

(c) Aluminum foil

Aluminum foil has the properties of being a good barrier, a good shield against light and stops contamination by insects and microorganisms, and is therefore highly suitable for packaging food. Since it is also heatproof and does not expand when heated, it is an indispensable material when compounded with plastic film and used for a retort pouch or barrier matrix of an aseptic pack. It is used for packaging food such as confectionery, dairy products, convenience food, cooked food and beverages and also for cigarettes, pharmaceuticals, detergents and cosmetics. Lately it has been used for standing pouches, composite vessels, lids of portion packs and inner seals such as the caps of glass bottles. The range of uses of aluminum foil is increasing every year in Japan as package technology and foil manufacturing machines are advancing with high speed. In the technical field, the technology has been developing remarkably. It is common to use X-rays for the Automatic Gauge Control System, and the Shapen Automatic Control System has been generalized. Flexible manufacturing system can be introduced by the use of a computer. Aluminum foil has become thinner, reaching the 5 micron level. The 5 micron aluminum foil though has many pinholes and may be used only for decoration.

Another area of aluminum foil technology is lamination. Recently extrude lamination has become popular, and has been increasing along with aseptic packaging. An example of this is the paper used for tetra brick packaging of wine, which is imported, and is made up of five layers, these are as follows:

PE - Al - PE - Paperboard - PE

The tandem development of package technology and aluminum foil manufacturing machinery will allow the mass production of goods.

(d) Glass

Glass has been used for containers for many years, it is a very attractive material with a nice gloss, good chemical stability and strength, and provides an excellent barrier. It is used to hold various beverages such as beer, liquor, juice, carbonated beverages and milk, and seasonings such as mayonnaise and ketchup, and also pharmaceuticals.

However, recently, containers made of PE, PVC and PET, steel and aluminum cans and paper packages often substitute for glass. This is because glass is heavy and brittle, consumers want containers to be diversified, and returnable containers have been replaced by disposable ones.

In Japan due to the influence of paper containers, the use of milk bottles has greatly decreased. All major companies are now overwhelmingly equipped with paper pack lines. The glass industry in Japan has developed light and tempered glass which is protected from damage by a surface coating of expanded plastic. It has also developed a manufacturing process where shapes can be easily changed, and in this way it has coped with diversification.

In Argentina, a great deal of wine is consumed and most of it is contained in glass bottles, although there are some paper pack vessels. Mayonnaise, ketchup and pickles are bottled, and milk is packed in plastic bottles, pouches or paper vessels. Liquor and juice are bottled. However, bottles which are coated for protection and for improvement of design, which have been recently developed in Japan, are not found.

In Japan glass bottles are commonly used for holding wine and although some sake is contained in paper packs, 1.8-liter bottles are the most common form of containers. Packaging would be greatly rationalized if paper packs replaced bottles, however, the image of a bottle is closely connected with wine as a table luxury, therefore bottles will continue to be used. Since wine contains alcohol, which exhibits strong osmosis, packaging is more technically difficult compared with that for longlife milk packs.

(e) Wooden boxes (crates)

The problems of wooden boxes were previously mentioned in the section on cardboard and that wooden boxes are commonly used for packaging fruit and vegetables in Argentina. Wood is a suitable material for moisture retaining products, and a wooden box can be used repeatedly, however it has the following problems.

1) Wooden boxes take up a large volume.

Wooden boxes are not collapsible like corrugated cardboard boxes and therefore an empty box requires the same storage volume as when it is packed. This means that a vast storage space is needed to stock empty boxes, and many empty boxes can not be carried at one time.

2) Wooden boxes are fragile.

Wooden boxes are fragile, and the impact of a fall may cause nailed parts to loosen or boards to break. If a box is used repeatedly, it is necessary to repair it when it is returned.

3) Sanitary problems

Wooden boxes are a good medium for microorganisms to grow in. New wooden boxes do not suffer from this problem, however, those used many times will cause the problem of insanitary.

4) Wood resources should be used effectively.

It is said that Argentina is rich in wood resources and that wooden boxes are cheap, however, the importance of preserving wood resources will become more and more urgent in the future, and therefore effective use of wood resources should be considered.

5) Disposal of wooden boxes

Disposal of wooden boxes is a problem in urban areas and their replacement by corrugated cardboard boxes will be necessary to solve

this problem in the near future. At the present corrugated cardboard boxes should at least be used for export.

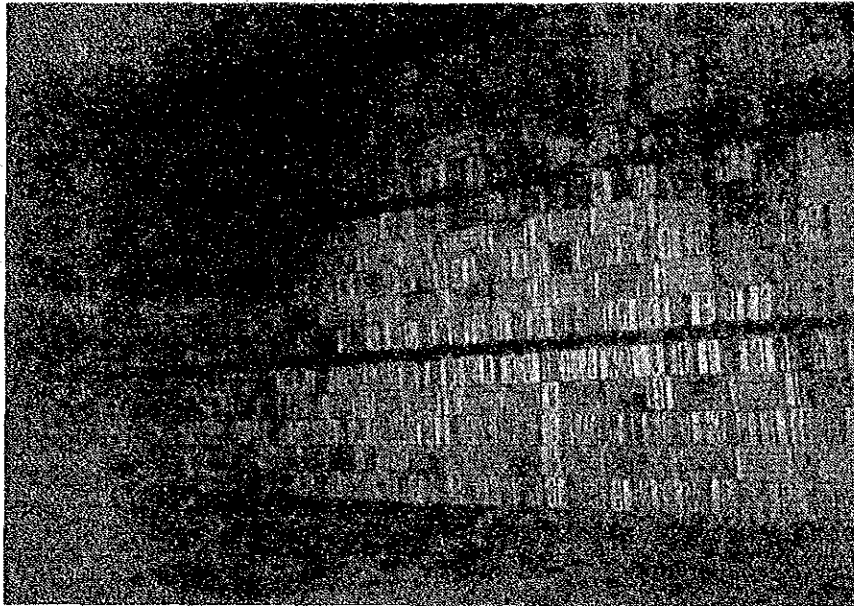
The method of packaging crates in Argentina does not seem well. The upper board is curved and nailed down as shown in Figure III-4-1-(2). This may be to show that the crates are very full, to impress buyers, and also because the crates will be piled on their sides, allowing air to reach the contents. However, oranges, tomatoes and green peppers in the crate are ruined by the pressure of the board, and therefore this method should be improved. However, it is evaluated well that the size of the crates is standardized and that they can be piled high.

When a factory for assorting fruit, which specializes in export, was visited, it was noted that fruit was assorted by an automatic assorting machine, and the contents of the crate were thought to be trustworthy. The price of a wooden box is almost the same as that for a corrugated cardboard box, however, since a wooden box is returnable, it is cheaper. Looking from another point of view though, if the wood was used to make paper and cardboard, it would make five times as many containers. There is still a long way to go towards changing to corrugated cardboard boxes, but hopefully the changeover will be done as early as possible.

Almost all vegetables and fruit in Japan are packaged in corrugated cardboard boxes, and wooden boxes are used only for gifts or in special cases. Packaging of oranges changed to corrugated cardboard boxes from wooden ones in the 1960's and soon afterwards other fruit were also packaged in corrugated cardboard boxes. This was mainly due to the fact, that, at that time the Japanese economy had been growing at a fast pace, and that there was a labor shortage, and wooden boxes had become more expensive than corrugated cardboard boxes.

Figure III-4-1-(1) Wooden Box in Argentina

Wooden boxes occupy much space.

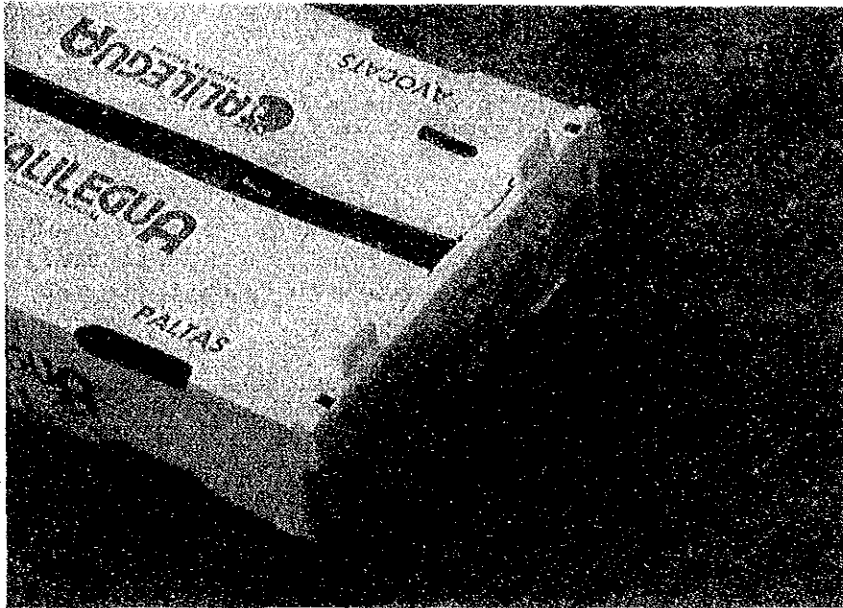


Automatic machine for assorting fruit and wooden boxes in Argentina (for export)



Figure III-4-1-(2) Wooden Box in Argentina

Packaging is studied in some places (Argentina)



Fruit is ruined (Argentina)



#### 4-2-3 Conditions of Packaging in Argentina

Following comments are made based on several factory visits in Argentina.

##### (1) Processed fishery product packaging

Fishery products are classified into chilled, frozen, canned and cured types. Chilled products on the market in Argentina are packed in wooden crates with ice. This is not so different from a method of packing once used in Japan.

In Japan today, expanded polystyrene boxes are mainly used for transporting chilled products. This type of box is generally used for distribution in a radius of about 200 km because it is very bulky and incurs higher costs when transported empty.

The popular use of expanded polystyrene is due to its heat insulation, water retention, low ice needs, and easy handling. Although its use was initially questioned in terms of its disposal, the problem has been solved by building a disposal plant inside the central market. Since Japanese people like to eat raw fish, strenuous efforts are made to ensure freshness. Fish are also often transported alive.

In Argentina, frozen fish are first packed in polyethylene bags and then in corrugated cardboard boxes after pan freezing. This method of packaging is also common in Japan, and is considered the best at the present.

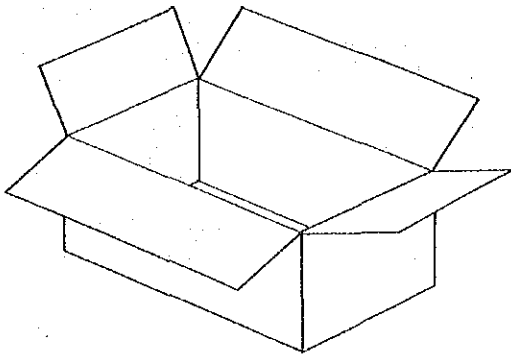
The packaging methods employed for canned products in a factory we visited have some problems. In Japan, there has been a shift from regular slotted containers (RSC) to wraparound cases. Tray shrink (see Figures III-4-2 and III-4-3) is now at an experimental stage. The companies concerned are reluctant to employ this method because there is a greater likelihood of damage to cans in transit. In Argentina though, this method is employed in a factory and cans are transported with a sheet of paper underneath them and craft paper between the upper cans and the lower cans.

This method of packaging is considered to be ideal for rationalizing packaging and has prospects for the future packaging of cans in Japan. Cans packed in such a way are likely to be dented, but the degree of this problem depends on the consciousness of the consumers.

In Japan, consumers dislike cans which are dented, and such goods are usually sold in bulk at bargain prices. However, in Argentina they are usually sold at the same prices as normal ones.

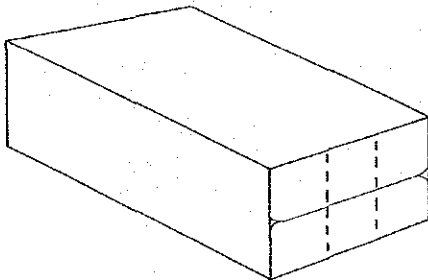
While cans are offset printed on themselves in Japan, they are labelled without actually printing on the can itself in Argentina. Labelled cans are not seen in Japan because their contents could not be identified if the labels were removed by accident. However, in Argentina, printed cans are not used globally as much as they are in Japan.

Figure III-4-2 Illustration of Corrugated Cardboard Boxes



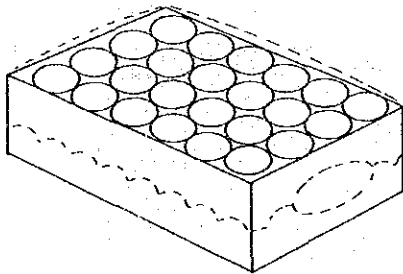
Regular Slotted Container

Most commonly used.



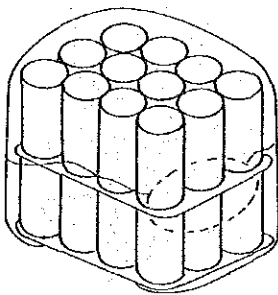
Wrap-Around Case

Used for canned juice and beer. Put cans on a flat sheet before shaping a box. Wrap them and paste the ends of the sheet to make a box. (In many cases, less packing materials are needed.)



Tray shrink

Put cans into a tray, cover the whole of the tray with polyethylene film, and shrink it with heat so that they are packed tightly.

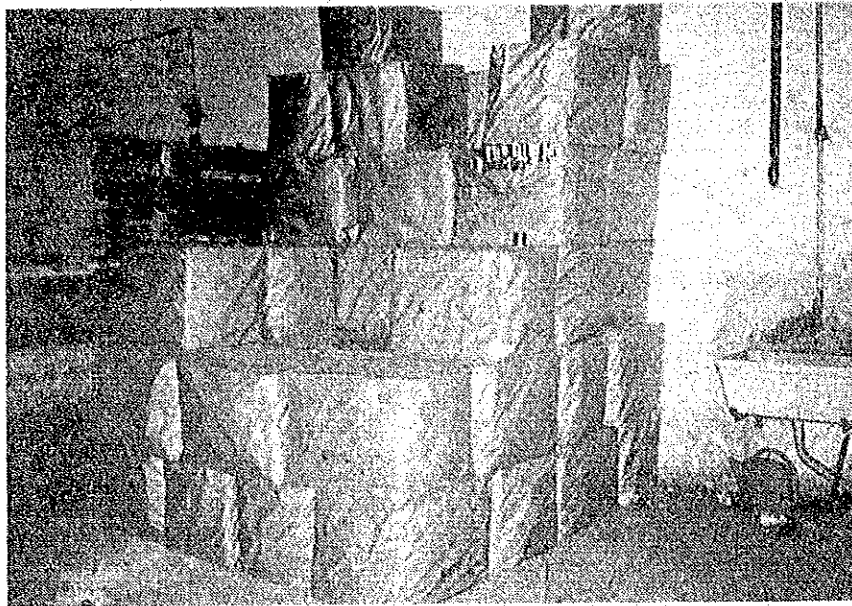


Packaging in Argentina (Flat tray shrink)

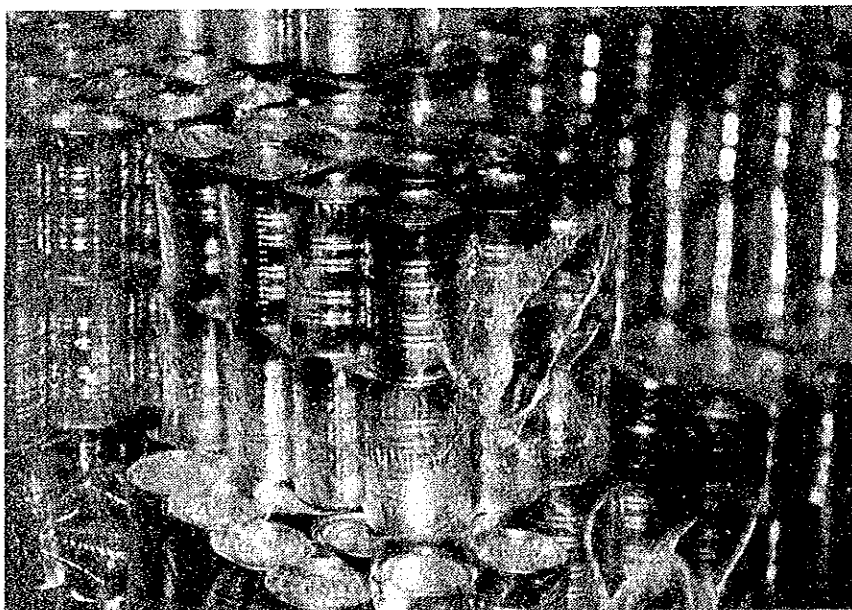
Put cans on a sheet of paper, insert craft paper between two layers of cans, cover them entirely with polyethylene film and shrink it.

Figure III-4-3 Transport Packaging for Cans

Empty cans are wrapped in craft paper.



Flat tray shrink of cans



Final point is that it is unacceptable to Japanese that the date of manufacture is not marked on canned goods. In a few cases in Argentina, only the date of manufacturing the can is marked.

(2) Packaging of processed agricultural product

Following are comments regarding processed Agricultural Product based on several factory visits.

(a) Factory for canning of fruits

The factory which we visited cans fruit, tomato puree, and cooked beans, and it also bottles jam, marmalade, and mayonnaise.

Empty cans are delivered to the factory in craft paper packs. Cans are automatically filled with tomato puree by machine, but we found a considerable amount of leakage from the cylinder of the pump. Cooked beans are uniformly scattered on a conveyor belt and received by a bucket conveyor which quantifies them. They are, however, placed on the conveyor belt manually. We generally found that the maintenance of machinery at the factory is not good. The actual conditions are far from what they should be for a food plant.

Canned goods are packed in cardboard boxes by a semi-automatic machine: that is, cans are automatically collected and pushed into the boxes which are made by hand.

Agricultural products are generally packed in wooden boxes or net bags, but not corrugated cardboard boxes, which may have to be considered as materials for packaging in the future.

(b) Factory for wine

We visited a wine plant in Mendoza, which turned out to be larger than we had expected. Wine products are supplied with the following packaging style:

- 1) Bulk: This is carried by lorry.
- 2) 4.75ℓ bottle
- 3) 750ml bottle

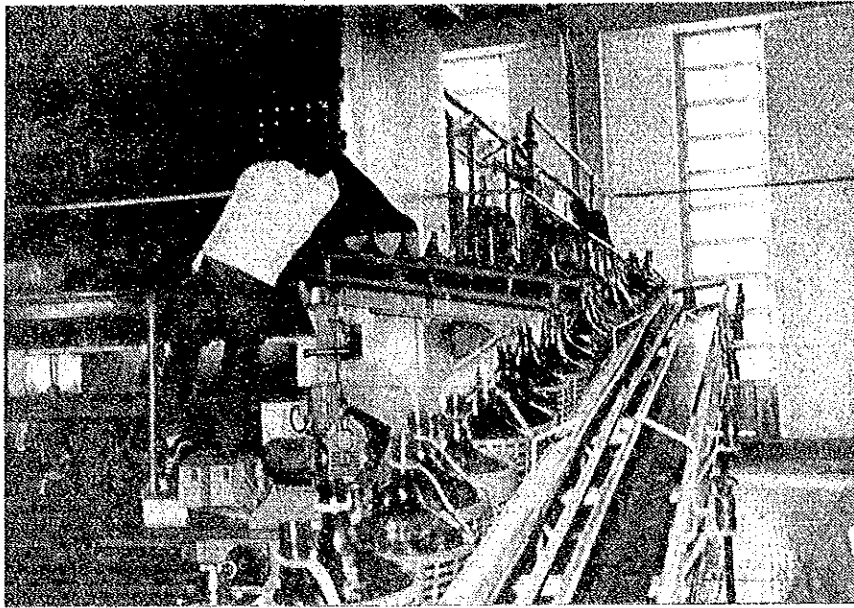
Both types of bottle are automatically filled by machines made in Germany and Italy.

4) 1-liter carton

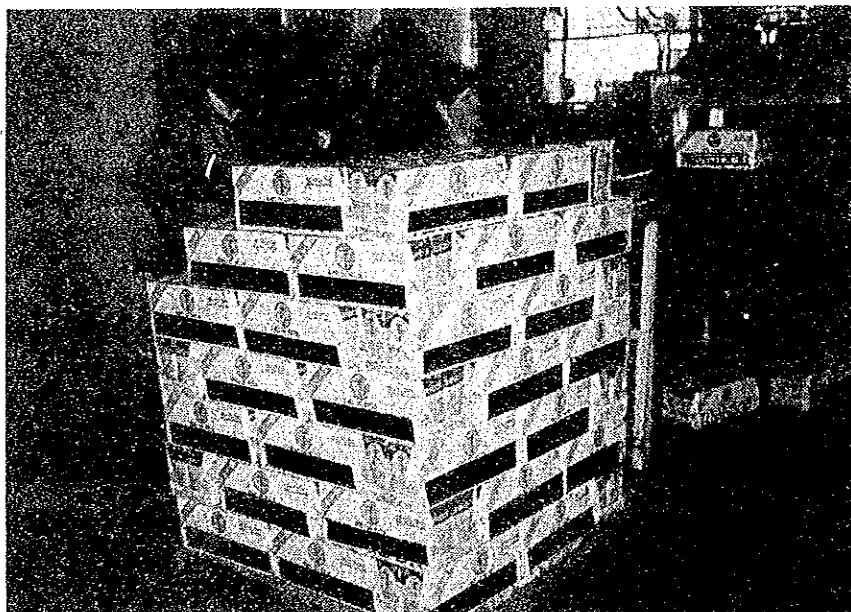
Wine is poured into tetra bricks, a dozen of which are packed into corrugated cardboard boxes covered with shrunk film. This is a complete aseptic packaging system. Although sheets of paper are now imported as materials, it is planned for them to be manufactured in Argentina in the future. Such sheets of paper consists of five layers, i.e. polyethylene (PE), a sheet of paper, PE, aluminum foil and PE (Figure III-4-4).

Figure III-4-4 Example of Wine Factory

The Device for Washing Recovered 4.75ℓ bottles



The Process of Packing Bricks of Wine



### (3) Processed livestock product packaging

Since the livestock industry is one of the key industries in Argentina and is an import and sector in exports, it is important to examine the packaging of such products. Example of meat packaging in Argentina is shown in Figure III-4-5.

The industry is characterized by the fact that there has been little change in the production process. Beef cattle are quartered and then transported by refrigerator car. Processed meat is distributed in a chilled or frozen state while cooked meat is supplied in cans. In other words, there are unexpectedly few forms of supply although volume is large. This means that beef is supplied to the market with low degree of processing.

In most cases, the number of type of packaging is limited, and therefore, it seemed to us that a thorough study on materials, forms and mechanization of packaging will be useful. Although more study will be necessary for actual application but the following methods are advisable.

#### 1) Vacuum packaging of meat

The sizes of the meat are almost the same, and it should be considered whether a continuous vacuum packaging machine can be developed and whether robots can be used to feed meat to such a machine.

#### 2) Changing the meat boxes and mechanizing the assembly

It is possible to change the meat-packaging boxes as well as to mechanize their assembly (see Figure III-4-6). The reason for such a change is that the boxes consist of too many materials.

#### 3) Automating cross-shaped banding

It does not seem to be difficult to automate the work, though some space will be necessary.

#### 4) Installing a palletizer

Since the types of boxes are limited, the introduction of a robot-type palletizer would not require much space.

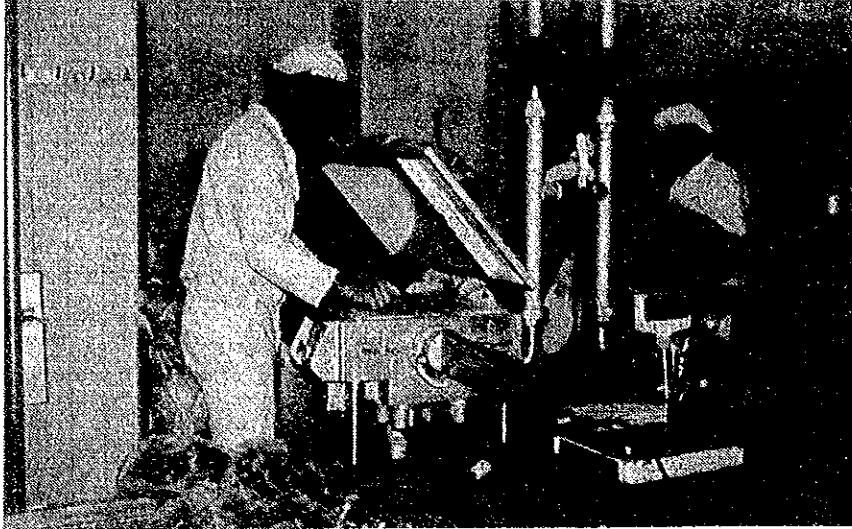
#### 5) Mechanizing the packaging of corned beef

Corned beef is packed into uniform sized cans. In this sense, mechanization raises no difficulties.

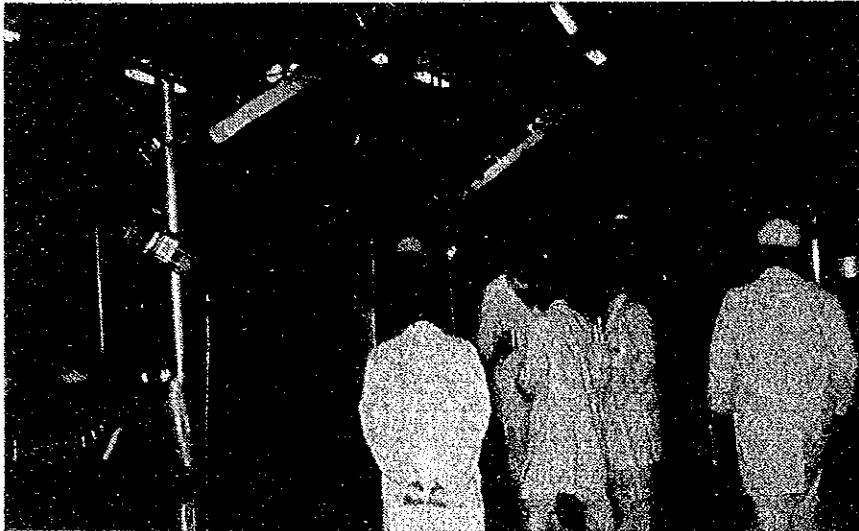
We found that many manual parts in the packaging process could be mechanized. Though the whole of the process may not be easily mechanized because of such problems as the difference between personnel costs and equipment costs and the suitability of packing materials for mechanization, it is worth to be considered.

Figure III-4-5 Example of Meat Packaging

Vacuum packaging of raw meat



Cans of corned beef



Manual inspection of cans

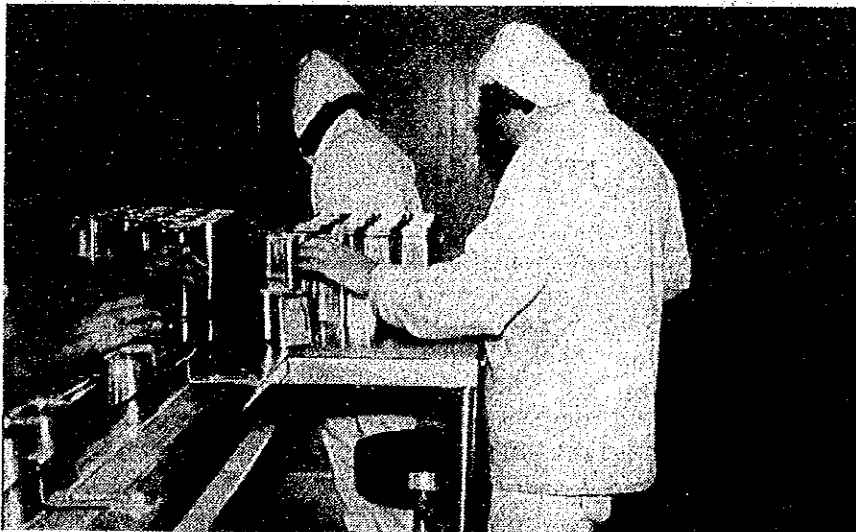
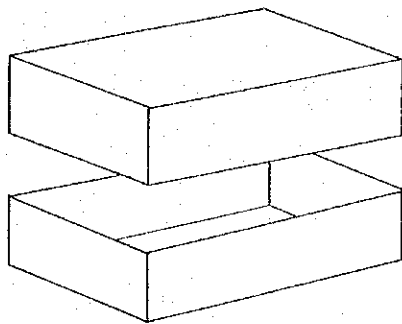
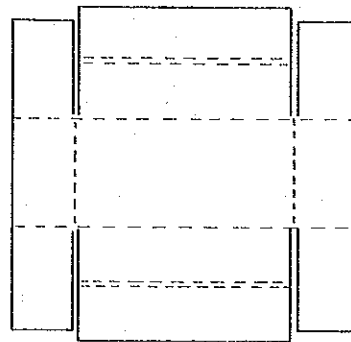


Figure III-4-6 Example of Improvement of Carton Box Packaging

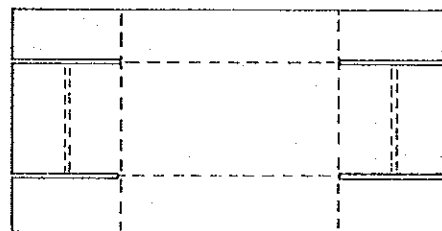
Currently used telescope-type box



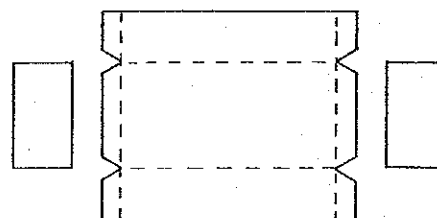
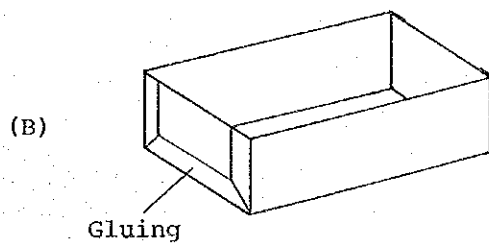
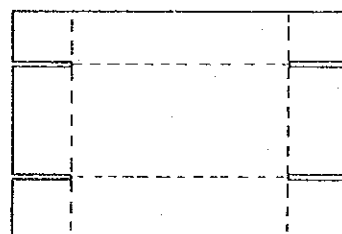
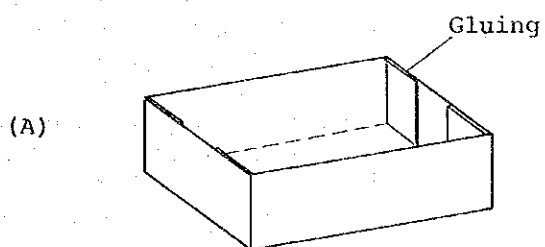
Contour of the lid



Contour of the body



Improved trays of better materials



- (A) Possible by tray making machine  
 (B) Bliss box (three-piece box)

#### (4) The way to mechanization of packaging

As already mentioned in terms of mechanization of packaging, packaging materials which are mass-produced, stable in quality and cheap should be selected.

Mechanization of packaging has already spread in many areas, and its points are as follows:

- 1) Qualitative stability,
- 2) Reduction in the volume of packaging materials,
- 3) Unmanned hygienic control,
- 4) Prevention of human error,
- 5) Elimination of monotonous work, and
- 6) Reduction in labor cost.

A machine works as it is designed, therefore, products and packing materials deviating from the design prevent the machine from working normally. Hence, such materials must be stable in quality.

Thus, an important thing is standardization. Standardizing the quality and sizes of materials for mechanization should also be examined from the standpoint of distribution. In the section referring to the packaging of wine products, a picture of palletized tetra bricks was shown. The readers may be able to recognize from the picture, the relationships between the dimensions of the pallet, the method of loading, and the packaging of the twelve 1-liter cartons. It is a complete packaging system with no waste. It should be noted that the standards of the pallet are related to that of the trucks and containers.

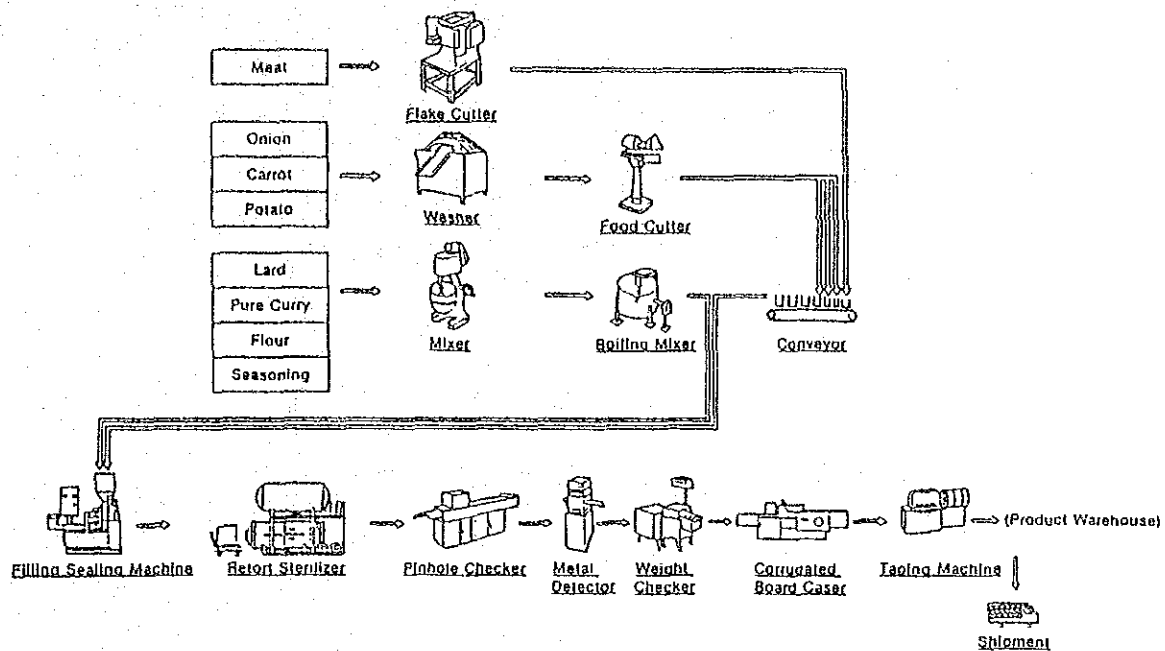
We saw many packaging machines in Argentina, but most of them were for packaging of individual product. In most cases, packaging for transportation is done manually. Mechanization of such packaging requires standardized corrugated boxes to be used. Also quality control must be conducted so that packaging materials are durable on the packaging machine.

Figure III-4-7 shows an example of mechanization of packaging. This is the flow of a manufacturing method for a curry sauce retort packed by a Japanese company. It seems that a similar method is adopted in Argentina, except checking and inspection system. No pinhole checker, metal detector or weight checker were found as far as we visited.

#### (5) Supermarkets

Generally speaking, we can get an idea of the food packaging materials and the level of technology in a country by visiting the food counter of one of its supermarkets. This is because finished products are presented there, with a wide range of choice for the consumer.

Figure III-4-7 Example of Mechanization of Packaging



Source: Study Team

Although the supermarket in Argentina looked like the supermarkets in Japan, Europe and the United States at a glance, it gave us a different impression in terms of the packaging materials, types of materials for cases, and the kinds of food available. For bottles and trays, PVC (polyvinyl chloride) is overwhelmingly used, with PE having the second most applications. Many materials which are familiar to Japanese consumers are not used in Argentina: e.g. compound film, multi-layered bottle, PET bottle, free oxygen absorber enclosed packaging, retort food, gas flush packaging, printed beverage can, food cans of various shapes, prelabeled glass bottle, etc. Following is a table which compares Japan and Argentina.

#### 4-2-4 Technology for Conserving Food

Various characteristics are required of plastic packaging, especially that for food, where there is mass production and mass transportation of goods. In Argentina, single film is overwhelmingly used at present, but if consumers become more conscious of food quality, food packaging with better characteristics will be needed. With this prospect, some examples of typical materials and the technology for conserving food in Japan are given in this section.

Table III-4-12 Packaging in Supermarket

Food	Packaging Materials in Argentina	Examples in Japan	Notes
Vegetables & Fruits			
Small cabbage	Paper tray	No major difference	For potato and rice, bag made of Polyethylene filament, cloth and jute are used as packaging materials. For packaging of vegetable and fruits, polyethylene and PVC which have properties of barrier to vapor and gas permeability are used to prevent vaporization and over breathing.
Potato	PVC (polyvinyl chloride) net		
Onion	Perforated PE (polyethylene) bag		
Cut vegetables	PVC tray, PE shrink pack		
Vegetables (tomato, eggplant, green pepper, etc.)	PS (polystyrene) tray, PE shrink pack		
Apple	Dispensed PE bag		
Dried fruits	Paper tray, PE shrink pack		
Rice	Wooden box PE bag		
Raw Meat	PE tray, PE shrink pack	good-barrier materials, gas flush pack	In order to keep the color of fresh red, packaging materials should have the properties of oxygen permeability, barrier to vapor and resistance to water. PA and PVDC are used as film in the in-house stretch packaging. For the case of gas flush packaging, gas of O <sub>2</sub> (80%) and CO <sub>2</sub> (20%) is used.
Fresh Fish	Metal and plastic trays PE takeout bag	PE and PVC shrink packs For frozen fish: PVC (polyvinylidene chloride), PE/LDPE (polyethylene terephthalate/low density polyethylene), OPP/LD PE, etc.	Packaging properties similar to those of fresh meat are required for the case of fresh fish. Packaging materials are almost same as vegetable and fruits. In the case of frozen fish, laminate film of PVDC, PE and PET are used.
Frozen Food	Carton, OPP/PE	ON/PE, PET/PE, etc.	Properties of packaging material 1) No change in quality of packaging material at the -18°C 2) Barrier to oxygen and vapor 3) Resistance to heat 4) Resistance to oil
Processed Meat (salami sausage, Vienna sausage, sliced ham, sausage, cattle blood, etc.)	PVDC (Cryobag for casing)	Bag: PT/PE, KOP/PE, KOP/PP, PET/PE, Pack: LD... OPP/KT/Ionomer Film, K2ET/PE, etc. Bottom... KN/Ionomer Film, PVC/Ionomer	Prevention of germ increase and prevention of change of color are important issues.
Edible Oil	Metal can, PVC bottle, glass bottle	PET, PE/EVAL/PE. Paper bag: PE/paper/PE/AL/PET/PE. Metal can	Properties of oxygen barrier, steam barrier, light barrier and oil resistance are important to avoid oxidation and leakage.

Table III-4-12 (Continued)

Food	Packaging Materials in Argentina	Examples in Japan	Notes
Milk, Milk-type Beverages			
Milk	PE bag, paper container, PE bottle	PE treated paper container, glass bottle, metal can	—
Milk-type beverages	PS cup	HIPS x CPPS, PE/Acid proof paper/PE	
Snacks	PE bag, PP bag, PVC	bag: KOP/PE, KOP/PE. carton: inner bag ... PE/AL/PE, PE/PVDC/PE, etc.	Properties of steam barrier, protection of food shape, prevention of oxidation of fat portion are important. For those purposes, aluminum foil and KOP-KT are used.
Candies	PVC	MST, AL, ALVN, etc.	Properties of steam barrier and protection of flavor are important.
Precooked Food	Carton: Al tray	Al foil tray, PET treated paper tray	Change of quality by oxidation and light, and influence of flavor on packaging material is important. Aluminum foil is often used for this purpose.
Beverages			Absorption of moisture is an important issue. Properties of moisture barrier, light barrier and oxygen barrier are important. Aluminum foil is used as basic material.
Wine	Carton, glass bottle		
Juice	Carton, PVC bottle, glass bottle	carton, PET bottle, glass bottle, metal can	
Powder juice	Paper pouch	PET/Al foil/PE, PT/Al foil/PE, paper/Al foil/PE, etc.	
Mineral water	PVC bottle, glass bottle	PVC bottle, glass bottle	
Soft Drinks	PET	PET, glass bottle, metal can	

### (1) Multi-layered Film

A multi-layered film has superior properties to a single film such as high barriers and is expected to have more applications.

There are various properties required of multi-layered films for food packages, and in particular, the following properties are the most important: 1) good barrier, 2) heat insulation, 3) physical properties, 4) transparency.

The property of a good barrier is to protect against various kinds of gases, vapor, flavor, plasticizers, and in the case of food packages, to be oxygen-proof and vapor-proof is especially important. Films which are good barriers against oxygen are made of PET (polyethylene terephthalate), nylon (NY), polyacrylonitrile (PAN), polyvinylidene chloride (PVDC), ethylene vinyl acetate copolymer (EVA).

Heat insulation is an important property of multi-layered films. Films which are good heat sealants are made of EVA, LDPE (low density polyethylene), HDPE (high density polyethylene), Ionomer, cast polypropylene (CPP). On the other hand, NY is used for films which are required to be heatproof.

Regarding the physical properties, tensile strength, impact attenuation, penetration resistance, rigidity, and pinhole resistance are required, and NY and oriented film are often used for those purposes.

Transparency is important to enhance the value of packaging as a commodity, and for this NY, PET, and EVA are good materials.

The following section describes the various packaging technologies which use the above-mentioned multi-layered films.

#### (a) Vacuum packaging

The existence of oxygen facilitates the growth of mold and aerobic bacteria. Vacuum packaging is a method of removing oxygen from packages by a vacuum device. This is applied to the packaging of meat, processed fish, smoked foods.

#### (b) Gas flush packaging

Many kinds of foods are packed by means of gas flush packaging, so as to conserve color and flavor, to prevent oil from being oxidized, and to stunt microorganisms. An inactive gas is used to replace the air inside film packages. For fresh food such as raw meat and fresh fish, a mixture of  $O_2$  and  $CO_2$  is used. For processed food such as cakes, tea, coffee, dairy products, processed meat and processed marine products,  $N_2$ ,  $CO_2$  or a mixture of these gases is used (Figure III-4-8 (1)).

(c) Free oxygen absorber enclosed in packaging

This is a method of removing oxygen from packages of processed food through the reducing process of an iron oxide to generate a vacuum state, so that microorganisms may be stunted and food oxidization may be prevented. It is a positive feature of the method that it requires just a free oxygen absorber to be sealed into packages, without any special packing machinery being required. In Japan, it is applied mainly to oiled cakes, peanuts, processed meat such as salami sausage, and processed fishery products (Figure III-4-8 (2)).

(d) Aseptic packaging

There is a worldwide tendency for aseptic packaging for the packaging of food which is easily rotten. In Japan, this is applied to various kinds of foods, for example, liquid food such as milk, fruit beverages, fresh cream and soup, seasonings such as tomato ketchup and spaghetti sauce, processed meat such as ham, sausage and dairy products such as cheese. Aseptic packaging is a method of filling presterilized food into presterilized containers and sealing packages under germ-free conditions. This method may be carried out if the necessary packing machines, packaging materials, and bio-clean rooms are technically developed (See Figure III-4-8 (3)).

(e) Frozen food packaging

This method is also adopted in Argentina, and it is applied to various packages in Japan such as that for vegetables, fish and shellfish, processed marine products, precooked food, fruits, frozen cakes, soup, etc.

The following characteristics are required of packaging materials: 1) coldproof -- no deterioration for one year or longer at -18°C or lower; 2) good barrier against oxygen and vapor -- to prevent dryness and condensation; 3) heatproof -- against boiling; 4) oilproof; and 5) waterproof.

(f) Liquid food packaging

In Japan, multi-layered film pouch packing is increasingly used because of its lightness, low-cost, and easy disposal. Since beverage containers are required to be independent of one another, standing pouches which are skirt-shaped at the bottom have been adopted for fruit drinks, coffee, soup and liquid seasonings (Figure III-4-8 (4)).

(g) Retort pouch

This is a pouch suitable for retort treatment after it has been filled with food (three classes: 115 - 120°C for 20 - 40 min., 135°C for 8 min. or less, and 150°C for 2 min. or less) as sterilization. It is made of heat-proofed, multi-layered film. Food packed in the pouch is called retort food. Materials for such a film vary according to the treatment temperature, the purpose of use and the contents. In many cases, several materials of PET, aluminium foil, polyolefin,

nylon, and ethylenevinyl alcohol copolymer are combined to produce the film. In Japan, the contents of pouches range widely from curry sauce, stew, soup, meat sauce, hamburgers, meat balls, precooked marine and agricultural products, and boiled rice (Figure III-4-8 (5)).

(h) Multi-layer blow bottle

While blow bottles mainly used in Argentina are made from PVC or PE. Those in Japan are made with additional materials such as PET (used for the food such as carbonated beverages, juice, draft beer, soy-sauce, sauce, dressing, edible oil, cosmetics, detergents, drugs), multi-layer (used for the food such as soy-sauce, sauce, mayonnaise, ketchup, dressing, edible oil, agricultural chemicals), or PP (used for the food such as detergents, perfume, drugs). Multi-layer blow bottles were developed in order to protect the contents from oxidization or discoloration, and in most cases, the barrier layer is a multiple combination of ethylene-vinyl alcohol copolymer and polyolefin resin.

(i) Other prelabeled glass bottles

In Japan, the demand for light glass bottle has been increasing. Prelabeled bottles are one of products resulting from the technologies of thinning and reinforcing glass.

These are bottles fitted with a heat-contractible expanded polystyrene label or an unexpanded PVC label, so that the bottle is unlikely to break or shatter. In particular, expanded polystyrene is excellent in terms of heat insulation and impact absorption. Moreover, colorfully designed prelabeled bottles are more appealing to consumers (Figure III-4-8 (6)).

(2) The technology for keeping fruit fresh

Fruit is usually harvested when it is still green in consideration of its storage time and transportation time, and it becomes mature around the time it reaches the stores. In this way, fruit which is still solid can be transported without damage just in simple packages. However, in terms of taste, such fruit is inferior to that which became ripe before harvested.

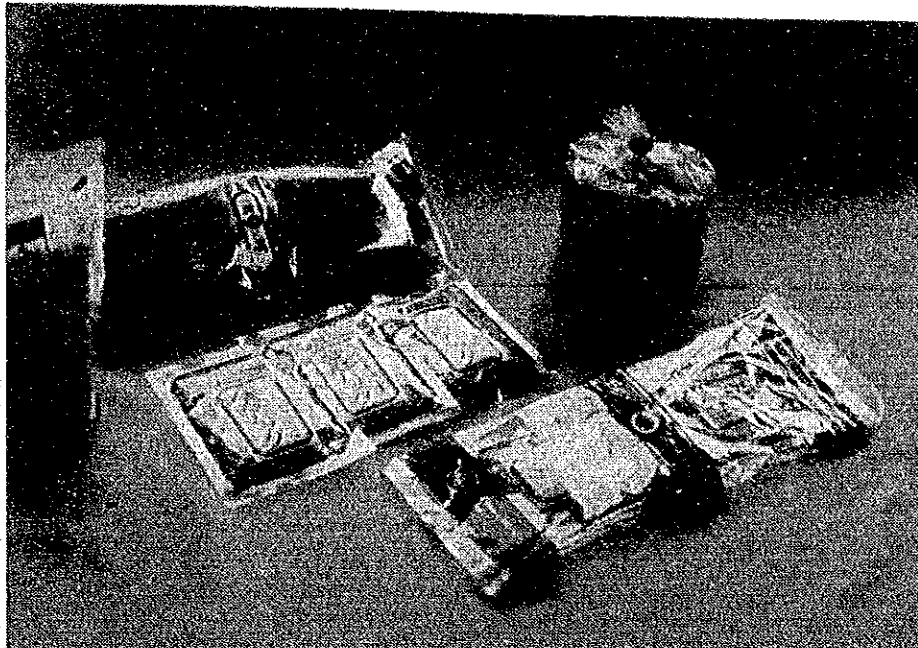
There is now a tendency to harvest fruit just shortly before it becomes ripe and to transport it without any damage. This method can supply tastier and bigger fruit, which can be sold at higher prices.

As a method of keeping fruit fresh, refrigeration, CA method, and preservatives are used individually or in a combination.

The packaging of apples in Japan is outlined below. The apple is harvested as it becomes ripe, and stored for a long time at 0 - 4°C. Upon distribution of the apples, preservatives as well as pulp-molded cushions are put into expanded polystyrene boxes. As a result, fresh apples which were harvested in the winter can be retained in the summer.

Figure III-4-8 Examples of Sophisticated Packaging

(1) Gas Flush Pack



Mini-pack of flakes of dried bonito

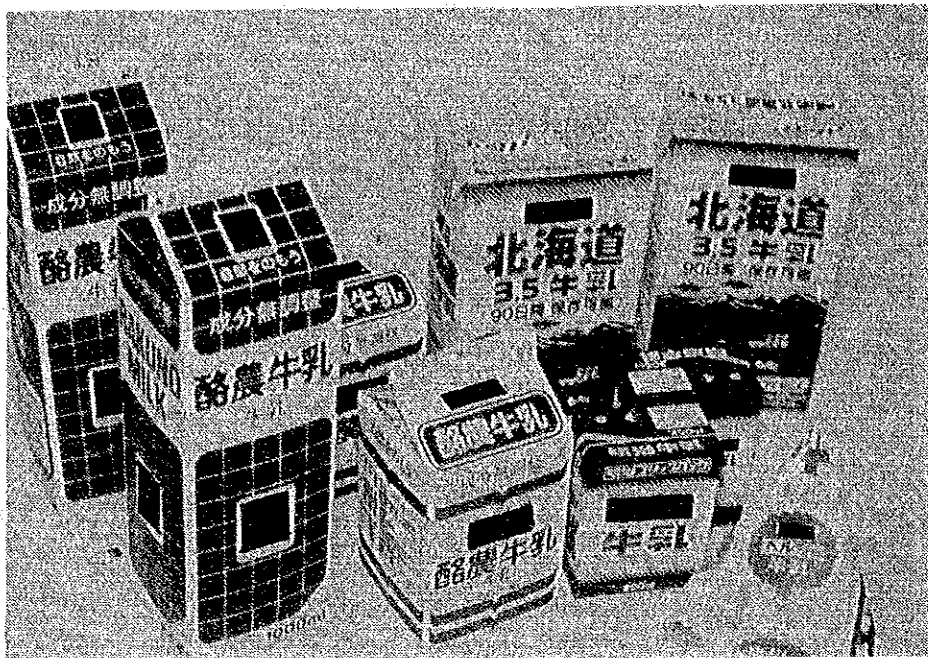
(2) Free Oxygen Absorber Enclosed in Packaging



Free oxygen absorbers enclosed in package of cakes and processed meat

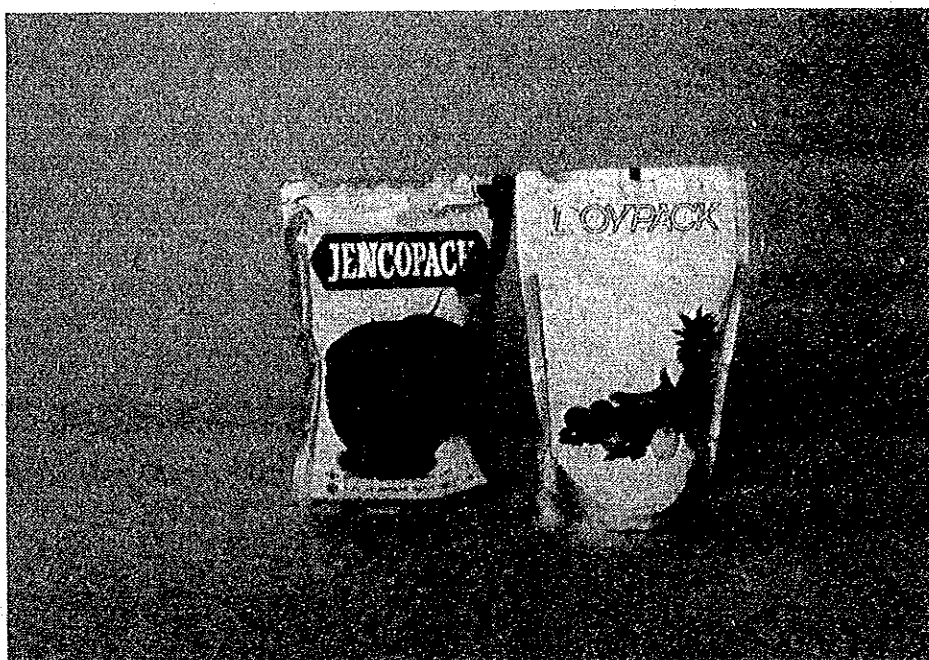
Figure III-4-8 (Continued)

(3) Aseptic Packaging



Milk packed in cartons

(4) Liquid Food Packaging



Fruit drinks packed in standing pouches

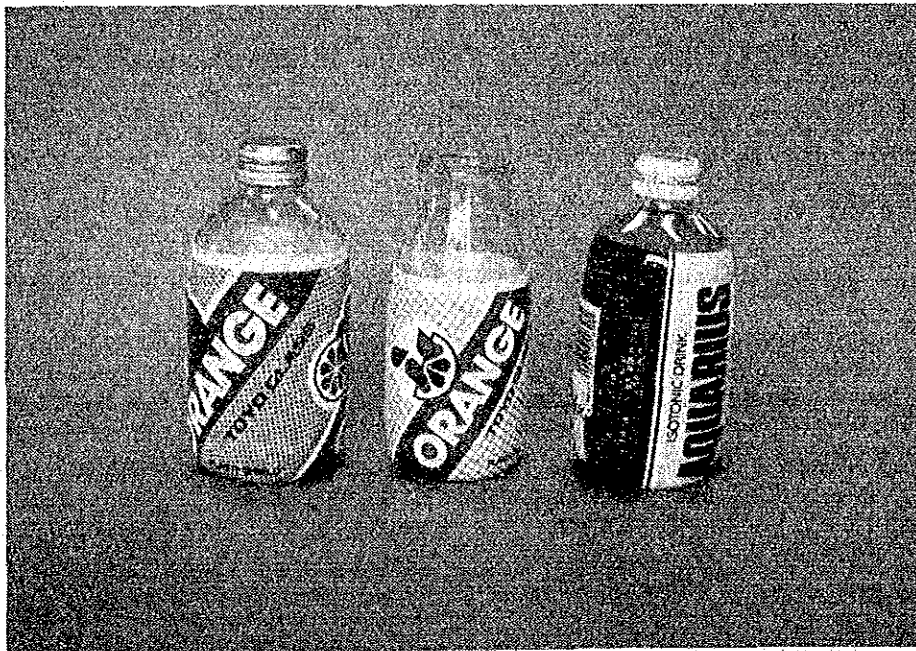
Figure III-4-8 (Continued)

(5) Retort Pouch



Retort pouch food such as curry sauce,  
stew and processed meat

(6) Prelabeled Glass Bottle



Beverages packed in bottles fitted with expanded polystyrene  
film (two on the left) and unexpanded PVC film

Being well known, refrigeration and CA storage methods are not described here. Preservatives are explained briefly as follows:

Apples and other fruits and vegetables send out ethylene and aldehyde gases, which accelerate their maturation. If those gases are removed, their maturation may be inhibited, and their freshness may be kept. Preservatives consist of active carbon, which absorbs the gases to inhibit the maturation. One problem is, however, that the occurrence of gases varies with the fruit or vegetable, and thus specific methods are required according to the species.

Since ripe fruit is sometimes damaged by the hardness of pulp-molded cushions, it may be wrapped with molded foaming polystyrene paper, expanded polystyrene net, or expanded polyethylene net for absorbing impact.

However the problem is that the prices of fruit will be inevitably high due to high cost of equipment and materials.

#### 4-2-5 Various Aspects of Packaging

Throughout this survey, we were especially impressed by the difference in the attitudes of consumers towards packaging between Japan and Argentina. Some of the reasons for this are considered below.

##### (1) The sensitivities of consumers

- a) Generally speaking consumers in Argentina are not so conscious of packaging as their counterparts in Japan are.
- b) They have a deep-seated image that packed goods are not fresh. In other words, they think unpacked goods to be fresher. In the past, meat was chopped before the eyes of consumers and offered to them at the butchers.
- c) They think that the price of packed goods is 10 - 20% higher, and that cheaper packages are better.
- d) While consumers in Japan, Europe and the USA may stop buying goods made by a company which have proved to be defectively packed, their Argentine counterparts are not nervous about such goods at all. The latter are rather willing to buy them if they are discounted because of such a defect.

##### (2) Steps towards more exports

- a) It is said in Argentina that defective packaging causes damage to the contents. As a result, they lose international standing, and do not sell well in the world market. In turn, manufacturers of packaging material do not attempt to improve the quality of packaging materials and technology.

The development of packaging materials and technology cannot be achieved in a short time. It requires accumulative efforts and

technological improvements. In order to encourage exports of agroindustrial product, packaging should be reviewed and improved first of all.

- b) It is often suggested that the packaging of goods for export should be improved in order to promote them. Persons concerned with packaging, especially in developing countries, often have misconceptions such as that the packaging of exports is essentially different from that for domestic products. It is impossible to improve the packaging of exporting goods as long as the packaging of domestic goods is neglected.

Considering the process of technological development or the development of a new product, the readers may understand that it has not been achieved by the use of just one single material or technology. Achievement can only be made when all the technologies for materials, processing, systems, measurements and management develop in connection with one another, and also all research and academic study in a wide range reach a certain level at the same time. Without such overall development, a good result cannot be obtained.

- c) It is well understood that Argentina produces an abundance of agricultural, fishery and livestock products, and makes efforts to increase the exports of such processed goods. There are, for example, canned goods, frozen foods, retort foods, dairy products, and processed agricultural, livestock and fishery products to be exported. For this purpose, packaging materials, technology, systems, and test facilities for domestic consumer goods is suggested to be reviewed at first.

### (3) Packaging design

It goes without saying that the effect of design is important. Looking at the good design of a packaging should remind consumers of the image of good quality. In recent years, it has been said that the design leads to corporate identity. Companies follow strategies to advertize their features from various angles, with packaging design being one such strategy.

Generally speaking, packaging design also has to be responsive to the time, place, and situation in which goods are presented. Corrugated cardboard boxes, which are seen in warehouses, trucks or markets, have to be designed to attract attention from a distance of 1 - 10 m.

This is also true in packaging consumer goods. In particular, since the development of supermarkets, packaging design has played an important role as a silent salesman, and packaging have to be attractive so as to make customers willing to buy them.

#### 4-3 Suggestions

##### (1) Training of specialist for packaging

In Japan training of packaging engineers contributed to the remarkable development of packaging.

Packaging has a wide range of applications in terms of materials and technology, and it is safe to say that there is no engineer who has knowledge of all of them. Only a few paper engineers are also familiar with plastics, glass or metal. Thus, one necessity is exchange of technical information between the different fields. Those engineers who know about one technology can exchange information with engineers from other fields. In Japan, the Japan Packing Technology Association, an incorporated body, plays such a role. Many people gather from various fields and take turns to give lectures or hold workshops in order to raise the overall technical level. Those people who have completed a certain curriculum are qualified as package supervisors, who will then go on to further exchange knowledge with one another. The number of package supervisors has already reached the level of 2,300.

The contents of such a curriculum ranges from a review of packages, manufacturing technology, characteristics and quality control of various kinds of packaging materials, to the technology to apply such materials. Both theoretical and practical lectures are given on packages for transportation or on those for consumers, by their respective specialists. The total course of lectures takes about 100 hours. Such educational activities have been going on for the past twenty years, and multidisciplinary approach has been taken.

Although the Argentine Packaging Technology Association holds various types of seminars, better results may be obtained if such activities were developed further, into a consistent education system like that of Japan.

##### (2) Enrichment of research regarding packaging

Although INTI is equipped with instruments for examining packaging materials, it has little test equipment. Package tests are designed to examine the methodology of packaging, under which packaging technique which has been actually used must be tested. Such tests should be conducted in parallel with those for materials.

The testing of a corrugated cardboard box will be used as an example. In Argentina, such boxes are considered to have a low value as packaging material. This is because the image of boxes made of paper is associated with that of weakness. In Japan, such boxes were also once viewed in this manner. However thanks to public package laboratories, which repeatedly conducted various types of tests on packages and their transportation, corrugated cardboard boxes have now come to be recognized as strong and are increasingly utilized.

Packaging can be applied to a wide range of fields, and though many people have a wide knowledge about packaging, only few people

have an in-depth one. An understanding of the present conditions of packaging is promoted by the test of packaging simulated the real situation. Simulation equipment is essential to the training of package engineers.

In Argentina, there is INTI, a governmental agency which carries out research and tests in connection with packages, ranging from packaging material to the final products. It is suggested to enrich the packaging research in the INTI, in order to improve packaging technology in Argentina.

### (3) Packaging Exhibition

People are not generally interested in packaging because the quality of the contents is given priority rather than packaging. However, all goods have to be transported so that they can be distributed to the consumer and therefore have to be packaged somehow for transportation. Accordingly, generally speaking the makers are interested in packaging material and technology for the product of their industry.

However, there are various types of packaging available to package one kind of commodity, and as makers have very little time to examine all these packages, a packaging exhibition can be a great source of information to them. Also, the producers of packaging materials and machines have a great chance to meet new customers. The packaging exhibition held in Japan has been expanding year by year. It has been a factor in enhancing the interest in packaging.

## 5. SMALL AND MEDIUM INDUSTRIES

### 5-1 Introduction

Promotion for small and medium industries (SMIs) is one of the key components of the present Argentine government's strategy for industrial reactivation. This attitude of the government reflects the awareness that SMIs contribute a large proportion of the country's manufacturing production and employment, especially among the national manufacturing enterprises, and their dynamic growth would be vital to the anticipated reactivation of the sector.

In this section, the current situations of SMIs in Argentina have been profiled on the basis of the available statistical information and interviews with several entrepreneurs in the selected industries. They were the food, metal products and machinery and auto-parts industries. These industries, as shown in section 1 of this chapter occupy a large share of the Argentine industrial sector, covering a wide range from large- to small-size enterprises. Furthermore, most of the small and medium enterprises in food industry produce final goods<sup>1)</sup> for the local market, whereas the metal products and machinery and auto-parts industries produce intermediate goods for urban markets where large factories are located.

Moreover, a review of the current promotion policies for SMIs, focusing on the financing and technical institutional supports, as well as some proposals regarding the promotion policy based on the survey data are made.

### 5-2 Present Situation of Small and Medium Industries

#### 5-2-1 Statistical Profiles of Small and Medium Industries

##### (1) Definition of small and medium industries

There is no overall uniform definition of SMI, and the meaning of SMI differs with each country and each industry type. As regards employment, for instance, there is a scale for developed countries that does not necessarily coincide with the idea of SMI in developing countries. And the idea of SMI for labor intensive industries is different from that for capital intensive ones. For reference, the definitions and ideas of selected countries are shown in Table III-5-1.

In the case of Argentina, the Secretariat of Foreign Trade and Industry is now clarifying the definition of SMI, and there is as yet

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- 1) According to a joint study by INDEC and UNDP/ILO, 72% of the SMIs in the food industry produce final goods, whereas the ratios in other industries are: 31.8% in metal products, 46.5% in non-electrical machinery, 29.5% in electrical machinery and 35.8% in transportation equipment. (INDEC y Convenio PNUD/OIT/ARG/81/008, Encuesta a Empresarios Industriales Pequeños y Medianos).

Table III-5-1 Definition of Small and Medium Industries in  
Manufacturing Sector of Selected Countries  
(As of March, 1983)

Australia	<ul style="list-style-type: none"> <li>- No legal or official definition.</li> <li>- In general, small enterprises are often defined as enterprises with 100 employees or less.</li> </ul>						
Belgium	<ul style="list-style-type: none"> <li>- No uniform definition.</li> <li>- Different laws define small and medium enterprise in different ways. Statistically, a small enterprise is defined as an enterprise with 50 employees or less.</li> </ul>						
Canada	<ul style="list-style-type: none"> <li>- Size of enterprises is classified according to the purpose.</li> <li>- Statistically, classification is made according to annual sales.</li> </ul> <table> <tr> <td>Small enterprise</td><td>less than C\$2 million</td></tr> <tr> <td>Medium enterprise</td><td>C\$2 million - C\$20 million</td></tr> <tr> <td>Large enterprise</td><td>C\$20 million or more</td></tr> </table>	Small enterprise	less than C\$2 million	Medium enterprise	C\$2 million - C\$20 million	Large enterprise	C\$20 million or more
Small enterprise	less than C\$2 million						
Medium enterprise	C\$2 million - C\$20 million						
Large enterprise	C\$20 million or more						
Japan	<ul style="list-style-type: none"> <li>- Capital of ¥100 million or less, or 300 employees or less (by the Small and Medium Enterprise Basic Law)</li> </ul>						
U.K.	<ul style="list-style-type: none"> <li>- No legal or official definition.</li> <li>- According to the 1971 report of the Small Enterprise Survey Committee, a small enterprise is defined as an enterprise with 200 employees or less.</li> </ul>						
USA	<ul style="list-style-type: none"> <li>- The Small and Medium Business Act does not have the definition, but provisions that definition by industry type is made by the Small Business Administration. For most industries, a small or medium enterprise is defined as an enterprise with 500 employees or less.</li> </ul>						
Egypt	<ul style="list-style-type: none"> <li>- No legal or official definition.</li> <li>- According to the Industries and Resources Ministry, small and medium business is defined as enterprise with 10 - 100 employees, and with equipment investment not exceeding £.500,000.</li> </ul>						
Malaysia	<ul style="list-style-type: none"> <li>- According to the Small Business Development Coordinating Committee, small and medium enterprise is defined as an enterprise with capital not exceeding M\$250,000.</li> </ul>						
Singapore	<ul style="list-style-type: none"> <li>- No uniform definition.</li> <li>- Definition differs depending on system or policy purpose. In the small business loan system, and medium enterprise is an enterprise with fixed production assets of S\$200,000 or less.</li> </ul>						
Thailand	<ul style="list-style-type: none"> <li>- Small enterprise is defined as an enterprise with an investment less than B.5 million and with less than 50 employees.</li> </ul>						

Source: Ministry of International Trade and Industry of Japan

no uniform criterion to define SMI. Examples of the adopted definitions in some surveys of SMI are as follows.

- 1) The Ministry of Labor and Social Security, the Secretariat of Planning and UNDP/ILO (1984)

small enterprise	6 - 50 employees
less formal	6 - 15 employees
formal	16 - 50 employees

- 2) Argentine Industrial Union (UIA) (1985)

small industry	less than 30 regular employees
medium industry	30 - less than 300 employees
large industry	300 employees or more

In addition, qualitative elements, such as non-separation of management and ownership or form of capitalization are included.

- 3) General Confederation of Industry (CGI) (1986)

micro industry	not more than 10 employees
small industry	11 - 100 employees
medium industry	101 - 300 employees
large industry	over 300 employees

- 4) Latin American Development Interdisciplinary Study Center (CIEDLA) (1985)

small industry	less than 50 employees
medium industry	50 - less than 100 employees
large industry	100 employees or more

The National Development Bank (BANADE) in charge of SMI financing has distinguished small and medium enterprises from large ones according to present net assets. The definition of SMI is very important in taking political measures for promotion. An essential strategy of reactivating the industrial sector is to determine on what type and size of industry promotion efforts should be focused. Although it is true that the SMI policy has a kind of social-political aspect, i.e. to "protect" SMIs from unfair competition with large industries, a strategic decision would be necessary when the promotion of SMIs is one of the means for reactivating the economy.

As mentioned above, there are two kinds of definitions which divide large industries, from SMIs at 100 or 300 employees. In the Small and Medium Enterprise Basic Law of Japan, the small and medium enterprise in the manufacturing industry is defined as one of "not more than 300 employees or not more than ¥100 million of capital". In this study of Argentina's SMIs, we consider "small industry" as that which employs up to 50 workers, "medium industry" as that which employs 51 to 200 workers and "large industry" as that which employs more than 200 workers. This criterion is based on information collected through conducting the study.

(2) Statistical profiles of small and medium industries

According to the Industry Census of 1974<sup>1)</sup>, 96.7% of 126,388 establishments in the manufacturing sector belong to the small industry of 50 employees or less, and these small establishments account for 41.3% of the total 1,525,257 employees. Their production represents 23.5% of the total output, 219,329 million pesos (Table III-5-2). The number of establishments classified to medium industry of 51 - 200 employees is 3,189, accounting for 2.5% of the total, 19.8% of total employees and 22.6% of total production. As for large industry (of more than 200 employees), the number of establishments is 1,031, accounting for 0.8% of the total, but 38.9% of total employment and 53.8% of total production. Namely, SMI, which has an overwhelming majority in terms of number of establishments, accounts for 61.1% and 46.1% of total employment and production, respectively.

More recent profiles of size distribution in the manufacturing sector is provided by the registration data compiled by the Secretariat of Foreign Trade and Industry (Registro Industrial de la Nacion: RIN). Table III-5-3 shows the comparison of size structure in terms of employment between 1984 RIN data and the 1974 Industry Census. In this table, micro establishments of not more than 5 employees, of which coverage by RIN data is supposed to be low, are excluded. The number of employees who belong to establishments of more than 5 employees is 966,769, of which 25.8% belong to small industry (6 - 50 employees), 28.3% to the medium industry, and the remaining 45.9% to the large industry. When this composition ratio is

Table III-5-2 Size Distribution of Manufacturing Sector in 1974

(% , persons, millions of pesos)			
Industries	Establishment	Employment	Production
Small ( - 50)	96.7	41.3	23.5
( - 5)	(24.6)	(14.9)	(5.0)
(6 - 50)	(72.1)	(26.4)	(18.5)
Medium (51 - 200)	2.5	19.8	22.6
Large (201 - )	0.8	38.9	53.8
Total	100.0 126,388	100.0 1,525,257	100.0 219,329

Source: INDEC, Censo Nacional Economico 1974.

1) This is the latest available industry census in Argentina. The new industry census of 1984 is being processed by INDEC.

Table III-5-3 Comparison of RIN Data with Census 1974 in Terms of Employment  
(Establishments with more than 6 employees)

	RIN 1984				
	6 - 50	51 - 200	201 - 500	501 -	Total
31 Food, Beverage, Tobacco	19.0	29.4	20.0	31.6	100.0
32 Textile, Apparel, Leather	28.5	33.1	20.7	17.7	100.0
33 Wood, Wood Products	62.7	29.2	8.1	0.0	100.0
34 Paper Products, Printing	26.0	27.9	19.1	27.0	100.0
35 Chemicals, Chemical Products	23.8	28.7	26.8	20.7	100.0
36 Non-metallic Mineral Products	22.0	28.3	23.6	26.1	100.0
37 Basic Metal Products	11.0	14.7	9.0	65.3	100.0
38 Metal Products, Machinery	23.0	27.2	18.2	31.6	100.0
39 Others	54.6	38.8	6.5	0.0	100.0
Total	25.8 (249,695)	28.3 (273,653)	19.5 (188,456)	26.4 (254,965)	100.0 (966,769)
Census 1974					
31 Food, Beverage, Tobacco	28.0	24.1	17.0	27.7	100.0
32 Textile, Apparel, Leather	32.9	26.9	19.1	21.2	100.0
33 Wood, Wood Products	75.1	18.5	3.2	0.0	100.0
34 Paper Products, Printing	33.7	29.6	15.6	21.1	100.0
35 Chemicals, Chemical Products	23.7	25.8	21.7	26.0	100.0
36 Non-metallic Mineral Products	37.4	22.3	16.7	18.4	100.0
37 Basic Metal Products	15.5	13.1	11.7	59.7	100.0
38 Metal Products, Machinery	29.1	21.9	15.7	33.4	100.0
39 Others	69.9	22.5	7.6	0.0	100.0
Total	31.0 (402,497)	23.3 (302,595)	16.4 (213,228)	29.3 (380,154)	100.0 (1,298,474)

Source: Direccion General de Informacion Industrial, Registro Industrial de la Nacion 1985, and INDEC, Censo Nacional Economico 1974.

Note : Figures in parentheses are numbers of employees by size.

compared with the 1974 Census result, it is found that the proportion of small industry has decreased, the proportion of medium industry has increased and that of large industry is roughly the same. However, larger industry of more than 500 employees shows a rise in the share of employment.

Table III-5-4 shows the size distribution of employment by industrial subsector according to the RIN data between 1980 and 1984. The number of establishments in 1980 was 39,011 and declined by 17% to 32,315 in 1984. The number of employees also decreased by 7%. As is shown already, the economic liberalization policy of Argentina caused a recession in the industrial sector, and its effects on small industry are most serious. From the table, it can be seen that small industry of not more than 50 employees declined considerably, particularly in the metal products and machinery industry, small industry's share dropping by 6.9 percentage points in the total employment in this subsector. Moreover, the number of establishments in this subsector decreased from 10,959 in 1980 to 9,028 in 1984 (18%), and the number of employees decreased from 102,206 to 68,589 (33%), showing the effect is considered to be serious.

Table III-5-5 shows the size structure in 1984 by subsector in terms of three items: the number of establishments, the number of employees and the value of production.

From the viewpoint of employment, the proportion of the small industry is 28.0% on average, and three industrial subsectors - wood and wood products (65.9%), others (57.8%), and textile, apparel and leather (30.3%) - exceed this average. Large industry's share is 44.5% on average, and the basic metal industry exceeds this average by a great deal (73.8%), while two industries with a relatively small number of employees are wood and wood products (7.4%) and others (6.1%). The proportion of medium industry is relatively large in the textile, apparel and leather industry.

From the viewpoint of production, characteristics of size structure of subsector are almost the same as the employment terms; however, small industry occupies a smaller share for all subsectors, and large industry accounts for a larger share. This tendency can be seen clearly in the paper products and printing, chemicals and chemical products, and non-metallic mineral products industries. The production share of medium industry increases or decreases depending on the industry type, but the degree of variation is small. As for the metal products and machinery industry, the decrease in medium industry is fairly large, and large industry increase their share overall from the viewpoint of production from that of employment.

When the industrial structure by size is viewed, all indices show that the food, beverage and tobacco industry, and metal products and machinery industry occupy large shares in every size of industry. From the viewpoint of production, in addition to the above two industries, the chemicals and chemical products industry also includes a prominent proportion of large, medium and small industries. Other features of note are that the textile, apparel and leather industry accounts for a large share in medium and small industries, and the share of basic metals is large for large industry.

Table III-5-4 Development of SMI between 1980 and 1984 (in terms of employment)

	Total		Small( - 50 )		Medium(51-200)		Large( 201- )	
	1980	1984	1980	1984	1980	1984	1980	1984
	(persons, %)							
31 Food, Beverage, Tobacco	246.265	237.787	22.1	21.5	26.3	28.5	50.2	49.9
32 Textile, Apparel, Leather	152.318	152.824	32.8	30.3	30.3	32.3	35.2	37.4
33 Wood, Wood Products	36.930	31.123	65.9	65.9	22.7	26.7	9.4	7.4
34 Paper Products, Printing	50.639	53.976	31.7	28.0	28.6	27.2	38.9	44.9
35 Chemicals, Chemical Products	131.723	126.497	24.1	25.6	27.2	28.1	47.6	46.4
36 Non-metallic Mineral Products	69.272	57.365	25.0	23.7	26.3	27.7	48.7	48.6
37 Basic Metal Products	63.828	61.427	12.1	11.6	13.2	14.5	74.2	73.8
38 Metal Products, Machinery	317.454	267.492	32.5	25.6	24.4	26.3	42.7	48.1
39 Others	8.490	7.970	60.1	57.8	25.5	36.1	10.8	6.1
Total	1,076.919	996.461	29.1	28.0	25.9	27.5	45.0	44.5

Source : Direccion General de Informacion Industrial.

Table III-5-5 Size Structure of Manufacturing Sector (1984)

	Size Distribution by Industry				Industrial Structure by Size			
	Total	Small ( - 50)	Medium (51-200)	Large (201- )	Total	Small ( - 50)	Medium (51-200)	Large (201- )
< Number of Establishments >								
31 Food, Beverage, Tobacco	100.0	87.2	9.5	3.3	22.1	21.8	23.8	27.1
32 Textile, Apparel, Leather	100.0	86.3	11.0	2.8	14.5	14.1	17.9	14.9
33 Wood, Wood Products	100.0	96.2	3.5	0.3	8.4	9.2	3.4	0.9
34 Paper Products, Printing	100.0	87.7	9.1	3.2	5.0	5.0	5.2	6.0
35 Chemicals, Chemical Products	100.0	84.9	11.2	3.9	10.4	10.0	13.2	15.2
36 Non-metallic Mineral Products	100.0	84.8	11.2	4.0	4.6	4.4	5.8	6.9
37 Basic Metal Products	100.0	79.6	14.6	5.8	2.0	1.8	3.3	4.4
38 Metal Products, Machinery	100.0	90.4	7.5	2.1	30.9	31.6	26.3	24.3
39 Others	100.0	95.0	4.7	0.3	2.0	2.2	1.1	0.2
Total	100.0	88.5	8.9	2.7	100.0	100.0	100.0	100.0
< Number of Employees >								
31 Food, Beverage, Tobacco	100.0	21.5	28.5	49.9	23.9	18.3	24.8	26.8
32 Textile, Apparel, Leather	100.0	30.3	32.3	37.4	15.3	16.6	18.0	12.9
33 Wood, Wood Products	100.0	65.9	26.7	7.4	3.1	7.3	3.0	0.5
34 Paper Products, Printing	100.0	28.0	27.2	44.9	5.4	5.4	5.4	5.5
35 Chemicals, Chemical Products	100.0	25.6	23.1	46.4	12.7	11.6	13.0	13.2
36 Non-metallic Mineral Products	100.0	23.7	27.7	48.6	5.8	4.9	5.8	6.3
37 Basic Metal Products	100.0	11.6	14.5	73.8	6.2	2.6	3.3	10.2
38 Metal Products, Machinery	100.0	25.6	26.3	48.1	26.8	24.5	25.7	29.0
39 Others	100.0	57.8	36.1	6.1	0.8	1.6	1.1	0.1
Total	100.0	28.0	27.5	44.5	100.0	100.0	100.0	100.0
< Production >								
31 Food, Beverage, Tobacco	100.0	15.0	28.4	56.6	28.3	23.3	31.4	28.5
32 Textile, Apparel, Leather	100.0	27.1	33.0	39.8	12.2	18.2	15.8	8.7
33 Wood, Wood Products	100.0	60.0	27.7	12.4	1.2	4.1	1.3	0.3
34 Paper Products, Printing	100.0	18.4	25.5	56.1	5.2	5.3	5.2	5.2
35 Chemicals, Chemical Products	100.0	15.1	25.5	59.4	20.5	17.0	20.4	21.7
36 Non-metallic Mineral Products	100.0	14.8	22.2	63.0	3.7	3.0	3.2	4.1
37 Basic Metal Products	100.0	7.7	14.9	77.5	6.3	2.6	3.6	8.6
38 Metal Products, Machinery	100.0	21.0	21.1	57.8	22.1	25.5	18.3	22.8
39 Others	100.0	46.5	45.3	8.2	0.4	1.1	0.7	0.1
Total	100.0	18.2	25.6	56.2	100.0	100.0	100.0	100.0

Source: Direccion General de Informacion Industrial.

As mentioned above, SMIs play an important role in Argentina's manufacturing sector. From the viewpoint of the industry type, in the textile, apparel and leather, wood and wood products, and others categories, SMIs have a large share, medium industry being prevalent in the former and small one being prevalent in the latter two types. In basic metals, the share of SMIs is small, large businesses of more than 200 employees accounting for 70 - 80% of both production and employment. As for the two key industries of food, beverage and tobacco, and metal products and machinery, which play the leading role in Argentine manufacturing, SMIs account for almost half of all employment and a little over half of production, leaving large and medium businesses roughly equal remaining shares. For reference, Table III-5-6 shows major subsectors with important SMI activities in 1983 by ISIC (International Standard of Industrial Classification) 4-digit classification.

Table III-5-6 Major Subsectors with Important SMI Activities in 1983  
(in terms of employment)

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High predominance of small industry (more than 50% of total)

3903	sport articles (100.0%)
3901	jewelry and precious stones (89.9%)
3320	furniture (88.1%)
3233	leather products & leather substitutes (75.4%)
3319	other wood products (74.4%)
3844	motor cycle, tricycle & bicycles (68.2%)
3823	wood & metal working machinery (65.3%)
3812	furniture and fixtures primarily of metal (62.2%)
3540	miscellaneous products of petroleum & coal (61.9%)
3902	musical instruments (58.2%)
3849	transport equipment, others (57.8%)
3909	manufactured products n.e.c. (56.7%)
3240	footwear except moulded rubber or plastic footwear (55.5%)
3852	cameras, photographic (54.2%)
3311	sawmills (53.9%)
3419	other paper products (52.9%)
3813	structural metal products (52.9%)
3215	cordage, rope & twine (50.9%)
3312	wooden & cane container (50.5%)
3560	plastic products (50.2%)

High predominance of medium industry (more than 40% of total)

3116	grain mill products (57.8%)
3114	fish (56.2%)
3412	packing containers of paper, paper board (50.7%)
3131	alcoholic beverages (49.2%)
3219	textile n.e.c. (48.1%)
3122	animal feeds (48.0%)
3213	knitting (47.6%)
3419	other paper products (47.1%)
3691	structural clay products (46.0%)
3132	wine (44.6%)
3113	fruit, vegetables (44.1%)

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Source: Direccion General de Informacion Industrial