Staff Report

ULTRA-HIGH-TEMPERATURE PROCESSING OF FLUID MILK:
IMPLICATIONS FOR THE FLORIDA DAIRY INDUSTRY

By

Robert L. Degner

Staff Report 4

November 1978

FAMRC

FLORIDA
AGRICULTURAL MARKET RESEARCH CENTER
FOOD AND RESOURCE ECONOMICS DEPARTMENT
Institute of Food and Agricultural Sciences
University of Florida
Gainesville, Florida 32611
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Food and Resource Economics Department
Institute of Food and Agricultural Sciences
University of Florida
Gainesville, Florida 32611
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The Center is staffed by a basic group of economists trained in agriculture and marketing. In addition, cooperating personnel from other IFAS units provide a wide range of expertise which can be applied as determined by the requirements of individual projects.
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ULTRA-HIGH-TEMPERATURE PROCESSING OF FLUID MILK: IMPLICATIONS FOR THE FLORIDA DAIRY INDUSTRY

Robert L. Degner

Introduction

Ultra-high-temperature processing (UHT) of fluid milk and other dairy products has gained interest for several years among leaders in the U.S. dairy industry. The purpose of this paper is to examine the latest developments in UHT processing and relate the possible impact of such processing on the Florida dairy industry.

What is UHT? The International Dairy Federation has recommended this definition for UHT milk: "a milk which has been subjected to a continuous flow heating process at a high temperature for a short time and which afterwards, has been aseptically packaged". UHT has also been described as "a product with a strange flavor and apparently, the gift of eternal life". From a practical standpoint UHT milk is ordinary fluid milk, either low fat or whole milk, which after processing and packaging, requires no refrigeration. The typical shelf life of such milk ranges from about three to six months, although researchers have reported a satisfactory product after one year had elapsed with no refrigeration (Hansen, 1978).

From a technical standpoint, UHT milk is usually defined as that milk heat treated at 145 °C (293 °F), although some sources give 2/5 to 300 °F) for two to six seconds. This compares with a temperature of 71.5 °C (160.7 °F) for 15 seconds for the process that is currently the industry standard (Table 1).
<table>
<thead>
<tr>
<th>Temperature</th>
<th>Time</th>
<th>Term</th>
<th>Needs refrigeration</th>
</tr>
</thead>
<tbody>
<tr>
<td>68°C</td>
<td>30.0 minutes</td>
<td>Low temperature</td>
<td>Yes</td>
</tr>
<tr>
<td>145.4°F</td>
<td></td>
<td>Longer time (LTLT)</td>
<td></td>
</tr>
<tr>
<td>71.5°C</td>
<td>15.0 seconds</td>
<td>High temperature</td>
<td>Yes</td>
</tr>
<tr>
<td>160.7°F</td>
<td></td>
<td>Shorter time (HTST)</td>
<td></td>
</tr>
<tr>
<td>88.5°C</td>
<td>1.0 second</td>
<td>Ultra high temperature (UHT) or higher heat shorter time (HHST)</td>
<td>Yes</td>
</tr>
<tr>
<td>191.3°F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>95.5°C</td>
<td>0.05 second</td>
<td>Ultra high temperature (UHT) or higher heat shorter time (HHST)</td>
<td>Yes</td>
</tr>
<tr>
<td>203.9°F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100.0°C</td>
<td>0.01 second</td>
<td>Ultra high temperature (UHT) or higher heat shorter time (HHST)</td>
<td>Yes</td>
</tr>
<tr>
<td>212.0°F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>138°C</td>
<td>2.0 seconds or more</td>
<td>Ultrapasteurization</td>
<td>Yes, but product has longer shelf life</td>
</tr>
<tr>
<td>280°F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>145°C-150°C</td>
<td>2.0-6.0 seconds</td>
<td>Sterilization, also commonly called &quot;UHT&quot;.</td>
<td>not until opened if packaged aseptically</td>
</tr>
<tr>
<td>293°F-302°F</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


### History of UHT

As novel as the concept of unrefrigerated milk may seem to us here in the U.S., the basic process has been investigated for approximately a quarter of a century. This kind of fresh tasting, long-life milk was produced and distributed in bottles in the 1940's by the Avoset Company and in cans in the 1950's by Real Fresh, Incorporated. Millions of pounds of such products have already been produced by several cooperatives in Wisconsin, Maryland and New York, and sent abroad, especially to Viet Nam (Hsu, 1969).
Meanwhile, UHT processing has been extremely successful in other countries. At present, there are approximately 800 UHT plants in operation worldwide (Danish Dairy Industry...Worldwide, 1978). UHT milk currently has approximately 50 percent of the total fluid milk sales in Italy. The proportion captured by UHT milk in Germany is approximately 45 to 50 percent, and in Switzerland about 40 percent. UHT sales in France constitute about 25 percent of all fluid milk sales. Several years ago, Canada obtained its first UHT processing facility in Quebec. It is estimated that UHT's current share of the market is very small, but apparently growing (Table 2).

Table 2.—Market share of UHT milk in selected countries.

<table>
<thead>
<tr>
<th>Country</th>
<th>Percent of fluid milk sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italy</td>
<td>50</td>
</tr>
<tr>
<td>Germany</td>
<td>45 - 50</td>
</tr>
<tr>
<td>Switzerland</td>
<td>40</td>
</tr>
<tr>
<td>France</td>
<td>25</td>
</tr>
</tbody>
</table>

Source: Danish Dairy Industry...Worldwide, June, 1978.

There are few UHT processing units in the United States. Currently there are no full scale commercial plants in operation producing fluid milk for domestic consumption. A number of existing UHT plants in the U.S. are primarily research units at such places as North Carolina State and the University of Maryland. The University of Florida also has a small unit for research purposes.
If UHT milk is such a fantastic product, what has kept it out of the U.S.? There are a number of factors in the U.S. fluid milk market which have served as barriers to adoption of the UHT process.

**Barriers to Adoption of the UHT Process in the U.S.**

The basic underlying factor acting as a barrier was expressed very succinctly by William R. Boardman, Executive Vice President, Dairy Farmers, Inc., when he said "We have an excellent product in fresh Florida milk" (Southeastern Dairy Review, 1978). The same can be said of fluid milk practically all over the U.S. The American consumer has had an abundance of fresh fluid milk, and contributing to this abundance has been adequate energy and refrigeration equipment needed to provide a storage and distribution system unmatched anywhere in the world. Low-cost energy has made much of this possible. The changing energy situation in the U.S. may provide the incentive for UHT to make an impact soon. Refrigerated distribution systems may be a luxury that Americans will not be able to afford in the future.

Aside from energy, barriers to adoption of the UHT process in the U.S. can be classified into three general categories. The first of these pertains to the product itself. This barrier involves the basic organoleptic and nutritional properties, packaging, and overriding consumer attitudes. Each of these will be discussed in greater detail below. A second major barrier is the present legal framework under which fluid milk and dairy products are regulated. Thirdly, there are very important economic barriers confronting the dairy processing industry and dairy distribution system.

**Product Barriers**

The ultra high temperature required in processing milk with this process gives the product a flavor which has been described as a "cooked"
or "scorched" flavor. Earlier processes, some of which are still being
used in Europe, undoubtedly leave much to be desired with respect to
organoleptic properties. However, a concern is that leaders in the
American dairy industry do not recognize the advances that have been
made in improving the taste of UHT processed milk in recent years.
Perhaps these attitudes have been fostered by unfavorable evaluation of
UHT milk years ago when there were definite flavor problems. For example,
four out of the five dairy farmer association managers in the state of
Florida recently made statements to the effect that UHT milk has flavor
problems. One said, "an uphill battle...flavor is a major problem...people
still want fresh milk". Another said [the] biggest problem...[with
UHT milk]...is flavor". Still another comment was [UHT milk has] "...a
flavor disadvantage to overcome", and a fourth said [UHT milk will have
a decided impact]"...if the producers of UHT milk can correct the
flavor problems...".

There is substantial evidence that the flavor problems that many
feel exist are not as severe as they may seem. For instance, a University
of Illinois taste panel test revealed that regular milk scored lower
than UHT in the taste panels. The University of Maryland, in their
dairy store on campus, sells UHT processed milk on an every other weekend
basis, packaged in conventional containers, and they have had no reaction
to different flavors. Their customers have not detected the weekly
change from regular milk to UHT or vice versa (Russell, 1977). Dr. W.
M. Roberts, Head of the Food Science Department at North Carolina State
University, recently said "UHT treated milk will probably be more readily
accepted by consumers than the industry may realize" (Roberts, 1978).
American travelers in Europe report that milk, particularly in Germany, tasted very good. Furthermore, a survey by the Canadian Department of Agriculture revealed that 40 percent of all people surveyed perceived no difference between UHT and regularly pasteurized milk, and an additional 25 percent detected only a slight difference.

Packaging is another important product characteristic that has probably constituted a barrier to UHT adoption. In order to obtain the extended shelf life of three to six months, it is essential that the milk be packaged in aseptic containers. Early attempts at aseptic packaging used cans and glass containers. In recent years though, there have been advances in using multilayered paper containers which provide the required product protection. Actually, in addition to paper, several layers are polyethylene and one is a metal foil. Three of the leading "paper" containers are the familiar Tetra Pak, a triangular shaped package, the Tetra Brik pack, which is a brick-shaped package, and the Pure Pak, a more conventional container made by the Ex-Cell-o Corporation. These multi-layered paper packages have been more expensive than other conventional packages because of their increased component cost.

Another major consideration may be that of a consumer acceptance of these aseptic packages. The triangular shaped Tetra Pak may be particularly unwieldy for any container size larger than a pint or liter. The Tetra Brik is probably the most successful container at present. The Tetra Brik is currently being used by Canadian dairy; it is sold singly or in a shrink wrap four-pack, which makes the unit purchase equivalent to or slightly greater than the current one gallon size commonly sold in the U.S. Blow-mold plastic containers have also been tested but with little
success. The basic problem with blow-mold plastic has been that of oxygen permeability. During prolonged storage, oxygen permeates the container resulting in product deterioration. Light penetration of the plastic container also contributes to product deterioration.

A major barrier may be that of the consumer's image of the product and ingrained buying habits. Many consumers are creatures of habit and years of conditioning to refrigerated milk may have caused the American consumer to expect that all fresh milk be refrigerated. The American housewife may be extremely skeptical of such an innovative concept and thus may refuse to purchase the product even though research shows it to be satisfactory. Other products have encountered this type of resistance. For example, poultry farmers and processors have been attempting to get consumers to accept frozen broilers for years. Considerable research has been done to determine why consumers will not purchase frozen broilers, but despite many attempts to market the product the poultry industry has failed. Until more is known about the consumer images and the concept of UHT milk, little can be said concerning consumer acceptance.

**Legal Barriers**

Legal barriers currently exist because no official definition exists for UHT milk which has been aseptically packaged for non-refrigerated distribution. However, there are provisions for the distribution of ultrapasteurized products such as whipping cream products. Under current regulations, only grade A products are sold in Florida. Such products must be produced by grade A farms and grade A processors, and all grade A products must be refrigerated. Thus, if UHT milk products are designated as grade A, they are required to be refrigerated, thus eliminating many of the cost advantages inherent in the UHT process.
With respect to interstate shipments of UHT products, there have been no requests to import UHT products into the state of Florida, according to Jay Boosinger, Director of the Dairy Division, Florida Department of Agriculture and Consumer Services. Boosinger also reports that there is a proposed change in the Federal Milk Ordinance that states "milk products hermetically sealed in a container and so processed either before or after processing as to prevent microbial spoilage are not required to be grade A". If this change is adopted, the Florida regulations would be in conflict because such products are defined and regulated as grade A products (Southeastern Dairy Review, 1978).

With widespread adoption of UHT processing other legal barriers may also arise due to farmers' Federal Marketing Orders which regulate milk. Canada is currently wrestling with such problems as inter-provincial shipments of UHT milk. Their problems have not been resolved; considerable controversy and discussion continues (Modern Dairy, 1978).

Legal barriers can usually buy time, but historically, where a food product has been involved they usually can be overcome. A good example is the anti-oleomargarine legislation that existed a generation ago.

**Economic Barriers**

Unknown relative production costs constitute another major barrier to adoption of UHT in the U.S. Very little is known about the relative savings of UHT processing versus conventional processing, primarily because costs typically decrease with increased volume (Figure 1).

Currently the conventional process, (high temperature short time or HTST), has virtually 100 percent of the fluid milk market. The average cost per unit is probably at a all-time low. UHT processed milk on the other hand has virtually no market at present. Assuming that it will be
Figure 1.—Hypothetical long run average costs for UHT and HTST processing.
introduced in American markets, it would be expected that the average cost per unit will decline rapidly. On the other hand, as it captures more and more of the fluid milk market the average cost per unit of conventionally processed milk would probably increase slightly. Obviously, a processor that has to install a UHT line initially, along with his conventional equipment, receives few benefits in the form of reduced costs due to non-refrigerated transportation. The greatest savings would come with complete elimination of all refrigeration.

One can deduce something about the relative cost from comparison of retail prices in countries where UHT milk is processed. In Canada, UHT milk currently sells for about 10 cents per liter more than conventionally processed milk and in the United Kingdom the price differential is approximately 22 1/2 percent higher for UHT milk than for regular milk. However, in Germany where 50 percent of the fluid milk market has been captured by UHT milk and where a number of dairies have completely eliminated refrigeration, the cost of UHT milk is 20 percent less than conventionally processed milk.

Examination of processors' production cost components indicate where UHT processing might be beneficial in reducing their cost (Table 3). The raw product currently represents about 65 percent of the processors cost in the U.S. There appears to be very little possibility for reducing the raw product cost under UHT processing given present production efficiencies. The quality level demanded by UHT processing is very stringent (Roberts, 1978). Thus the raw product cost may actually increase. However, as farmers adjust to more efficient seasonal production cycles, raw product prices could conceivably be reduced. The net effect is very uncertain.
Table 3.--Estimated wholesale costs for U.S. dairies.

<table>
<thead>
<tr>
<th>Item</th>
<th>Type of processing</th>
<th>(Percent)</th>
<th>(Change)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw product</td>
<td></td>
<td>65</td>
<td>-?</td>
</tr>
<tr>
<td>Processing</td>
<td></td>
<td>5</td>
<td>-?</td>
</tr>
<tr>
<td>Packaging</td>
<td></td>
<td>7</td>
<td>+?</td>
</tr>
<tr>
<td>Cooler, loadout</td>
<td></td>
<td>3</td>
<td>-?</td>
</tr>
<tr>
<td>Distribution</td>
<td></td>
<td>15</td>
<td>-?</td>
</tr>
<tr>
<td>Administration</td>
<td></td>
<td>3</td>
<td>-?</td>
</tr>
<tr>
<td>Profit</td>
<td></td>
<td>2</td>
<td>?</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Source: Adapted from (Russell, 1978).

Processing costs amount to about 5 percent of the total cost and little is known about the actual operational cost of processing equipment for UHT. From the labor standpoint, however, UHT processing could reduce total processing costs because of the automated nature of the equipment. Packaging currently amounts to about 7 percent of the total processors' cost and UHT would probably increase these costs somewhat, due to the more expensive packaging materials. Cooler and loadout costs currently amount to 3 percent; UHT processing would probably reduce these costs somewhat due to the non-refrigerated nature of the product. The primary gains would come from using non-refrigerated transportation for distribution. Conventionally processed milk distribution costs currently amount to 15 percent of the total wholesale cost. These
distribution costs could possibly be reduced 25 percent under UHT processing methods (Russell, 1978). Administration, which amounts to 3 percent, could possibly be reduced with a smaller labor force; this is a big unknown. Profit, the remaining 2 percent for U.S. processing firms would probably remain unchanged. While specific processing cost comparisons for UHT and conventionally processed milk are still unclear, there are other factors which can be compared.

**UHT Advantages and Disadvantages**

The UHT process promises both advantages and disadvantages for every segment of the American dairy industry. Each major segment of the industry is examined and discussed below.

**Farmer Advantage**

From the farmer's standpoint UHT processing offers several advantages. One of the most obvious is to level out production to sales differences. Seasonal production and seasonal demands are frequently quite different, especially in Florida where a heavy influx of tourists during the winter months occurs. Farmers are usually faced with the necessity of attempting to schedule their production in a less than efficient seasonal production cycle. Thus, UHT processing and long term storage would allow more efficient production cycles. Another advantage, distinctly more remote, is that of using small capacity, compact processing equipment at the farm level. With such equipment, farmers could eliminate the necessity for refrigerated storage at the farm and refrigerated transport to market (Southeastern Dairy Review, 1978). **Farmer disadvantages**

Probably the greatest threat to farmers at the present is that in a competitive climate, areas with lower production cost could capture
part of Florida's market. Obviously, every effort must be made by Florida dairy farmers to reduce production costs in order to remain competitive.

Another disadvantage facing the farmer is uncertainty as to consumption effects. The UHT process could effectively reduce consumption of milk from the farmers' standpoint by reducing overall spoilage. Additionally, consumption may be effectively reduced by the nature of the product or packaging. On the other hand, expanded markets may effectively increase demand. Little is known about the effects of the product upon consumption.

Processor Advantages

Processors could gain a number of distinct advantages with adequate volume of UHT production. The greatest potential savings could result from refrigeration and energy savings. The non-refrigerated product requires no expensive refrigeration equipment nor would it require the massive amounts of energy for storing and distribution. The product's extended shelf life would mean less spoilage. There would be fewer returns and fewer dumps. The typical shelf life would be approximately three months.

There would also be a high rate of equipment utilization. Not only regular milk but low-fat milk, cream, other milk-based drinks, orange juice, fruit drinks, custard, and ice cream mixes could be processed with the same equipment. With bulk aseptic storage, the UHT system would also allow storage of unpacked products, affording versatility of package sizes or perhaps finished products.

Labor savings could also be substantial. Most of the UHT equipment currently available in the world is highly automated and requires little manual control during operation or cleaning. Because larger runs of
individual products could be made at one time and then stored, improved scheduling could permit processors to work on a typical 8:00 AM to 5:00 PM day or some other more convenient schedule. Additional labor savings would be gained by easier product handling for storage and distribution. Rather than handling a refrigerated product under cold and wet conditions, workers could more efficiently handle a dry product on pallets with fork lifts.

Additional savings would be gained through lower transportation cost. The longer product life would enable processors to make fewer trips to retailers. As discussed earlier, delivery could be made in non-refrigerated vehicles at a savings that have been estimated to be approximately 25 percent.

Another possible advantage for processors would be that of expanded sales. Expanded sales could result from developing markets where little refrigeration exists, such as foreign markets, recreational markets, etc. Greater sales could also be attained through broader product distribution. Non-refrigerated milk could be sold at newsstands, service stations, and vending machines. Increased sales could also occur in conventional retail establishments due to fewer out of stock situations, particularly during holidays and other high volume times when product needs are frequently underestimated. An interesting example of market expansion is provided by the Canadian plant that is currently producing UHT milk in Quebec. They have expanded their markets by selling to the maritime industry, to U.S. Armed Forces in Puerto Rico, and to disaster food programs in Guatemala. These and similar markets are among many that the Florida dairy industry could expect to gain with UHT product.
Processor Disadvantages

Consumer acceptance is probably the greatest unknown with respect to UHT milk in the U.S. Since the product has not been commercially available, most processors are very reluctant to test the water and take the initial plunge. A reason for the reluctance is the expense involved. UHT processing equipment is very expensive and so is packaging and distribution hardware. Early adopters could invest in expensive equipment that may be obsolete in a short time. Another major disadvantage is the type of packaging that is currently available. Packaging equipment is not only more costly but packaging materials are more expensive as well. Also, consumer acceptance of the product may be lacking. Further, the effects of packaging on overall consumption is unknown and may either increase or decrease consumption. Too little is known about the effects of packaging.

Still another disadvantage is that of product inventory. UHT milk immediately after processing usually has a very strong cooked flavor. However, this flavor tends to dissipate within 2 to 7 days after processing. Therefore, the product must be stored until the flavor is acceptable for consumption. These increased inventories would contribute substantially to many processors' capital requirements. Another disadvantage would be that of having to retrain production personnel to cope with the new equipment.

Retailer Advantages

Retailers would share many of the same advantages as processors. Major advantages would be in energy and equipment savings with respect to refrigeration equipment, both out front and in the back room. Labor savings would be another major inducement to retailers to adopt UHT milk. Labor savings would accrue from having fewer deliveries and thus
less time involved in check-in and handling, and further, in palletized handling of the dry product versus a cold wet product. Retailers would also benefit from extended shelf life. Less time would be spent in product rotation and there would be fewer product returns. Further, there would be fewer out of stock situations enabling them to sell more product. UHT milk would also give the retailer flexibility in merchandising. No longer would the retailer be restricted to merchandising milk in the refrigerated section in the dairy department. The non-refrigerated product could be displayed on pallets, in center displays as it is currently done in Canada and Europe, or it could appear in the beverage section alongside canned and bottled soft drinks and other canned beverages and juices. It would also expand the retailer's market. There are certain market segments that UHT milk with its exceptionally long life would appeal to, such as small households, campers, etc.

Retailer Disadvantages

The major problem confronting the retailer could be consumer resistance, but it is not known how the consumer will react. However, potential resistance is probably less important to the retailer than to the processor because retailers are faced with consumer resistance on new products all the time. UHT milk really has few disadvantages to the retailer because it is so similar to the 10,000 or so dry groceries and non-grocery items he now handles. If the product meets with insurmountable consumer resistance all the retailer has to do in most instances is refuse to stock it.

Consumer Advantages

Consumers stand to benefit from UHT milk as well as other segments of the dairy industry previously discussed. The major advantage to the
consumer would be that of convenience. Shoppers currently have to buy fresh milk quite often. UHT milk would enable the consumer to stock up, store the milk at home in a non-refrigerated area and refrigerate milk as necessary for consumption. Non-refrigerated storage at home would also benefit the consumer through energy savings. The long shelf life would also benefit the consumer through less product spoilage at home.

Taste might even be viewed as an advantage by some consumers. In informal tests some people actually preferred UHT milk to conventional milk, thus, the product may offer them a taste advantage. Ultimately, if UHT milk is widely available, the cost savings may be eventually passed on to the consumer, resulting in a lower priced product.

**Consumer Disadvantages**

In the short run the primary disadvantage faced by the consumer would be higher cost. As previously mentioned, the product sells for a premium in Canada and the United Kingdom. Another disadvantage, especially in the early stages of UHT technology, will be that of variable product quality. There is still considerable product variation depending on the type of UHT processing equipment used and UHT milk from one processor might be quite different from that produced by another, depending on the type of equipment used. Therefore, consumers will be faced with differing product taste if not necessarily quality. And finally, some consumers may find the taste objectionable.

**Questions Raised By UHT**

From the farmers standpoint, the most critical question raised by the UHT process is "can Florida dairy farmers remain competitive?"

Extended shelf life for fluid milk products and elimination of refrigerated storage and transportation could allow highly efficient production areas
to become dominant. Surplus milk production now going into manufacturing could be UHT processed and shipped to areas to compete with less efficient producers unless prevented by marketing orders or other legal barriers. Are Florida producers currently competitive? Most probably are, but UHT could pose a serious threat.

Questions faced by retailers with respect to UHT milk do not appear to be as grave as those faced by farmers and processors. However, widespread introduction and acceptance of the product could affect refrigeration requirements for new stores. Another consideration faced by retailers is the possibility of restructuring the delivery system for fresh milk. Rather than have daily store deliveries by processors as is presently done, retailers may prefer to have warehouse delivery so that milk could be delivered to stores along with other grocery products. Florida dairymen have made great strides in improving efficiency in recent years, but continued improvements are essential for long-run survival.

UHT milk processing poses a number of very serious questions for processors too. Foremost among these questions is probably "what distribution system will evolve?" Retailers no longer dependent on critical timing of deliveries of a highly perishable product may conceivably bypass the present distribution system altogether. The non-refrigerated product could be delivered along with the other items from a central warehouse. Processors may deliver directly to retailers' warehouses with increasing frequency compared to the present situation rather than be bypassed completely.

Another intriguing question is "who will UHT processors be?" Many current processors may be locked into their present processing facilities
due to financial commitments. Many will be unwilling or unable to risk investment in a new venture such as UHT, particularly where their fluid product market share is relatively small. The first UHT processors will probably be larger firms with broad geographic distribution. Since the product's market share in any location will be relatively small during the early stages of its introduction, a large territory will be required in order to have sufficient total volume to be economically feasible.

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Alternatives for Florida Dairy Producers and Processors

One alternative is to ignore UHT. Judging from the success of UHT in other countries of the world the use of the process is likely to increase. Most present firms, whether producers, processors or retailers, can probably survive for quite a while by ignoring UHT, but firms that fail to adopt technological change in order to increase their efficiency usually fall by the wayside. There are many firms that have gone out of business in the last decade simply because they failed to adapt to changing technology and marketing developments. Florida dairymen have made great strides in improving efficiency in recent years, but continued improvements are essential for long-run survival.
An alternative for processors is to be an early adopter and offer UHT milk. Obviously this is a risky alternative given the present knowledge of processing equipment and consumer acceptance.

Another alternative is to act together as an industry to explore the cost and benefits associated with UHT processing. Comprehensive cost studies should not only be made for the production and processing sections but the retail sector as well. Consumer acceptance of the concept and perhaps even product testing may also answer many of the questions faced by the industry. Such studies could allow firms that are currently contemplating necessary changes in equipment to make better decisions.

**Summary**

There is a considerable amount of interest in UHT milk in the U.S. at the present time. Noted food scientists have greatly improved the product's quality and many feel its introduction in the U.S. is imminent. UHT's success has been notable in Europe, currently accounting for up to 50 percent of the fluid milk market in some European countries.

While successful in Europe, UHT faces many unknowns in the U.S. A foremost concern is that of consumer acceptance of both the product and the package. The dairy industry needs to know more about the consumer's probable reaction to both.

Cost savings will be the incentive for the processor and the retailer. Product savings to the consumer will be an ultimate test as well, although there will be a certain market segment that will purchase UHT milk even at a cost higher than that of conventional milk because of the unique storage qualities that it offers. However, in order to be eminently successful UHT milk will have to be offered at a lower price than conventional milk.
U.S. consumers have an excellent fresh product. But, as energy
cost escalate, can they continue to afford it? Fresh milk may eventually
be viewed as a luxury. Keep in mind the current situation of butter
versus margarine.

There are apparent advantages to UHT processing in the long run for
processors, retailers, farmers, and consumers. However, if UHT processing
becomes widespread, there may be serious implications for Florida processors
and farmers. Now is the time to be thinking about the possibilities
required to remain competitive.

References

Hsu, David S. Ultra-High-Temperature (U.H.T.) Processing and Aseptic
Packaging (A.P.) of Dairy Products, Damana Tech. Inc. N.Y., N.Y.
1970.

Reeves, Melissa. "UHT: Threat or Promise?" Southeastern Dairy Review,

Roager, Vagn. "How Big A Future Has UHT Milk?" Danish Dairy Industry-
Worldwide. Danish Dairy Manager's Association and Danish Dairy
Engineer's Association, June 1978.

Roberts, W. M. "Status of Long Shelf Life Milk," paper presented at the
Dairy Farmers Inc. annual meeting, Daytona Beach, Florida, June


Stakenberg, Bert. "Is Interprovincial Trade in Milk Coming?" Modern
Dairy, January 1978.