

# The Fish Processing Industry In Singapore

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## Introduction

Singapore is a small island with limited natural resources and a small population of about 2.6 million people. The ultra-modern city state tends to be generally associated with high-tech industries and entreport services. The marine fishery industry is therefore relatively small and contributes only about 10-15% of the total fish requirements of the country. Fish, however is an important source of protein and the annual per capita consumption of seafood is the second highest in Asia after Japan.

Although Singapore has little natural marine resources, the flourishing seafood industry have been able to source its raw materials from neighbouring countries in the region and to add value to the products, building a reputation for quality in a wide range of export markets. The acquisition of advanced processing and freezing technology has therefore enabled the Singapore seafood industry to remain internationally competitive despite higher labour and operational costs. This has successfully attracted overseas investments from Japan, Taiwan, USSR and the USA. In 1990, Singapore exported 127,854 mt of fish and fish products valued at S\$672 m whilst imports amounted to 181,805 mt at S\$624 m (Table 2.).

**Table 1. Fresh fish supply (mt) to Singapore.**

Year	Total	Local Production
1986	109,529	20,497
1987	112,079	15,310
1988	109,310	13,110
1989	118,000	12,240

Source: Primary Production Department (PPD), Singapore.

Singapore's favoured geographical position and excellent infrastructure and services have enabled the island to become an important seafood entreport trade and processing centre in the region. Its excellent wholesale market complex plays an important role as a landing point for foreign fishing vessels and trucks bringing in fish from neighbouring countries like Indonesia, Malaysia and Thailand.

## Status Of The Fish Processing Industry

The fish processing industry comprises export-oriented companies, and the domestic-based traditional fish products factories. All fish processing companies exporting their processed products overseas are licensed and inspected by the Primary Production Department (PPD). The PPD conducts on-line monitoring of the processing lines and provides advice and services to the industry to assist them to produce high quality and safe seafood products. The Department also provides health certificates for products from these factories.

## The Export-Oriented Fish Processing Industry

In 1990, a total of 18 factories produced 25,362 mt of processed products of which 4,939 mt were consumed locally (Table 3). Amongst these 18 factories, 8 companies processed for export,

**Table 2. Import and export of fish and fishery products.**

Year	Imports		Exports	
	Quantity (mt)	Value (S\$'000)	Quantity (mt)	Value (S\$'000)
1986	153,313	507,445	89,203	379,963
1987	153,129	607,667	105,444	533,491
1988	176,800	691,136	116,743	638,351
1989	164,311	671,801	115,638	623,727
1990	181,805	624,461	127,854	671,746

Source: PPD, Singapore.

**Table 3. Processed fish products in Singapore, 1990 (mt).**

Item	Processed	Exported	Local Consumption
Whole fish	9877	7660	2217
Fish fillet	7056	6746	310
Prawn	2611	2141	470
Squid, octopus	1649	1446	203
Cooked prawn	1549	1547	2
Fish ball, fish cake	539	0	539
Cooked fish	467	0	467
Imitation crab stick	440	398	42
Cuttlefish ball, finger, paste	328	22	306
Prepared prawn crackers	210	120	90
Prepared cuttlefish	179	112	67
Cuttlefish	119	26	93
Lobsters	118	83	35
Prawn meat	55	41	14
Prawn ball, finger	49	2	47
Breaded fish	47	47	0
Fish dumpling	40	28	12
Sharksfin	23	0	23
Mussel, scallop	9	7	2
Fish finger	0.9	0	0.9

Source: PPD, Singapore.

frozen fish and fish fillet mainly of tuna, swordfish, marlin, red snapper, shark and Spanish mackerel. The bulk of the frozen horse and Indian mackerel imported were reprocessed for local consumption. The 3 major prawn processing factories together with other factories produced about 4,160 mt frozen prawns for export mainly in the form of head-on, headless, peeled and cooked, using IQF nitrogen freezing tunnel systems. Two other factories process mainly cuttlefish and prawn balls for local consumption, but are now going into export to the Japanese market. The remaining factories process fish balls and fish cakes, imitation crab stick, prepared squid and prawn crackers and sharkfins.

These products are exported to a large number of countries including Malaysia, Brunei Darussalam, Thailand, Hong Kong, Japan, Taiwan, South Korea, the USA, Canada and Australia.

### The Domestic Traditional Fish Processing Industry

The domestic traditional fish processing industry caters to the needs of the local domestic

market, and comprises small to medium-sized factories processing fish balls and fish cakes, chilled and frozen fish, snack seafood products (dried squid, fish satay) and seafood delicacies (sharksfin, sea-cucumber etc).

There are now about 50 fish ball/fish cake factories producing about 50 mt of products per day (Table 4). In the past the industry was basically backyard and traditional family-run concerns without much technical or management expertise. Their operations relied heavily on the daily availability of cheap and abundant fish, manual heading and gutting of fish, separation of meat, mixing of minced meat in wooden containers and forming of products by hand. All these activities are labour intensive and operations are often not entirely hygienic. Due to improper handling, the products are easily contaminated. Our high local air temperatures also contributes towards the short shelf-life of these products. The handling and retailing of the cooked products therefore needed improvement. The industry also faced a problem of insufficient raw materials, fishes like coral fish and dorab (traditional raw materials) were becoming increasingly expensive and short in supply.

Table 4. Number of fish jelly products factories in Singapore.

Types of Factories	No. of Factories	Total Production/Day (kg)
Fish ball, fish cake, <i>yong tau foo</i> , <i>ngoh hiang</i> , fish fillet	33	36,339 - 36,979
Cuttlefish ball, prawn ball, fish burger, prawn stick, prawn chip, prawn roll	8	4,222 - 4,322
Fish dumpling, fish roll	2	736
Minced meat	5	6,350 - 7,200
Fish <i>otak-otak</i>	2	500
Imitation crab stick	1	1,800
Total	51	49,947 - 51,537

Source: Survey on Fish Jelly Product Factories in Singapore by Ng M. C. (unpublished).

For large scale production, processors depended heavily on fish landed by foreign trawlers, often of low quality and availability subjected to seasonal changes, price fluctuations etc.

### Changes In The Fish Jelly Product Industry

Over the last 10 years or so, many of the backyard operators were relocated to the government flatted factories around the housing estates, where there is now improvement in facilities such as better flooring, drainage and general cleanliness. Taking the opportunities for change under these circumstances, the PPD/MFRD provided technical guidance to manufacturers to upgrade in terms of mechanisation, output and quality improvement. Various processing equipment and processing techniques were introduced and recommended to enable processors to increase production capacities and to mechanise the forming of fish cakes.

Demonstration courses were conducted and processors were invited to view and evaluate the technology and equipment available. Subsequently, detailed processing trials were also conducted with manufacturers to test the suitability of equipment for their product lines. The concept of product development was introduced and processors were encouraged to market a wider range of products to consumers.

Raw material sourcing is always a problem to the processors and in 1980, the Department introduced the use of frozen surimi which not only provides a more stable supply of raw materials but also increases productivity by reducing the need to handle fresh fish. In 1981, Singapore imported 0.5 mt of frozen surimi. This has now increased to about 2600 mt in 1990, mainly from Thailand (Table 5). A new intermediate product in the form of chilled minced meat (washed) from West Malaysia and Thailand has also increased recently.

The use of frozen surimi as a semi-processed raw material has enabled fish ball manufacturers to concentrate on production and product development. Several large processors are now using the silent cutter which enables them to handle a larger

**Table 5. Import of frozen surimi into Singapore.**

Year	Quantity (mt)	Value (\$1000)
1981	0.5	0.6
1982	445.1	1145.7
1983	1087.4	2989.9
1984	1055.2	2751.9
1985	1390.3	3226.1
1986	1455.1	3590.1
1987	1916.3	5277.3
1988	1745.2	4898.5
1989	1936.6	5342.8
1990	2601.9	7176.5

Source: PPD, Singapore.

volume of fish paste and achieve better product quality compared to the traditional paddle-mixers. These processors are now able to produce about 1.5 to 2 mt of products each day. Various types of fish cake forming machines are also now being used by the manufacturers, further reducing the dependence on cheap labour and increasing the production capacity.

There has been substantial growth in the local fish ball processing industry with 21 new factories established since 1985 mainly with production capacities of between 500-1000 kg/day (Table 6). There has also been an increase in the factories

**Table 6. Production capacities of factories.**

Production Capacities	No. of Factories	
	1985	1989
< 500 kg/day	11	16
500 - 1000 kg/day	5	17
> 1000 kg/day	14	18
<b>Total</b>	<b>30</b>	<b>51</b>

Source: Survey on Fish Jelly Product Factories in Singapore by Ng M. C. (unpublished).

producing more than 1 mt/day. This can be taken as a result of the increased use of frozen surimi and the use of machinery such as large capacity silent cutters, both of which increased production capacity.

There has also been efforts to further increase productivity and the Seafood Industries Association of Singapore (SIAS) in collaboration with the Singapore Institute of Standards and Industrial Research (SISIR) and PPD have started a project to develop a fully automated fish ball/fish cake machine to form, cook, steam (or fry) and chill the products ready for packaging.

This will not only reduce the use of manual labour but will also reduce handling, thereby extending the shelf life of the products. The equipment is expected to be ready by the end of the year.

The Department's efforts to encourage product development has also resulted in an increase in the range of fish jelly products available in Singapore. In addition to the traditional fish ball, fish cake, *yong tau foo* and *ngoh hiang* (spiced fish roll), some manufacturers have now specialised in breaded fish burger, fish fillet, fish dumpling, prawn chips, etc. One processor purchased in 1989 a S\$250,000 *chikuwa* forming machine from Japan with production capacity of 3,500 pcs/hr to produce *chikuwa* for the domestic market.

The fish jelly product industry is also gearing up for exports of fish jelly products to markets in Japan, Europe and USA. Products like cuttlefish balls have already been successfully exported to Japan and Europe.

Frozen fish balls are also a potential export item especially to the Asian communities in USA and Canada.

### Problems Of The Industry

a) The sourcing of raw materials for further processing is a major problem facing both the export-oriented factories as well as the domestic traditional fish processors. The advantage of Singapore as a trading center however has enabled processors to source

raw material from China and Indonesia for prawns, fish from New Zealand, USA and other parts of the world.

The fish jelly products processors now rely heavily on the use of frozen surimi as a semi-processed raw material and imports have been increasing steadily as more processors use it. The supply and cost of surimi from Thailand however is affected by fluctuation in the international supply and demand of surimi. The processors therefore have to source for additional supplies from Malaysia especially in the form of chilled leached meat.

b) To remain competitive Singapore processors have to produce high-value added products and to actively explore such markets in Japan, Europe and USA.

Because of the high cost of labour, processors have to automate to increase productivity and to ensure high and consistent quality products. The support of the PPD in providing on-line monitoring services and a good health certification system for the products have established Singapore's reputation for high quality seafood products.

The Economic Development Board of Singapore also provides loans and funding assistance for research and development in automation and upgrading of small and medium size industries. Coupled with the technology assistance from the PPD/MFRD many of the smaller factories have taken the opportunity to upgrade and to use higher production-capacity machinery.

c) The fish jelly products industry needs to further upgrade their technology and improve standards of hygiene and quality control. One of the constraints is the limitation of factory space and availability of labour. The fish jelly products produced under present processing conditions have a short shelf-life

Table 7. Types of products.

Product	Price Range (S\$)	Total Production/Day (kg)
Fish ball	\$2.30 - \$9.00/kg or 0.04 - 0.10/pc	14,315 - 14,471
Fish cake	\$1.10 - \$6.00/kg or 0.04 - 0.55/pc	15,363 - 15,633
<i>Yong tau foo</i>	\$5.00/kg or 0.05 - 0.08/pc	1,405
<i>Ngoh hiang</i>	\$2.00 - \$2.50/kg or 0.16 - 0.22/pc	2,956 - 2,970
Fish roll	\$6.00/kg or 0.07 - 0.08/pc	670
Fish dumpling	0.07 - 0.08/pc	536 - 636
Imitation crab sticks	\$5.00 - \$8.00/kg	1,800
Fish burger	\$3.90 - \$5.50/kg	380
Fish fillet	\$9.00/kg	150
Cuttlefish ball	\$6.00 - \$10.00/kg	3,650 - 3,750
Prawn ball	\$6.00 - \$9.00/kg	402
Prawn stick	\$5.00 - \$5.80/kg	30
Prawn chip	\$5.00 - \$6.70/kg	20
<i>Otak-otak</i>	0.07 - 0.15/pc	500
Minced meat	\$2.40 - \$9.00/kg	6,450 - 7,300
Leached meat	\$4.00/kg	200
Prawn roll	-	700 - 800
Cooked fish	-	20

Source: PPD, Singapore.

of 2-4 days under chilled storage. Improvements in post-processing handling and chilling of the products are necessary pre-requisites to packaging of these products to extend shelf life for local consumption and export. The PPD/MFRD will continue to work with the industry to accomplish this objective.

## Discussion

When asked whether it was economical to use liquid nitrogen instead of other freezing methods, Mr Tan answered that although liquid nitrogen is expensive, it is produced locally and used only for high-value products.