Evaporated Milk in California

analysis made of in-plant costs and relationship between the unit cost of processing and output rate of plant production

James N. Boles

The relationship between unit cost of processing evaporated milk and scale—size—of plant was the primary objective of a recent analysis of in-plant costs. The secondary objective was to estimate the relationship between unit cost of processing and ouput rate for each of several specific but hypothetical plants.

Nine of the 11 evaporated milk processing plants in California are of approximately the same size. Most of them are located in an area which also supplies large quantities of fluid milk to the San Francisco Bay region. Declining per capita milk production or declining per capita demand for evaporated milk—or both—may make existing plant locations and sizes quite inefficient. Even in 1951, three plants produced less than 60% of their largest annual output since 1941; two plants produced only about 75% of their largest annual output; while the remainder almost equalled or exceeded their largest annual output.

On the other hand, declining per capita production of evaporated milk in California in response primarily to a rapidly expanding population is likely to lead to the need of extensive increases in evaporated milk production in other areas of the western region such as the Columbia Basin of Washington and parts of Idaho and Utah. Here the problem is likely to be one of new plant construction rather than a reorganization or consolidation of existing plants.

To isolate the effect of a change in the scale of plant on unit processing costs, it was necessary to specify certain characteristics and operating conditions common to each plant studied. In general, these characteristics and operating conditions are typical of the 11 plants in California currently producing evaporated milk. One major exception is that the hypothetical plants studied are single-product plants while most of the actual California plants produce multiple products.

Annual processing costs were estimated at 1953 prices for 10 cost categories—excluding packaging—for each of six plants. For the specified plants, each operating at capacity, average processing cost per case of evaporated milk decreased from 48.2¢ for the smallest plant to 30.9¢ for the largest plant, a decrease of about 36%. The principal differences occurred in the labor and management categories. The cost of fixed labor and management for the largest plant was 7.3¢ per case less than for the smallest plant, while the cost of variable labor was 6.2¢ less. Another major difference was that of 3.0¢ per case for the cost of equipment and buildings. These categories accounted for 16.5¢ of the total difference of 17.3¢ per case. Minor savings occurred in machinery rental and electricity and gas cost.

These cost differences relate to a set of plants of varying size each operating at capacity. The relationship between cost and percentage of capacity was also estimated for each plant. The smallest plant has an annual capacity output of 468.6 thousand cases of evaporated milk at an average processing cost per case of 48.2¢. Operating at 50% of capacity would result in an average processing cost per case of 72.8¢, an increase of 24.6¢ per case. At the other extreme, the largest plant studied has an annual capacity of 1,874.4 thousand cases at an average processing cost per case of 30.9¢. Operating at 50% of capacity for this plant would result in an average processing cost per case of 45.1¢, a difference of 14.2¢ per case.

In comparing processing costs for plants of adjacent capacity it was found that it is more economical in general to use a smaller plant operating at capacity than it is to operate a larger plant at less than capacity to process the same quantity.

The study further indicated that—in the long run—processing costs for evaporated milk could be substantially reduced if existing plants were fewer in number but with capacities ranging up to three times those of most of the current plants. The saving in processing costs, associated with such a change, might be partially offset by increases in the collection costs necessary to achieve the higher volume of receipts. Disregarding the potential increase in collection costs, the results of the analysis indicate that, if three plants, each with an average daily production of 1,280 cases—operating at capacity—were replaced by one plant with an average daily production of 3,850 cases, exactly the same annual output would be achieved with total processing costs reduced by approximately $201,000. If this saving were realized, the total investment required for such a plant would be equivalent to this saving accrued over a period of less than four years.

The cost estimates in this study are sufficiently detailed so that they may be adjusted in response to variation in any one of the cost determinants. In combination with studies of procurement and site costs, the cost estimates can be used as an aid in selecting the size and location of a new plant to minimize the sum of procurement and processing costs. They are now being revised and used with comparable processing cost estimates for butter-powder and cheese plants to project the most efficient number, size and approximate location of manufactured dairy product plants in the eleven western states for the conditions that are most likely to prevail in 1975 with respect to the availability of manufacturing milk and the concurrent consumer demand for manufactured dairy products.

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A detailed analysis of the study, "Economies of Scale for Evaporated Milk Plants in California," prepared by the same author is in the process of publication.

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