

# IMPLICATIONS OF STERILE PROCESSING OF FOOD DISTRIBUTION AND CONSUMPTION

Chairperson: Jarvis Cain, University of Maryland

## STERILE PROCESSING IN THE UNITED STATES FOOD INDUSTRY, NOW AND IN THE FUTURE

by

Dr. Graham Smith  
Custom Reports, Inc.  
Boston, Massachusetts

The last two years have seen one of the most dramatic changes that has ever taken place in the structure of the U.S. food system. Aseptic packaging has appeared - as if overnight - and is the hot topic on everyone's lips. New Product News reported that 1982 saw more new product entries in the U.S. marketplace than ever before - and the most active subcategory was aseptic juices and juice drinks.

What I want to talk about today is not only what has happened, but the reasons for this product acceptance and, in a broader sense, what this implies about the structure of the U.S. food industry and how I see this changing in the years ahead.

Basically, the food industry is regarded as a no-growth, relatively low-technology industry. It generally does not have much "sex appeal" for investment analysts. A recent article in Forbes magazine mentioned that the food industry had increased in value by 23% in a period that average stock market issue increased 70%. Per capita consumption of food has held steady at 1200-1400 lb/year for the last 20 years. Population growth has averaged less than

1%/year for the last decade and is projected to hold this rate for another 10 years. So we're looking at a situation of no real overall growth. This does not mean, however, that there is no change. There is a great deal of jostling for market share within the fixed "pie". Some bright spots emerge, and it is these that capture my attention and, I suspect, yours.

Aseptic packaging provides a case in point. I have just published an article in Food Processing magazine that illustrates how rapidly change can occur. Since aseptic processing received FDA approval in January 1981, this table in my article shows there are now 116 commercial installations already in place in the U.S. If you look at this table, you will see that those companies that invested in this new technology were not necessarily those who held the dominant share of the market for a particular product category. So far, we are basically dealing with the juice industry. Those companies that have taken the lead here are those that have a very aggressive marketing stance. It may be that many of the leading companies have a commitment to established containers and equipment and would find a change of this sort too

expensive and drastic. But you can be sure they're watching. Companies like General Foods and General Mills have 1 or 2 machines to experiment with. Only 4 companies (Coca-Cola, Dairymen, Del Monte, and Ocean Spray) account for 50% of installations. So it has not been uniform throughout the industry. This is a situation where you might see what I mean by the potential for change within the established order of the no-growth industry.

Dr. Cain did not mention in his kind introduction that my graduate degree is actually in the field of ecology. In ecology, you tell what is happening to a system as it changes by observing the plants and animals that live in the area - their population, size, etc. As the environment changes (e.g., as a stream is polluted), some organisms will disappear and others will be present for the first time. There are certain species that appear under specific conditions (e.g., when stream pollution reaches a certain acidity), and these are called "indicator species". They indicate that a particular kind of change has taken place. The existence of this species can, in turn, change the environment. They take in nutrients and excrete - and so change the surrounding conditions. I think that we can view aseptic packaging as an "indicator species" that illustrates a changing environment. Today, I'd like to spend some time examining the characteristics of this species and the environment in which it finds itself and also the ways in which its presence might alter the environment for others who exist there. In this way we can begin to prepare ourselves for change - and hopefully avoid the rapid shock that comes with major change (and can result in extinction of a species - extinction is forever - and none of us want to be on the list of endangered species).

Let me just take a minute to talk a little about what aseptic packaging is - and what it is not. Basically, it consists of four components:

- A) sterilization of the food product
- B) sterilization of the containers
- C) placing product in container in a sterile environment
- D) holding the shelf stable product. This means that the package must have microbiological integrity.

It is a system. Every part is as important as every other part. There is no point in sterilizing the product if it can be re-infected during filling, or if the container is not reliable.

The title of this afternoon's session is "sterile" processing. I would like to note that these products are not truly "sterile" in the sense used in the pharmaceutical industry. There all living organisms of all kinds must be killed. In food processing, we are dealing with a situation of commercial sterility in which you kill all organisms that have a potential public health significance or that could conceivably cause spoilage of a batch of product. Organisms that don't cause disease or spoilage might be present in low numbers, and probably they are.

I won't talk more about how the commercially available aseptic processing and filling systems work. I assume you all have a general idea and expect that many of you have seen them working.

The big advantage that aseptic processing provides, of course, is a high quality, shelf stable product. Up until now, in order to achieve a fresh taste and high quality product, it had to be either frozen or chilled. I don't have to tell an audience of this sort about the difficulties that this poses in the distribution system - and the consequent high price that is commanded for the product. Shelf stable items in the past were processed in the can for long periods at high temperatures, or hot-filled into containers - so that they took a long time to cool down. This extensive heating destroyed the natural, fresh elements of the product,

Aseptic products are quickly sterilized - often in a matter of minutes or even a fraction of a minute. Whereas in a retorted can, the product might be heated to 250°F or above for up to 30 minutes and a hot-packed glass bottle (185°F) might take 25 minutes to cool down, the heat load on the product was considerable. The aseptic product is heated very high in a HTST process and then cooled almost as rapidly. Milk may be heated at 275°F for a few seconds, juice at 190°F for 10-15 seconds. (Incidentally, during cooling, there is transfer of heat to help heat the next product coming through the line, and this heat recovery [regeneration] system is an important part of the economy of this processing.) The aseptic product thus begins its shelf life in a much fresher condition than previous processes.

All this is well and good. But that technology has been available for years - why the sudden interest? There are several reasons. One of the most significant changes has been the availability of new types of containers that have a marked economic advantage over the cans and bottles previously used. During the inflationary years of the 1970s, the costs of energy, labor, material, and transportation all rose dramatically. The cost of producing glass containers doubled in less than ten years, and the cost of making cans doubled in six years. At that time, it was projected that the price of rigid containers would rise at a rate of at least 10% per year through the 1980s. In some instances, metal and glass containers account for 25% or even 35% of the product's cost. Non-rigid aseptic packages may save up to 5¢ per container. For containers that are priced in the realm of 12-15¢ each, that is a pretty dramatic incentive to look at the new alternative,

The kind of aseptic packages we are now becoming familiar with had been available elsewhere in the world for years. In 1980, TetraBrik, the best know system, produced more than 15

billion packages worldwide (in some 80 countries). Then, not one was sold in the U.S. The reason for this, of course, is that as I mentioned before, the package has to be sterilized before the sterile product is added to it. This is not the case if you "hot-fill" - say into bottles - because the heat of the product is enough to kill any microorganisms on the glass. As I mentioned earlier, though, the time to cool down results in a cooked flavor to the food. The kinds of containers Tetra and Combi use cannot stand "hot-fill". They are sterilized with a chemical (usually H<sub>2</sub>O<sub>2</sub>), and their use in the U.S. required FDA approval.

The incentive for use in the U.S. (cost savings) was already there - so as soon as FDA approval was received, the aggressive companies were ready to jump in. Ocean Spray was on the market with product in these containers within about 6 months of FDA approval of the sterilant. (Of course, their R&D people has been investigating the options for 2 years before that; they had an experimental unit in place to learn how to operate it, and their marketers had made some assessment of consumer receptivity to the new container.)

At this critical point in time then, several European companies were ready to step in with complete, turnkey systems that accomplished the steps necessary for aseptic production. The packaging machine sterilized the containers and filled them in a sterile environment. They were designed to hook up to a processor that sterilized the product, and they sold the package that had integrity under these conditions.

In addition to the cost savings per package, there are a number of other incentives for food manufacturers to consider aseptic packaging.

-- flexible containers weigh less and occupy less space. One system on which I have seen figures is a plastic pouch system: to contain 200 ml of beverage, the package

weighs 5 gr. This means that 97.5% of the weight is in product and just 2.5% in packaging material. Compare this with steel cans that weigh seven times as much and glass containers that weigh 25 times as much. Hal Thorkilson of Ocean Spray suggests that freight costs for their "paper bottle" should be lowered by more than 30%.

- inventory space for empty containers is drastically reduced. Aseptic cartons of Tetrapak and Combibloc type store in very small space. Rolls may have 20,000 packages. There is thus an enormous savings in space compared to empty bottles, for example.

All of the reasons I have given so far are good from the industry point of view. Ultimately, of course, one expects this advantage to be passed along to the consumer and to provide a benefit there. Consumer reaction is the ultimate test of viability of new items of this sort, and there is no doubt that the juice and juice drinks now available have been a resounding success.

Ocean Spray, the pioneer in the field, conducted a survey that showed:

- 83% thought the taste was better than in metal cans (no taste from cans). Fresher, less processed.
- 85% felt the packaging was safer to open than a metal container.

Ocean Spray also found that 83% of those triers of the aseptic product who are under the age of 25 have repeated purchase. Ninety percent of all repeat buyers had purchased the product at least 3 times - and this survey was taken after the product had been on the market for only 3 months!

Within 6 months of the introduction of this form of packaging, it had cap-

ured 13% of the \$800m blended juice market. There is no doubt that consumers have accepted the package - at least for juice products in this small size.

In terms of the juice drink market, the entry of aseptic packaging has had a very positive effect on overall consumption. The market had been fairly static. Previously, juice drinks had not been marketed successfully in single-serve containers. This was because the traditional containers were too expensive - when you coupled that cost with the higher cost of juice products, they could not compete with soft drinks. Now, however, the package makes a lot of difference. In your local convenience store, you can see soft drinks in cans priced at 55¢ and right next to them a juice drink in an aseptic package for about 45¢. Now consumers have an alternative to soft drinks in this size, and manufacturers are delighted to find that this has expanded their overall market. All sales of juice products to date have been plus sales. That is, there is no cannibalization of existing products, but an entirely new product category has evolved due to the aseptic packages. Most of the companies now reaping the benefits of these sales were not previously marketing in single servings. I expect to see the cannibalization begin to occur as the larger aseptic packages come on the market, to rival the quart glass bottle or the 46 oz. can. These markets seem to be fairly well saturated, so I expect the new packages will probably cut into existing sales.

In addition to the food manufacturer and the consumer, the supermarkets should also benefit from this packaging. It is estimated that a retailer can put 36% more liter containers on the shelves than 32 oz. bottles. Also, with the proliferation of mandatory deposit laws, the fact that these containers are disposable is a big plus.

In Europe, where these containers have been standard fare for a number of years, the supermarkets have been integrated more into the system as a whole.

There, the processor fills the packages and they are packed directly into shipping trays and then on to standard pallets. They are stored in fully automated warehouses, called forth for loading onto trucks (still in the pallet), and the pallets (some with wheels) can be wheeled directly into the refrigerator counter of the supermarket and one side removed so that shoppers can lift our merchandise. There is virtually no handling of the package at all.

I don't have good figures on what this sort of arrangement could save the U.S. retailer. Studies in West Germany showed that replenishing shelfstocks, including receiving and pricing of individual consumer packages, accounted for 42% of the total worktime needed in self-service retailing. When labor costs are a major factor in expense, this becomes significant. In Sweden, from 1970-77, labor costs trebled. In Canada in the same period, they rose by 157%. I suspect the U.S. figures are comparable with those of Canada. In Sweden, they estimate that ready-for-display units of this sort save more than 60% in labor for stock replenishing.

So far, the U.S. has not proceeded to this stage. Wheeled pallets of this sort require that the supermarket be set up in a particular way, and this has not yet happened here. We're only just incorporating the UPC bar code, which is, of course, a prerequisite to this sort of system that avoids having to handle and price each item. (Of course, even the UPC code is having problems with aseptic packages; priced for 3 shrink wrapped together or one - some supermarkets are blocking out the original and putting their own mark on the overwrap.) BrikPak cartons do come in trays that can be placed directly on the supermarket shelf - (these hold 27 of the 250ml packages). Retailers don't need to handle these - but many have not yet adapted and still exert time (and

therefore money) on removing from these trays.

I can think of other ways in which supermarkets could benefit, but I'm not sure they see it the same light. Some 4 years ago, I wrote to all the major chains suggesting that they consider aseptic packaging as an ideal place to integrate backwards into packaging. Since they generally don't have a vested interest in canning or glass lines, it seems a good opportunity to increase their profit margins by handling house brands from the word "go". I did not have one response to my letter - either I was way ahead of my time, or this is not an area in which it is appropriate for them to become involved.

I mentioned the standardization of pallets, wheeled pallets, etc. that are found in Europe. They also have trucks specifically designed for these pallets. A conveyor boom runs the length of the truck, with retaining arms all around it that hold one of these pallets. The tailgate of the truck opens and the operator uses a remote control to rotate these pallets until the desired one is at the front. He then lowers the tailgate and wheels the pallet into the store. He does not have to enter the truck or lift anything. Furthermore, since the retaining arms lock the pallets firmly in place while the truck is moving, there is virtually no damage in transit. The truck body can be made thinner also, since there is no slippage of the load.

With all of these advantages for the food manufacturer, the distributor, the supermarket, and the consumer, it is easy to see why the aseptic systems have shown such dramatic growth in the U.S. in such a short period of time.

There are, however, several reasons for viewing the overall situation with some caution.

First: it is an expensive capital investment for the manufacturer. The aseptic packaging lines are slower than

a canning line (producing only about 450/hr. as opposed to up to 1000-1200 in canning baby foods on a canner). Thus, you need to set up 2 or more fillers to replace a canning line. Each filler costs about \$350,000. The aseptic processor may cost about \$300,000 and the secondary equipment (palletizers, shrink wrap, straw applicators, etc.) another \$200,000. So you're already beyond \$1 million without any installation costs or other incidentals. Of course, you can run the machine at 90% efficiency for 20 hours/day, 6 days a week, and this helps to justify the investment. With this sort of investment, you can't afford not to run the lines around the clock. As an example of the capital involved, Ocean Spray has spent about \$40 million on aseptic equipment.

Second: This form of packaging is more friendly to some products than others. At present, juice and juice drinks seem to be the important products. These are high-acid products; you might have some yeasts or molds survive the processing, but these don't have extreme public health significance. Low-acid foods can be handled (we'll hear about milk), but controls need to be much tighter. The FDA regulates low-acid foods more strictly because of the health effects of botulism. Plants must be registered with the FDA and the process approved.

Products packed must be those that can resist damage when held at ambient temperature. Apple juice and prune juice, for example, are well suited to this and give a good 6 month shelf life. Citrus is less ideal and has a somewhat shorter life, especially in concentrated form.

Third: the packages that have been so successful to date are in the 250ml range. Most juice (and milk) in the U.S. is sold in larger containers. Will flexible packaging be able to compete successfully with quart bottles and 46 oz. cans? Initial entries have not been widely successful. A flexible package is more unwieldy at that size

and the cost savings may not look so dramatic (especially since milk is already in paperboard - so cost advantage is being realized).

Fourth: Opening features. The small sizes generally have a straw. They are single servings and consumed all at once. Will the packaging companies be able to provide an easy-open and re-close feature?

Fifth: Labor and quality control need to be much more sophisticated. One of the advantages of the systems that are currently available is that they are turnkey systems; everything is coordinated and fewer operators are required. However, the operators need to be much more sophisticated and need to be aware of the significance of what they are doing. Training programs are available, but close supervision is essential. With a system running all the time like this, a mistake can be costly. When the system is stopped and re-started, it must be re-sterilized throughout.

Product is generally held for several days while product is tested for microbiological safety. If an error occurs, it may be several days before the mistake is caught and corrected. One company I know of found contamination and, following backwards, found that the machine had not been re-sterilized several days earlier before a start-up. This is not like running a canning line - each time it stops, it needs to be re-sterilized. In this case, the line was stopped because of a power blackout during a thunderstorm. It was the night-shift, in a new aseptic operation. They did not fully appreciate the importance of re-sterilization, although they had been instructed about it. The upshot was that 10,000 cases of product had to be destroyed.

You can expect to go through a learning curve of this sort when you enter a new technology of this sort. A company should be prepared for the fact that it may take several months to reach the high efficiencies of which these systems are capable.

Although fewer workers are needed to operate a packaging line of this sort, the technical competence required for some key positions is considerably greater than with traditional food packaging systems. Microprocessors can monitor every stage of production, and a filler operator in a booth can supervise the entire operation. As I mentioned earlier, in some European plants, there is virtually no other labor involved until the product leaves the warehouse. This is getting into a sort of high-tech operation that is not usually associated with food processors in this country but it will undoubtedly come.

Maintenance of these machines is also much more sophisticated than we are used to. Some U.S. food companies were reluctant to consider these systems at first because they were concerned that all the technical service required would have to come from Europe. Now that U.S. packaging manufacturers are becoming involved in marketing and service, however, this objection has been removed. Conoffast (Continental Can) and the International Paper system are U.S. companies with whom we are comfortable. Combibloc has formed a joint venture with RJR Archer, Inc., to market and service the equipment in the U.S. and to manufacture the cartons. BrikPak has opened a plant in Texas as a maintenance and training center. Within a year, both organizations should be assembling machinery in this country. Thus, it is no longer "foreign" technology, and more U.S. companies will become comfortable with service contracts that involve more local equipment and maintenance facilities.

How is all of this going to affect the food industry? As I have already mentioned, this packaging is an indicator of changes that are moving the food industry closer to the high-tech era. It will become much more sophisticated. I have discussed the control of flow in filling lines by microprocessors, the automation of all steps to the ware-

house, and, potentially, to the shopping cart. Quality control becomes crucial.

No longer do you have the long lines and unskilled labor in a food processing plant. Capital investment is very high. This means several things:

- a) Only well financed companies can be in the game. We all have heard of the rate at which food companies are being swallowed up by conglomerates. In the 1947 census, there were more than 40,000 companies that identified themselves as food manufacturers. By 1977, the number was 22,000. Mergers and acquisitions seem to be growing at an increasing rate. This trend can be expected to continue when the means of production excludes the possibility of small processors opening up in competition.
- b) This expensive machinery must be operated continuously. The investment is too great to have the machinery idle, and when aseptic machines are stopped, they must be re-sterilized before start-up. The tendency then is to stop them as infrequently as possible. When you change product, you must re-sterilize. Thus there is a tendency to carry out long runs with one product line. Again, this feature will rule in favor of large companies and may exacerbate the mergers within the industry.
- c) Labor will be greatly reduced in number, but greatly expanded in sophistication. A new "elite" will be created among workers in the food processing industry. However, because the machines run continuously, there will probably be three shifts. A processor is committed to this sophisticated labor force, and might find it difficult to alter his operations and cut back on shifts.

All of these factors point to less flexibility with the industry. There will be effects on competition and on related industries.

Some companies are already changing their operations due to aseptic packaging. Johanna Farms (SSips and Tree Ripe) has already begun to expand its distribution area. When it shipped refrigerated juice products, it was limited to the East coast. Plans now call for expansion as far west as Chicago. In Europe, dairies that were once limited to a very narrow market area, now have expanded their range to cover entire countries.

Some related industries may suffer. The potential of aseptic packaging is enormous and the metal cans and glass containers that have been used for shelf stable juice drinks are most likely to be affected. Juice products now account for about 4.5 billion rigid containers annually in the U.S. - that loss could make a big difference to manufacturers of traditional containers. The small-sized containers are especially vulnerable. I'm sure the effects are already being felt. Prices for glass containers have not risen for two years, and there are rumors of heavy discounting. The glass companies seem to be maintaining market share at the expense of investments already in place. Investment analysts project the closing of some glass production facilities and view this as a declining industry. There is rumor about that one of the major companies may discontinue the manufacture of cans for juice.

Enlightened people in the canning industry clearly see the writing on the wall. Although aseptic packaging has not yet advanced to the stage where particulate matter of any size is being processed, this seems only a matter of time and R&D investment. After years of only minor innovation, metal can manufacturers have come out with lighter gauges, lighter coatings, and improved line speeds in an attempt to cut costs. They have developed several methods that may replace traditional retorting. The Sterivac system features a direct flame HTST process for canned fruits before the

lid is placed on the can. This should reduce "cooked" flavor that comes from retorting. Another system, Pressure Fresh, fills the can with liquid nitrogen to extend product shelf life and improve color and flavor. It is possible that this is a case of "too little, too late". There are available now in Europe, plastic cans that can be retorted or can be aseptically filled.

I can foresee vending machines adapted to stock flexible packages (most immediately, milk and juices in these vending machines might be allowed in schools where sodas are forbidden). Up to now, vending machines have almost exclusively used metal cans. These machines account for about 50% of the sales of soft drinks in aluminum cans. That would make quite an impact on the aluminum can industry!

This is what I was referring to when I spoke of the "indicator species". Aseptic packaging is an indicator that change is happening in the system, and this kind of change in other, related companies is evidence that the overall environment is being altered. All this is just the beginning. I have seen estimates that 4 billion aseptic packages will be produced annually in the U.S. by 1987. The flexible packages we have seen so far are (by and large) paper-board, with aluminum and plastic. There are materials (e.g., certain plastics) that provide better barrier properties than those coating the cartons now in use in most of these machines. In some cases now the shelf life is shorter than it might be because there is some oxygen permeability in the packages. They are not as impermeable as metal or glass. The emergence of coextrusion technologies will allow for new combinations of plastics with barrier properties made to order. They will also allow the manufacturer to differentiate the shape of the container to highlight his product.

There will be a continuing need for innovation in aseptic packaging. We're already seeing the second generation of equipment with new Tetrabrik AB8 (liters)

and AB9 (small) machines which are respectively 33% and 66% faster than the machines they supplement. Rapid changes are evident in second packaging such as straw applicators, etc.

Aseptic packaging is also encouraging the development of new products. For example, the most delicate and sensitive part of fruit juices are the volatile "essences". These are the first aspect to be affected by prolonged heating. Thus, canned products that have been retorted have very little of the "fresh" flavor. There are sophisticated new ways to capture these essences without heating the juice. But until now they had to be heated when added to the product in order to make a shelf stable product.

Sterile flavors and essences may be added to the package just before it is sealed. They are not then subjected to the heating required to sterilize the bulk of the product. Similarly, heating destroys enzymes. It is possible to add the enzyme lactose to milk after processing. This will then allow lactose-intolerant consumers to enjoy milk.

The advent of aseptic packaging is thus encouraging other new technologies (like extracting essences) and encouraging still further changes in the overall food system. Another related development involves the bulk storage and handling of aseptic juice concentrate. Some frozen citrus concentrates cost more to store than they are worth. FranRica has developed aseptic rail cars that can hold up to 10,000 gallons of juice concentrate. I can envision a situation in which this concentrate could be shipped to a location near the market. A relatively small installation (perhaps 2 or 4 aseptic lines) could then reconstitute or blend this (possibly without having to reheat) and package it for local distribution. This would make more sense than shipping water over long distances and would alter the food

distribution system quite markedly. Whereas most other industries are located near their end markets, it seems that the food industries have located near the commodity. Perhaps this development is an indication that there could be more bulk transport of concentrate rather than of finished products. This could apply to juices right now. The collection of milk from farms is rapidly becoming uneconomical. With new membrane filtration units at the farm level - it will be possible to remove much of the water from the milk. The residual could be heat-treated and held for a week before collection by the dairy.

Although I am obviously excited by the many possibilities that aseptic processing offers now and of the insights that it offers for the future, it is clearly not for everybody. There is always the danger of everybody jumping on the band wagon and creating great competition.

There is some evidence for growing competition among the few dominant producers of aseptic systems. It appears that there is already a surplus of equipment worldwide. The U.S. is one of the few remaining undeveloped markets. Although there are a number of alternative systems available in Europe (mostly cups), the foothold that a few manufacturers have established in the U.S. may effectively prohibit the entry of these alternatives by effectively satisfying demand. I estimate that 400 or so machines would be sufficient for the juice and juice drink market.

The systems now available supply both the packages and the machinery. This may change, if other systems can develop packaging to meet the specifications of the machinery.

Perhaps it is just a coincidence, but aseptic packaging seems to have come along just at the point where the food industry is switching from a commodity orientation to a market-oriented one.

Up to now, the large food companies

have found their profits in new product development and images. They spent large amounts of money in A&P to differentiate their products, for which they would then charge a premium price. To give you an idea of the magnitude of this, General Mills doubled its new-product development spending from 1975 to 1980 and tripled its advertising spending to 5.1% of sales from 3.1%.

Other food products - like juice, milk, and meat, and not easily differentiated and have been treated as commodities. Selling a commodity is often not a very profitable game. There is not generally room for adequate profit and at the same time to provide an appropriate A&P budget. In order to charge a higher price, it must differentiate its product. Frank Purdue has achieved this to a certain extent.

I think we're beginning to see that we're entering an era where the food industry will be quite different. Marketing departments are now looking at technology as a way to differentiate what had been a commodity product. In this sense, then, the aseptic package is more than merely a container. It plays the whole scenario that industry now wants and needs. It allows a new image, differentiation of the product (at least for now, when not everyone is packaging this way), and provides the potential for differentiating a commodity that has less "processed" taste and that may have flavors and essences added that would not have been possible before.

There are, of course, other ways in which technology is being used to differentiate a commodity product. Orange juice is a case in point. Proctor and Gamble's Citrus Hill orange juice is an example - they have patented their product. Now they are using their marketing muscle and technology to try to establish a differentiated niche. A company the size of P&G is able to provide the marketing money to force supermarkets to carry the brand - even

couponing homes directly in order to create a demand to which the supermarkets must respond.

Another example with orange juice is Minute Maid's reduced acid juice. They have used modern technology to change the juice in such a way that they can differentiate it and charge a higher price.

Of course, with technological changes, the advantage may only last for a short while and then everybody has a chance to do the same thing.

As the packages become more common in the marketplace, they will not in themselves provide the differentiation of product that warrants a higher margin. We're already seeing the pressure, then, to become the low cost producer. In order to create significant profit margin to cover the A&P budget, the costs of production must be kept low. Therefore, I think we'll see the large companies pushing the efficiency of food processing even harder and with their ability to supply large capital investment, this could mean more and more automation.

We have been accustomed to hearing that the food industry is "mature", "stagnant", etc. I have tried to show today that aseptic packaging is one aspect of the "dematuration" of the industry. By this I mean that aseptic systems open the possibility for new generations of products, and so create innovations that revitalize the industry and allow for growth from the plateau we had reached. The same sort of thing has happened before. In the 1940s, the development of frozen juice concentrate opened up whole new horizons for the juice industry. We then began to see new developments that were made possible by this basic innovation of freezing concentrate. We had better means of concentrating the juice - TASTE - and the development of cutback juice containing balanced amounts of oils and flavor essence. Thus we were able to rise to a new level of maturity from that innovation. Now, with aseptic processing in the juice industry,

we have the possibility for a less heat-damaged juice and for flavors and enzymes to be added without heat destruction. We will probably see the commercialization of better methods of concentration (such as freeze concentration, or with membranes).

Aseptic processing can be viewed, thus, as more than just a packaging

system. It offers a glimpse of the dematuration of an industry with all the potential and opportunities that new horizons can offer. Also, it indicates an environment that is changing, and we can only speculate on what changes this might bring to the structure of the food industry in the years ahead.