);
Salaried Employees,
Dairy Products Industry; 1970 SIC 104

Interest

To update the interest cost component, after normalization of the 1987 base cost, the first step is to adjust for the change in interest rate using the following reference:

Bank of Canada Review
Table F1. Selected Canadian and International Interest Rates
MYW Weighted Long-term Corporate Bond Yield,
Index B 14048

The price index then is applied to this revised interest cost to account for increases in asset values being financed. This is calculated by reference to the following statistical indicators:

Construction Price Statistics, Catalogue 62-007
Table 7.1. Output Price Indexes of Non-residential Construction
Industrial Building (factory),
Index D 477103 (weighting of 20%)

Construction Price Statistics, Catalogue 62-007
Table 16.1. Machinery and Equipment Price Indexes, by Industry of Purchase
Food and Beverages,
Index D 639718 (weighting of 80%)
Allowance for Income Taxes and Returns

To update the allowance for income taxes and returns after normalization of the 1987 base cost, the first step is to adjust the change in the before-tax rate of return using the following reference:

Bank of Canada Review
Table F1. Selected Canadian and International Interest Rates
MYW Weighted Long-term Corporate Bond Yield, Index B 14048

The price index is then applied to account for increases in the asset values. This is calculated by reference to the following statistical indicators:

Construction Price Statistics, Catalogue 62-007
Table 7.1. Output Price Indexes of Non-residential Construction
Industrial Building (factory),
Index D 477103 (weighting of 20%)
Construction Price Statistics, Catalogue 62-007
Table 16.1. Machinery and Equipment Price Indexes, by Industry of Purchase
Food and Beverages,
Index D 639718 (weighting of 80%)

Appendix B provides an illustration of how these indices should be utilized to maintain the model. The illustration assumes that the procedures would be completed in July, 1988.
APPENDIX A

LIST OF PLANTS SURVEYED
LIST OF PLANTS SURVEYED

The 1987 cost data assembled during the course of this study was obtained from the following industrial milk processing plants. Together they produced all the butter and skim milk powder tendered to the Commission in 1987.

<table>
<thead>
<tr>
<th>PRODUCTS PRODUCED</th>
<th>Butter</th>
<th>Skim Milk Powder</th>
</tr>
</thead>
</table>

**Alberta:**

- Northern Alberta Dairy Pool Ltd., Barrhead
- Northern Alberta Dairy Pool Ltd., Camrose
- Central Alberta Dairy Pool

**Saskatchewan:**

- Dairy Producers Cooperative Limited Yorkton
- Dairy Producers Cooperative Limited Saskatoon

**Manitoba:**

- Modern Dairies Limited St. Claude

**Ontario:**

- Gay Lea Foods Cooperative Ltd. Guelph
- Gay Lea Foods Cooperative Ltd. Teeswater
- Ault Foods Limited/ Stacey Bros. Mitchell

**Quebec:**

- Ault Foods Limited/ Lafrenière Laverlochère
- Ault Foods Limited/ Lactantia Victoriaville St. Agapit
- Agrinove Beauceville
- Agrinove Bon Conseil
- Agropur Granby
- Agropur Lourisville
- Agropur Plessisville
- Agropur Verchères
- Agropur Weedon
Quebec: (cont'd)

| Les Aliments Delisle Coop Agricole Côte-Sud | Nicolet | X | X |
| Nutrinor | St. Alexandre | X | X |
| Purdel | Chambord | X | X |
| | Trois Pistoles | X | X |

Maritimes:

| Dairytown Products Ltd. Farmers Cooperative Dairy Limited Perfection Foods Ltd. | Sussex, N.B. | X | X |
| | Truro, N.S. | X | X |
| | Charlottetown, P.E.I. | X | X |
APPENDIX B

DETAILED CALCULATIONS OF MAINTAINING THE MODEL USING INDICES
NORMALIZATION FACTOR

Source: Statistics Canada, Catalogue 23-001
The Dairy Review, Table 6

PRODUCTION (KGS)

<table>
<thead>
<tr>
<th>YEAR</th>
<th>BUTTER</th>
<th>POWDER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1984</td>
<td>107788</td>
<td>129387</td>
</tr>
<tr>
<td>1985</td>
<td>94882</td>
<td>98926</td>
</tr>
<tr>
<td>1986</td>
<td>98742</td>
<td>106133</td>
</tr>
<tr>
<td>1987</td>
<td>95568</td>
<td>102317</td>
</tr>
</tbody>
</table>

NORMALIZATION FACTOR CALCULATION

3-year average 1987 production 3-year average 1987 production

\[
\begin{align*}
\text{BUTTER} & = \frac{96397}{95568} = 1.00868 \\
\text{POWDER} & = \frac{102317}{101892} = 1.00417 \\
\end{align*}
\]
INTERBRANCH HAULAGE

. Index Source: Statistics Canada, Catalogue 62-004
  Table 2. Farm Input Price Indexes, Machinery and Motor Vehicles Operation
  Index D 600294

. 1988 Update Factor Calculation:
  Index for Quarter II, 1988
  Index for Quarter II, 1987

. Application of Update Factor to 1987 Costs:

<table>
<thead>
<tr>
<th>Product</th>
<th>Base Cost</th>
<th>Update Factor</th>
<th>1988 Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butter</td>
<td>1.08¢</td>
<td>x</td>
<td>=</td>
</tr>
<tr>
<td>Powder</td>
<td>0.88¢</td>
<td>x</td>
<td>=</td>
</tr>
</tbody>
</table>
DIRECT LABOUR

- Index Source: Statistics Canada, Catalogue 72-002 Employment, Earnings and Hours Table 2.1. Estimated Weekly Earnings Average Weekly Earnings (including overtime); All Employees Dairy Products Industry

- 1988 Update Factor Calculation:

  Index for June, 1988

  Index for June, 1987

- Application of Update Factor to 1987 Costs:

<table>
<thead>
<tr>
<th>Product</th>
<th>Base Cost</th>
<th>Update Factor</th>
<th>1988 Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butter</td>
<td>8.13¢</td>
<td>x</td>
<td>=</td>
</tr>
<tr>
<td>Powder</td>
<td>7.17¢</td>
<td>x</td>
<td>=</td>
</tr>
</tbody>
</table>
VARIABLE PLANT COSTS

Index Source: 

a) Statistics Canada, Catalogue 62-011
   Table 3. Industrial Product Price
   Indexes, Fabricated Metal products
   Index D 614089

b) Statistics Canada, Catalogue 62-004
   Table 2. Farm Input Price Indexes,
   Supplies and Services
   Index D 600832

1988 Update Factor Calculation:

a) Index for June, 1988
   \[ \text{Index for June, 1987} \times 50\% = x \]

b) Index for Q.II, 1988
   \[ \text{Index for Q.II, 1987} \times 50\% = y \]

Application of Update Factor to 1987 Costs:

<table>
<thead>
<tr>
<th>Product</th>
<th>Base Cost</th>
<th>Update Factor</th>
<th>1988 Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butter</td>
<td>4.52¢</td>
<td>x</td>
<td>=</td>
</tr>
<tr>
<td>Powder</td>
<td>5.10¢</td>
<td>x</td>
<td>=</td>
</tr>
</tbody>
</table>
ENERGY

Index Source: a) Statistics Canada, Catalogue 62-001
Table 6. Electric Power Selling Price Indexes,
Index D 613700

b) Statistics Canada, Catalogue 62-001
Table 3. Industrial Product Price Indexes, Refined Petroleum and Coal Products Industries,
Index D 614144

1988 Update Factor Calculation:

a) Index for June, 1988
   \[ \text{Index for June, 1988} \times 40\% = x \]
   \[ x + y = \text{update factor} \]
   \[ \text{Index for June, 1987} \times 60\% = y \]

b) Index for June, 1988

Application of Update Factor to 1987 Costs:

<table>
<thead>
<tr>
<th>Product</th>
<th>Base Cost</th>
<th>Update Factor</th>
<th>1988 Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butter</td>
<td>2.71¢</td>
<td>x</td>
<td>=</td>
</tr>
<tr>
<td>Powder</td>
<td>8.00¢</td>
<td>x</td>
<td>=</td>
</tr>
</tbody>
</table>
### Packaging

- **Index Source:** Statistics Canada, Catalogue 62-002

  **Table 3. Industrial Product Price Indexes**
  **Paper, Box and Bag Industries**
  **Index D 614072**

1. **1988 Update Factor Calculation:**
   - Index for June, 1988
   - Index for June, 1987

2. **Application of Update Factor to 1987 Costs:**

<table>
<thead>
<tr>
<th>Product</th>
<th>Base Cost</th>
<th>Update Factor</th>
<th>1988 Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butter</td>
<td>3.42¢</td>
<td>x</td>
<td>=</td>
</tr>
<tr>
<td>Powder</td>
<td>2.62¢</td>
<td>x</td>
<td>=</td>
</tr>
</tbody>
</table>
DISTRIBUTION

- Index Source: Statistics Canada, Catalogue 62-007
  Table 16.1. Machinery and Equipment
  Price Indexes, by Industry of Purchase
  Motor Transport
  Index D 639796

- 1988 Update Factor Calculation:
  Index for Q.II, 1988
  Index for Q.II, 1987

- Application of Update Factor to 1987 Costs:

<table>
<thead>
<tr>
<th>Product</th>
<th>Base Cost</th>
<th>Update Factor</th>
<th>1988 Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butter</td>
<td>1.78¢</td>
<td>x</td>
<td>=</td>
</tr>
<tr>
<td>Powder</td>
<td>1.64¢</td>
<td>x</td>
<td>=</td>
</tr>
</tbody>
</table>
**INDIRECT LABOUR**

- **Index Source:** Statistics Canada, Catalogue 72-002
  
  **Employment, Earnings and Hours**
  
  **Table 2.1. Estimated Weekly Earnings**
  
  **Average Weekly Earnings (including overtime); All Employees**
  
  **Dairy Products Industry**

- **1988 Update Factor Calculation:**

  - **Index for June, 1988**
  
  **Index for June, 1987**

- **Application of Update Factor to 1987 Costs:**

<table>
<thead>
<tr>
<th>Product</th>
<th>Actual Cost</th>
<th>Normalization Factor</th>
<th>Normalized Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butter</td>
<td>5.39¢</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Powder</td>
<td>6.27¢</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product</th>
<th>Normalized Cost</th>
<th>Update Factor</th>
<th>1988 Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Powder</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**FIXED PLANT COSTS**

Index Source:

- a) Statistics Canada, Catalogue 62-011
  Table 3. Industrial Product Price Indexes, Fabricated Metal products
  Index D 614089

- b) Statistics Canada, Catalogue 62-004
  Table 2. Farm Input Price Indexes, Supplies and Services
  Index D 600832

1988 Update Factor Calculation:

a) Index for June, 1988

\[ \text{Index for June, 1987} \times 25\% = x \]

\[ x + y = \text{update factor} \]

b) Index for Q.II, 1988

\[ \text{Index for Q.II, 1987} \times 75\% = y \]

Application of Update Factor to 1987 Costs:

<table>
<thead>
<tr>
<th>Product</th>
<th>Actual Cost</th>
<th>Normalization Factor</th>
<th>Normalized Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butter</td>
<td>1.25¢</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Powder</td>
<td>1.93¢</td>
<td>+</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product</th>
<th>Normalized Cost</th>
<th>Update Factor</th>
<th>1988 Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butter</td>
<td>x</td>
<td>=</td>
<td></td>
</tr>
<tr>
<td>Powder</td>
<td>x</td>
<td>=</td>
<td></td>
</tr>
</tbody>
</table>
DEPRECIATION

Index Source:  

a) Statistics Canada, Catalogue 62-007
   Construction Price Statistics
   Table 7.1. Outprice Indexes of Non-Residential Construction, Industrial Building
   Index D 477103

b) Statistics Canada, Catalogue 62-007
   Table 16.1. Machinery & Equipment Price Indexes, Food and Beverages Industry
   Index D 639718

1988 Update Factor Calculation:

a) Index for Q.II, 1988
   \[ x \times 20\% = x \]
   Index for Q.II, 1987
   \[ x + y = \text{update factor} \]

b) Index for Q.II, 1988
   \[ x \times 80\% = y \]
   Index for Q.II, 1987

Application of Update Factor to 1987 Costs:

<table>
<thead>
<tr>
<th>Product</th>
<th>Actual Cost</th>
<th>Normalization Factor</th>
<th>Normalized Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butter</td>
<td>2.10¢</td>
<td>$</td>
<td></td>
</tr>
<tr>
<td>Powder</td>
<td>3.19¢</td>
<td>$</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product</th>
<th>Normalized Cost</th>
<th>Update Factor</th>
<th>1988 Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butter</td>
<td>x</td>
<td>=</td>
<td></td>
</tr>
<tr>
<td>Powder</td>
<td>x</td>
<td>=</td>
<td></td>
</tr>
</tbody>
</table>
**ADMINISTRATION**

- **Index Source:** Statistics Canada, Catalogue 72-002 Employment, Earnings and Hours, Table 2.1. Estimated Weekly Earnings Average Weekly Earnings (including overtime); Salaried Employees Dairy Products Industry; 1970 SIC 104

- **1988 Update Factor Calculation:**

  Index for June, 1988

  Index for June, 1987

- **Application of Update Factor to 1987 Costs:**

<table>
<thead>
<tr>
<th>Product</th>
<th>Actual Cost</th>
<th>Normalization Factor</th>
<th>Normalized Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butter</td>
<td>9.31¢</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Powder</td>
<td>7.66¢</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product</th>
<th>Normalized Cost</th>
<th>Update Factor</th>
<th>1988 Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butter</td>
<td>x</td>
<td>=</td>
<td></td>
</tr>
<tr>
<td>Powder</td>
<td>x</td>
<td>=</td>
<td></td>
</tr>
</tbody>
</table>
INTEREST

Sources of Reference

- Update Factor:
  
  Bank of Canada Review,  
  Table F.1, Selected Canadian and  
  International Interest Rates,  
  MYW Weighted Long-term Corporate Bond Yield  
  Index B14048

- Inflation Factor:
  
  a) Statistics Canada, Catalogue 62-007  
  Construction Price Statistics  
  Table 7.1. Outprice Indexes of  
  Non-Residential Construction,  
  Industrial Building  
  Index D 477103
  
  b) Statistics Canada, Catalogue 62-007  
  Table 16.1. Machinery & Equipment  
  Price Indexes, Food and Beverages  
  Industry  
  Index D 639718

1988 Inflation Factor Calculation:

a) Index for Q.II, 1988  
   \[ \text{Index for Q.II, 1987} \times 20\% = x \]
   \[ x + y = \text{inflation factor} \]

b) Index for Q.II, 1988  
   \[ \text{Index for Q.II, 1987} \times 80\% = y \]

Application of Factors to 1987 Costs, where  
\[ R = \text{Weighted Long-term Corporate Bond Yield for} \]
\[ \text{June, 1988:} \]

<table>
<thead>
<tr>
<th>Product</th>
<th>Actual Cost</th>
<th>Normalization Factor</th>
<th>Normalized Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butter</td>
<td>2.59¢</td>
<td>+</td>
<td>=</td>
</tr>
<tr>
<td>Powder</td>
<td>3.33¢</td>
<td>+</td>
<td>=</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Normalized Product Cost</th>
<th>Update Factor</th>
<th>Inflation Factor</th>
<th>1988 Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butter</td>
<td>x R/10.71%</td>
<td>x</td>
<td>=</td>
</tr>
<tr>
<td>Powder</td>
<td>x R/10.71%</td>
<td>x</td>
<td>=</td>
</tr>
</tbody>
</table>
ALLOWANCE FOR INCOME TAXES AND RETURNS

Sources of Reference

- Update Factor:

Bank of Canada Review, Table F.1, Selected Canadian and International Interest Rates, MYW Weighted Long-term Corporate Bond Yield Index B14048

- Inflation Factor:


b) Statistics Canada, Catalogue 62-007 Table 16.1. Machinery & Equipment Price Indexes, Food and Beverages Industry Index D 639718

1988 Update Factor Calculation:

1987 Before-tax Rate + (weighted Long-term Corporate Bond Yield, June, 1988 - 10.71%)

1987 Before-tax Rate

1988 Inflation Factor Calculation:

a) Index for Q.II, 1988

\[ \text{Index for Q.II, 1988} \times 20\% = x \]

\[ \text{Index for Q.II, 1987} \times x + y = \text{inflation factor} \]

b) Index for Q.II, 1988

\[ \text{Index for Q.II, 1987} \times 80\% = y \]

Application of Update Factors to 1987 Costs:

<table>
<thead>
<tr>
<th>Product</th>
<th>Actual Cost</th>
<th>Normalization Factor</th>
<th>Normalized Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butter</td>
<td>4.97¢</td>
<td>+</td>
<td>=</td>
</tr>
<tr>
<td>Powder</td>
<td>6.14¢</td>
<td>+</td>
<td>=</td>
</tr>
<tr>
<td>Product &amp; Returns</td>
<td>Normalized Allowance for Income Taxes</td>
<td>Update Factor</td>
<td>Inflation Factor on Capital Base</td>
</tr>
<tr>
<td>-------------------</td>
<td>--------------------------------------</td>
<td>---------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>Butter</td>
<td>$x\frac{14.27x(R-10.71)}{14.27}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Powder</td>
<td>$x\frac{13.71x(R-10.71)}{13.71}$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>