DRAFT FOR COMMENT

MEASURING AND COMMUNICATING THE INDUSTRY IMPACT OF SHELF STABLE TECHNOLOGY

PROJECT NO. RMICS.001

MEAT AND LIVESTOCK AUSTRALIA

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1 Executive Summary

The shelf stable technology requires a heavy investment in capital equipment which is effectively a strong barrier to entering the market. Aside from the costs of the retort itself – ranging between $400,000 - $650,000 - there are peripheral costs including provision of an appropriately-sized boiler; equipment for assembling, filling, flushing and sealing the pouches; and the ancillary costs normally incurred in establishing a food manufacturing site.

Development costs, and other "soft" costs, will also have deterred some manufacturers from embarking on this route. Estimates provided by installers suggest that these product development costs may represent as much as an additional 25%-30% of the capital investment necessary at stake in the project. While the elementary principles of heat and pressure on food are established, there are many variables in terms of processing food in flexible materials such as thickness gauge, opacity, number of layers in the laminate, varying density of raw materials, etc. The successful production of a product which will be acceptable to the consumer or end-user is very demanding and all the installers and manufacturers currently producing this type of line attested to the heavy product development costs. Each time a new product line is considered, moreover, it is necessary to conduct and fund a product development stage which may take up to one year to be either implemented or abandoned.

Flexible pouch technology has its basis in provision of army rations where supply lines could not reliably reach armed forces. The rudimentary canning techniques developed in the 19th century were later refined into the retort canning system which has underpinned sales of a wide variety of canned food products including beef and mutton. Use of flexible laminate pouches which are durable enough to withstand the heat and pressure of the retort process has been progressively refined over the past few decades and is now regarded as a mainstay of the new round of food product innovations. It offers ease of opening, colourful graphics, lower unit weight, open-ended shelf life and versatility in terms of storage and transport. Sales of retort pouch food products are currently accelerating in many global markets particularly Asian markets where refrigerated space both at distribution point and in the home are at a premium. In the US the flexible pouch is being seen as another vehicle to get new products to time-poor consumers. The category "ready to eat" may be set to expand.

The outcomes of the adoption of shelf stable technology can be summarised by the following categories:

Economic benefit/cost

Market-related

Capability building

Building demand for meat products

At the same times as the shelf stable products may appeal to consumers' need for convenience in meal preparation, they also contradict another current consumer mantra: 'fresh is best.' The quantitative research on cooked value added red meats, undertaken in 2005, identified this as a major concern among shoppers: that they wish to buy or perceive themselves as buying fresh ingredients for preparing their family's meals. While the idea of a long-life meal, easily stored in the pantry, may have some appeal based on time management principles, it appears to sit uneasily with consumers' feelings about freshness and wholesomeness.

In contrast to the US market, there is no national brand company in Australia currently producing shelf stable meat products. The absence of a hard-hitting recognised brand behind these products at retail level will likely continue to act as a deterrent to increased consumer interest and acceptability. It is also true to say that the Australian market lags behind the US in terms of branded, value-added products. By extension, therefore, market penetration of shelf stable meals will possibly stall until one or more consumer brands take up the cause. The Sunrice range of side dishes has certainly assisted in placing the concept before the consumer but rice, rather than meat, defines the product profile.

Sales figures provided by the relevant manufacturers indicate that total product sales in 2005 reached around $11 million. Much of this comprised export product, particularly to Europe where the market niche was first identified in the foodservice industry. Projections for 2006 place total sales at around $14 million. The entry of Sunrice into the marketplace has boosted the technology's presence on the retail shelf and may well lead to faster consumer acceptance for the concept of ready-cooked meals not requiring refrigeration. At this stage, however, most manufacturers refused to predict any further significant increase in market demand, attributing much of this to high raw material costs and relentless competition from other meal solutions.

Recommendations

Investigate the potential for a major consumer brand to develop shelf stable products with emphasis on meat content.

2 Introduction

3 Objectives

The objective of the report is to provide an evaluation of the industry impact of shelf stable technology (SST) for Meat and Livestock Australia (MLA).

The Terms of Reference (TOR) for the report identified the following objectives:

- Report the industry impact of the shelf stable technology for key stakeholder groups;
- Report the domestic market opportunities for shelf stable technology;
- Provide recommendations on MLA's role to facilitate industry's uptake of shelf stable technology.

4 Background to the Project

In 2000 MLA concluded an agreement with Innovative Foods (Australia) Pty Ltd (IFA) to provide funding to develop a technology which would enable production of meat products into a shelf-stable form which would then be compatible with packaging in flexible pouches for distribution outside the conventional chilled/frozen supply chain. Development of the concept took place over the period 2000-2002 when a further agreement was concluded which assigned IFA certain rights to license the technology to interested parties. A licensing agreement was concluded between IFA and Tatiara Meat Company Pty Ltd (TMC) in 2002. A second license agreement was concluded with Sunrice Australia Pty Ltd (Sunrice) in 2004.

In the absence of file reports and associated literature from MLA, and in contrast with previous research and development projects such as the Macpro boning system, the development of the shelf stable technology is assumed to have been completed largely by IFA rather than MLA as the funding agency working together with IFA from concept development to commercialisation of the new process refinements.

The project fitted well within the aims of MLA's Partners in Innovation Program (PII) which had as its objectives:

- To significantly increase the level of enterprise investment in innovation in the Australian red meat industry.
- To significantly enhance the outcomes of commercially focussed innovation thereby ensuring quantifiable commercial returns to individual enterprises and ultimately to the industry overall.

- To significantly increase the number of successful commercialisations thereby adding to the quantum of innovations available to the industry.
- To achieve commercial returns for the Meat Donor Company [where appropriate], which can be reinvested in Programs and projects that grow the level of profitable innovation within the industry.
- To undertake research and development with individual enterprises to increase the innovation capability of the Australian Red Meat Industry.
- To extend the industry's reputation for innovation in overseas markets.

In 2002 the technology received the Science Innovation Award from the Australian Institute of Food Science and Technology as well as the Rabobank/Monash University Australian Institute of Agricultural Science and Technology Innovation Award.

4.1 Expectations

Among the attributes identified for the technology and in anticipation of commercial projection were the following:

- Being shelf-stable, it substantially altered the transport logistics from those associated with refrigeration to those of dry cargo;
- Extended product life of 12 months gave distributors and end-users greater flexibility;
- It provided another method of distribution for red meat products whether through foodservice or through retail outlets;
- It offered the potential to take lower-value cuts for conversion into higher-value finished items;
- It enabled better management of supply fluctuations for manufacturers and end-users alike.

Since the initial contracts were agreed there has been a promising increase in exports of this type of product and reportedly more interest from domestic wholesalers, foodservice operators and distributors and also interest at supermarket/retail level.

It has not been possible to quantify the expectations agreed between the parties for the IFL technology at the commencement of the project and this has been compounded by the inability of the consultants to contact the developer of the technology during the evaluation.

The development of the technology was expected to successfully address several strategic issues including:

4.1.1 Process Issues

- Reduction in skill levels required

- Improved return on red meat raw material
- Consistent quality of finished product

4.1.2 Equipment Issues

- Machinery would be safe to operate and easy to clean
- Enhance process and product versatility
- Minimal product preparation required

5 Methodology

The evaluation was conducted as foreshadowed in the project proposal and comprised of:

1. Discussions and file review with MLA as to objectives, expectations and timing.
2. Review of technology.
3. Preliminary market review of available products in the foodservice and retail sectors.
4. Review of AHECC classification (product attracts a different tariff code to traditional chilled/frozen meat products).
5. Review and discussion with installers of the licensed technology as well as other enterprises using the technology independently.
6. Identification and review of relevant market research to assess impact and potential for shelf stable products in the domestic context.

The evaluation was hindered by the fact that the relationship between MLA and the company which conducted the technology innovation - IFA - has apparently broken down. The evaluation team were instructed to not approach IFA. This has necessarily hampered an attempt to gain a complete understanding of the initial aims, objectives and critical path for development of the technology.

5.1 Definitions

5.1.1 Shelf Stable Technology

The term "shelf stable technology" as noted in the original Terms of Reference is understood to include developments under the MLA's Partners in Innovation Program (PII) in the period 2000-2005. The process concentrated on improvements and refinements to the traditional "retort under pressure" process which enabled *inter alia*:

- The use of flexible tray packaging and gas-impermeable film in place of traditional metal cans;

- The use of flexible pouch material (typically three-layer laminate) in place of traditional metal cans;
- The inclusion of bone-in product;
- The inclusion of other food products e.g. rice, sauce, vegetables which are compatible with identified consumer trends;

5.1.2 Installer

Installers are defined as companies or other entities that have concluded an agreement with the licensee of the technology – IFA – for the right to apply the technology to the production of shelf stable products and to avail themselves of technical advice from IFA on its successful introduction and implementation. Agreements were between the entity and IFA. It is further understood that agreement was reached whereby IFA would remit to MLA 5% of the 3% licensing fee paid to it by licensed installers. The schedule of royalty payments for the period 2001-2005 was not available for this project.

It should be understood that there are additional manufacturers of shelf stable products containing meat which have not taken out a license from IFA but report that they have invested their own funds independently in development of equipment and processes. The project was unable to disaggregate the impact of the technology to those licensed by IFA on the one hand and others but has instead examined the likely overall impact of the adoption of new shelf stable processing methods.

In addition to the three known entities which have a licensing agreement with IFA for use of shelf stable technology, there are other firms employing retort under pressure principles. Traditional retort users such as canneries (Simplot, Heinz Watties and Nestle) were not considered in the terms of this project although as a group they are considerable users of red meat raw material.

Three sites which use retort in the manufacture of flexible pouch products were identified but there are likely to be up to four more sites also producing retort-prepared foods for the foodservice market.

6 Program Strategy & Approach

6.1 Current Shelf Stable Operations

As at March 2006 there were five known enterprises operating in the Australian market. This list excludes those plants utilising the traditional retort canning process.

Figure 1 provides a breakdown of the current capacity of sites using shelf stable technology (note that traditional retort cannery sites are excluded from the estimate).

*Figure 1 – Relevant Shelf Stable Technology Sites 2006**

Capacity	No. of sites
> 3 tonnes/day	3
1-3 tonnes/day	1
<1 tonne/day	2

*excludes traditional retort cannery sites

6.1.1 Cook Freeze Pty Ltd *trading as Prepared Foods*

The company was established in 1979. Its manufacturing headquarters are at Wacol, Qld. The premises were previously owned by Eurest International Ltd until Cook Freeze Pty Ltd purchased the business in 2005. This company has been involved in the manufacture of frozen products primarily for the foodservice trade. The facilities, when owned by Eurest, were the site of the prototype IFA technology and Eurest later undertook product development and contract manufacturing for IFA.

6.1.2 Enjoyo-Meal International Pty Ltd

The company is located on the outskirts of Adelaide, SA. It has operated as a fish processing enterprise for approximately seven years; subsequent to the installation it has changed its business focus towards manufacture of shelf stable meals for the retail sector. Their products were first launched in the marketplace in July 2004.

Figure 2 - Enjoyo-Meal Retail Pack, 2006

6.1.3 Neat Meats Australia Pty Ltd

The company was established in 2001. It currently operates in the marketplace as Microlok Pty Ltd. Its manufacturing and company headquarters are located at Casino NSW. It is understood to have had a licensee arrangement with IFA at one time which has since been abandoned.

The company has supplied shelf stable meals into the foodservice sector briefly over the past three years, however, it reports that the current high prices of raw materials precludes their competitiveness in this area at the current time. Their subsequent focus has been on production of other shelf stable products and cook/chill products.

6.1.4 Sunrice Australia Pty Limited *trading as Sunrice*

The company was established in 2002. Sunrice is the trading name and business name for the interests of Ricegrowers' Limited, a public company limited by shares. It has a shareholder base of around 2000 ricegrowers. It is understood to have a licensee arrangement with IFA.

Figure 3 – Sunrice Retail Pack, 2006

Sunrice's involvement in shelf stable products stems from its goal to vertically integrate its rice production business and to market a more extensive range of rice and value-added rice food products. It has annual sales of around $800 million, over half of which come from value added exports. In the past two years the company has moved into multi-food brand platform as witnessed by its shelf stable range of rice products and side dishes containing rice and chicken, beef, lamb and pork. Its pre-cooked rice dishes (and specifically the SunCreations Light Meals with Meat Range) are marketed as being microwaveable and have been supported by a national television and print advertising campaign since their launch in October 2005. The meat content in the three examples is approximately 16% by finished product weight in a 300 gram pack.

6.1.5 Tatiara Meat Company Pty Ltd

The company was established in 1979. It operates a processing plant at Bordertown, SA and is recognised as one of the country's major lamb processors. Its value added manufacturing operation is located at Laverton, Victoria. The company has a strong export focus on lamb cuts particularly into the European Union, Japan and the USA. It was the first company to conclude a licensee arrangement with IFA. While the export market is its primary focus, its shelf stable products are also marketed to foodservice operators in the eastern states through a distributor.

Figure 4 – Tatiara Foodservice Pack, 2006

6.2 Other relevant players

6.2.1 Innovative Foods (Aust) Pty Ltd

The company does not currently have a full manufacturing site but is active in the marketplace promoting the license arrangements for the technology and servicing existing licensees' ongoing needs.

6.2.2 Nature's Beef Pty Ltd

It is understood that the company commenced negotiations in 2003 for a license with IFA but did not proceed with the project.

6.2.3 Other relevant shelf stable products

There is an additional shelf stable product available at retail utilising red meat. The product range is manufactured in India by MTR Limited[1] (as shown in Figure 5) and the product lines are available in both of the major retail chains. Currently there are three product lines available.

Figure 5 - Imported Shelf Stable Product, 2006

[1] Website: www.mtrfoods.com their shelf stable range comprises 12 types of masalas, curries and kurmas.

Of the five operating sites shown above, four regularly use the technology to produce flexible pouch products containing meat. Of these, Sunrice can be described as a marginal user of red meat products but a significant player in the retail marketplace by virtue of its brand power. Additionally, Neat Meats/Microlok advises that for its flexible pouch operations are currently directed at other markets e.g. vegetables, pasta and are also deemed to be marginal users of red meat products.

7 Description of Process

Shelf stable technology, like canning, is a form of thermal processing which serves to preserve food and to prevent spoilage by destroying the micro-organisms in the product being preserved. It works under the principles of the pressure retort which was designed and developed by Denis Papin and, later, by Nicolas Appert specifically for the food industry. The development of retorting at the end of the 18th century was closely linked with the warring between the major European military powers because it enabled troops to be provisioned over long supply lines. In 1810 an Englishman Durance patented the use of metal containers for preserving food and the first recorded commercial canning factory was built in 1813.

The pressure retort destroys micro-organisms in the product through the application of sustained heat, under pressure, over a specified time. Ingredients are placed in individual units, traditionally into metal cans or glass jars or, under the modern shelf stable application, into flexible plastic pouches or trays. The units are sealed. Once the can or pack has been sealed no further bacteria can enter and the pressure component ensures that the product is evenly and thoroughly heated to complete the sterilization process. A quantity of liquid – normally water - is brought to boiling point in a sealed airtight chamber or retort. The steam is superheated and, as the liquid in the product boils, the steam increases which fills the chamber retort and raises the pressure. The pressure forces the superheated steam into and through the contents. Microbes are destroyed in the process and the pouch's contents are stabilised from deterioration for an indefinite period.

A pressure regulator is used to maintain the right pressure and keeps the steam from rushing out while the pressure is controlled by raising or lowering the heat. Typically cookers use a constant pressure of l5 lbs of pressure/ square inch of retort space.

The retort process, however, cannot give the ingredients, particularly meat a "brown" appearance. This is often normally accomplished through a pre-cooking cycle prior to the product being batched and placed in the retort for processing.

During the 20th century further concentrated work was done on food production through retort in the United States, culminating with the release of "MRE" – "meal ready to eat" – rations in flexible packaging, which enabled troops to produce a hot meal on demand in the field with the use of a field stove or similar. Like the traditional can, the flexible pouch is comprised of several layers for durability and impermeability but is lighter, easier to carry and negates the need for a can opener.

Because meat, like seafood, poultry and milk, is a low acid food, it is more prone to spoilage and requires more thorough heating over a longer time than acid foods. Commercially sterile canned meat products generally reach an internal temperature of **225oF-240oF** but this can be slightly lower depending upon the level of salt and nitrites which are added to the product mix. The severe heat treatment which the product sustains during the thermal process can also create changes in the flavour, texture and colour of the product being treated referred to as organoleptic characteristics). These are factors which the shelf stable technology under review seeks to minimise without compromising the product's safety through product development which requires some calibration of the cooking times and pressure levels to the specific product ingredients. The exact details of this phase of product development was outside the scope of this report.

7.1 Modern Retort Operations

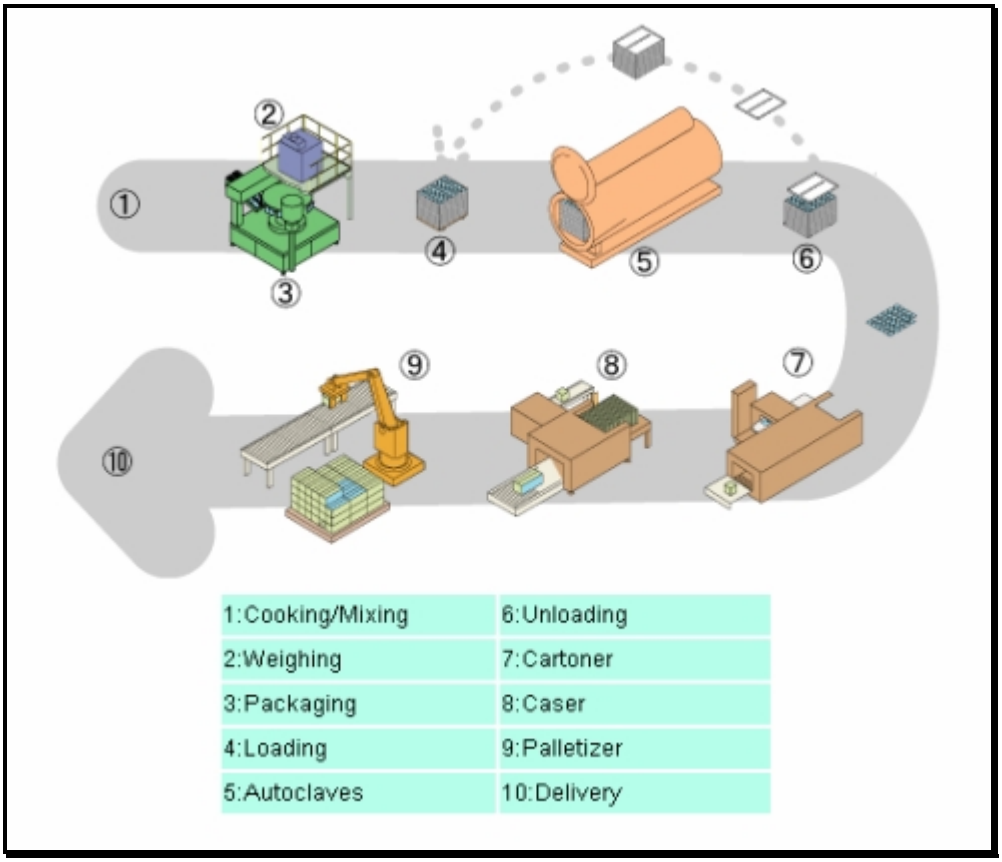
Control of the retort phase itself is the most critical phase of the shelf stable process because the product must be subjected to sufficient high temperature under pressure for an adequate length of time to destroy all micro-organisms and to ensure that the foods are thoroughly cooked so that they can be consumed straight from the can or package.

The schematic at Figure 6 shows the modern retort process commencing with pre-cooking, mixing and weighing of product batches before being combined, bagged, sealed and subjected to thermal processing. The process is as follows:

- Assembly of ingredients/mixing
- Pre-cooking
- Weighing, mixing, batching
- Filling into retort pouch
- Sealing
- Loading of pouches/trays into batch containers
- Processing through the steriliser/retort
- Cooling and unloading
- Unloading from batch container into carton or shipment format
- Consolidation into carton or case for shipment
- Palletising and despatch

Food safety guidelines for thermal processing typically require that the enterprise have a suitably qualified staff member to supervise the retort procedure in order to ensure that the time/pressure/temperature parameters are met and that proper data recording procedures are followed to ensure details of product batches are maintained.

Figure 6 - Schematic of Retort Pouch Process



Source: *Toyo Jidoki* website

Retorts are normally either custom-built or modified for specific premises with issues like access to services, footprint size and load-out areas in mind. There are a variety of overseas manufacturers and two or three local manufacturers. Examples of modern retorts are shown at

Figure 7 - Industrial Food Processing Retort

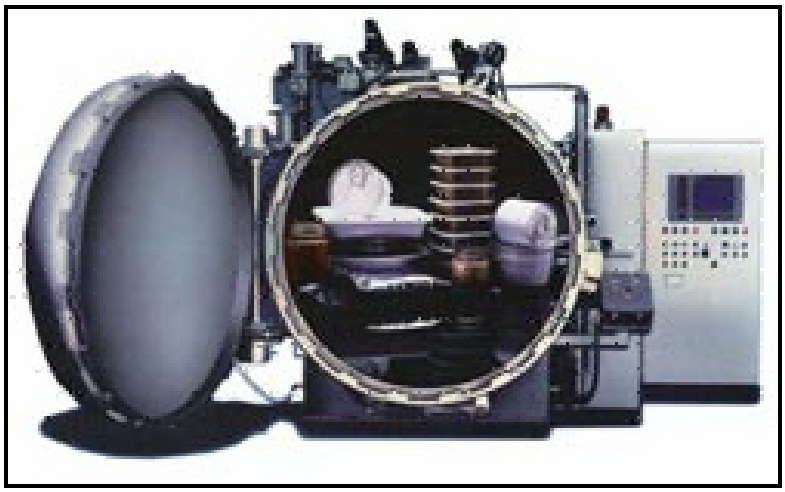


Figure 8 - Industrial Food Processing Retort

The retort itself is a steel tank (either horizontal or vertical) into which the product units are loaded in metal crates or baskets. The product units are also cooled in these crates after they are removed from the retort. The retort has a door or hatch which is sealed to ensure the steam pressure during cooking and cooling is maintained.

Most retorts used in canning are hydrostatic whereby the steam pressure is maintained by water pressure and cans are carried continuously through the cooker on a chain or rail. By contrast, the flexible pouch technology uses a batch system operated through a stationary retort: the retort is loaded, closed, and the batch is cooked and removed for cooling. Then another batch is loaded. For this reason it is crucial that the rate of heat penetration is appropriate for the product density. There may be significant difference in cycle times for bone-in product compared to meat strips or dice.

There must also be control mechanisms as part of the retort process for the steam pressure within the vessel; monitoring of the temperature throughout the process; and provision for a controlled release of the steam pressure at the beginning of the cooling cycle. There will also be a continuous time and temperature recording device to document the plant's HACCP records that time/temperature/pressure requirements have been met which the operator of the system will have responsibility for maintaining.

Cooling is also a vital stage as it quickly retards the cooking process initiated by the retort and also controls any deterioration in the product's appearance and taste. The IFL technology on offer provided a framework for assessing the product parameters and establishing the correct cook and cool protocol that would not compromise the organoleptic characteristics or the food safety of the finished meal.

Several of the manufacturers use gas flushing techniques to assist in maintaining the product's appearance for consumer acceptability. This is usually done through flushing with a mixture of nitrogen and carbon dioxide immediately prior to the bag being sealed. The IFL technology provides support for achieving this, since an incorrect amount of 'headspace' in the pack can lead to leaking packs or inadequate cooking.

7.2 Distinctions from other Processed and Valued Added Products

There are other processing systems which pasteurise foods containing meat, normally by obtaining an internal temperature up to 100oC. This is usually achieved in simple cooking vats after the product has been placed in packaging and air evacuation from the pack has taken place. After the cooking process the product packs are quickly cooled in a water bath. However this category of product still requires refrigeration and has a relatively short product life compared to canned product because some micro-organisms resist this moderate form of heat treatment. An example of this is sous-vide products like soups and the cook-chill packs which are increasingly used by foodservice clients. In effect these products compete directly with shelf stable products in the marketplace.

8 Product profiles

The meat-based products currently available in the retail and foodservice markets using the shelf stable technology comprise:

- bone-in lamb
- boneless beef, lamb, chicken and pork
- diced/comminuted meat products inside a dry rice or wet pasta mix

In addition bone-in beef ribs were briefly available but proved difficult to source.

The major product identified with the shelf stable technology so far has been the very prominent bone-in lamb shanks, presented in a range of sauces including red wine and garlic and rosemary. Typically these products are derived from the foreshank (HAM No. 5030)[2] as indicated in the adjacent illustration. Depending on customer requirements the shanks are included whole in the pack along with the sauce. This is suitable for packaging in a flexible pouch or rigid tray format. Alternatively, the bone-in shank may be band sawed to specification. The latter variation is normally packed in a rigid tray format for retail sale inside a full-colour cardboard sleeve.

Boneless beef and lamb products are normally comprised of lean manufacturing trim and forequarter cuts either cut into strips or cubed. Manufacturers noted that the trim on these raw materials must be carefully monitored to ensure the resulting sauce after reheating is not fatty, greasy or lumpy.

While these items do not present the puncture potential as the band-sawed bone-in shanks discussed above, the process needs to ensure that the strips do not adhere to each other and that the rate of heat penetration is sufficient to cook them through.

[2] Handbook of Australian Meat. 2004, 4th edition. www.ausmeat.com

The third product category is a mixed medium whereby the meat content is a minor component alongside a major ingredient e.g. risotto or pasta dish. The Sunrice SunCreations products are one example. Typically the volume of meat used in these applications is extremely small (around 10%-16% of total product weight) and may at times be difficult to discern from other ingredients such as diced vegetables, etc.

9 Capital Costs

9.1 Equipment Purchase

The single largest capital equipment item is the retort kettle itself. While standard autoclaves or sterilisers are available through equipment companies the need to produce a commercial quantity of the food product necessitates a retort of a reasonable volume. Moreover the retort occupies a large 'footprint' in the plant and may well have to be manufactured to best access existing power and water connections. Capacity of around four tonnes/day of finished product i.e. possibly incorporating other ingredients like vegetables or rice/pasta is considered to be the entry-level capacity in order to provide a reasonable return on investment.

Not surprisingly the decision to invest in a shelf stable process at an existing factory or at a new site requires careful consideration of a number of issues. These include targeted production levels, anticipated payback period, labour issues, storage of raw materials and finished goods and the machinery and equipment suited to produce the ideal product volume. The scale of the machinery and equipment must be selected to ensure that idle time or excess capacity is minimised as soon as possible after commissioning. To this end like other value adders some manufacturers perform contract packing from time to time to reduce their fixed overheads. Figure 8 indicates the extent of capital outlay required for a small scale investment (<1 tonne output/day) in shelf stable processing alongside a larger-scale plant (>4 tonne output/day). The larger scale shown here would still be considered small scale in a European or US environment.

As indicated the requirements of this type of operation comprise more than the retort itself but also encompass ancillary equipment required to prepare, cook, pack and handle the finished products. It should also be noted that packaging and other consumables including trays, lids, sleeves, etc are excluded from this costing. Estimates for these are presented along with other operating cost components in Figure 11 and Figure 12.

Figure 8 - Estimated Capital Costs for Establishing Shelf Stable Manufacturing Capability

		$A	
Item	Notes	<1 MT/day	>4 MT/day
Room infrastructure	power, panels, water, waste, other services	$120,000	$170,000
Food preparation machinery & equipment	includes slicers, mixers, grinder, blanching	$150,000	$280,000
Cooking, filling, gas flush production	kettle, pouring, evacuate and seal	$200,000	$350,000
Thermal processing	retort/autoclave/pressure equipment/boiler	$400,000	$650,000
Cooling	air/water tank	$35,000	$60,000
Conveyors etc		$150,000	$220,000
Labelling and packing equipment	sleeve inserter, label	$280,000	$400,000
Training component, liaison, testing, food safety etc	start-up process in first year	$30,000	$40,000
Other		$20,000	$35,000
Total excl trays/materials $A		$ 1,385,000	$ 2,205,000

9.2 Packaging

Typically the product is manufactured and marketed in plastic pouches which may either be clear, opaque or colour-printed for retail display. In some instances product appearance is not enhanced by the use of a clear film for the pouch: most product lines at present use opaque plastic or colour-printed plastic. The pouch may have a gusset at the base to facilitate display or for stability when reheated in a microwave oven. Alternatively, the product can be manufactured in a rigid tray either with or without partitions for other meal ingredients including rice, pasta shapes or vegetables.

9.2.1 Pack Size

Product pack sizes are being tailored for the end-user in mind with retail packs commonly weighing around 400 g net or around 300 g net for side dishes such as SunCreations. There is a wider range of pack sizes in the foodservice sector ranging from 350 g for a single serve up to 800 g or 1 kg packs in some circumstances. Each variation in pack size requires a degree of product development in terms of additional cooking time and the likely organoleptic consequences.

9.2.2 Plastics manufacture

The plastic used for the manufacture of the pouch or lidding film must be of a heavy grade to withstand the heat of the retort vessel and impermeable to oxygen in order to retain the sterilised state of the product inside. There are a limited number of suppliers for this type of film. Companies include Versapack, Amcor and FMC. The film must be gas impermeable and normally is three-layer or four-layer aluminium or plastic layered pouches.

9.2.3 Tray manufacture

The plastic used for the manufacture of the rigid tray, where applicable, must be able to withstand the heat of the retort process. There are a limited number of suppliers for this type of film. Companies include Versapack. Relatively rigid containers can also be made from laminated firms made of polyester/polyethylene and polyamide/polyethylene.

9.2.4 Other packaging issues

The shelf stable products have also enabled merchandising of meat products using packaging styles and printing graphics not readily available to retail meat products in the past. These include items like cardboard sleeves, full colour graphics and advanced packaging materials like laminates, foil products and pouch designs.

With the shelf stable packaging value added meat products have a great deal more in common with other grocery items like pre-cooked rice, beverages, snack foods etc.

10 Operating Costs

10.1 Labour Impacts

Although the retort process itself is automated, there is also a heavy labour component involved in loading and unloading the raw materials into the mixing units and loading and unloading the retort itself. Maintenance of the machinery is also a factor with care needed to prevent corrosion of the retort or associated equipment. Care must be taken to ensure that cycle times are observed and documented into the enterprise's HACCP plan which is a further time component.

Low-capacity factories are almost certainly at a disadvantage in this area because the size of the retort has a direct bearing on the labour required and may subsequently expose workers to more risk of injury from loading and unloading the baskets into the retort. Smaller retorts (say, less than 70 cm in diameter) use smaller baskets or crates but the low capacity requires more batches and more human intervention in pushing the baskets in and out of the retort. Companies that utilise "jumbo" retorts (those having a diameter of over 100 cm) can improve production efficiency but as a trade-off must still have an alternative means of handling the heavier baskets and effectively managing the plant safety risks.

Automated retort loading for larger scale plants, therefore, is increasingly being accomplished either through a retort with an internal conveyor which is integrated into the whole product handling system, or through retort indexing/basket trains.

The disadvantage of using an internal conveyor, of course, aside from the large capital cost involved (upwards of $250,000 owing to the fully stainless steel nature of its manufacture) is that its components are thermo-processed right along with the product being retorted. The temperature variance which the mechanism has to endure may accelerate maintenance issues well beyond normally acceptable limits and certainly faster than the interior of the retort itself.

At present there are two large scale retorts in operation for the type of product under discussion (refer Figure 1) one of which uses an integrated conveyor.

The basket train option is more attractive to many manufacturers because it allows them to "build" their retort process room one component at a time. The system enables baskets of product to be slotted into a train mechanism which is then loaded or unloaded by forklift into the retort. It can fit into an existing room more easily than an integrated conveyor system. The main drawback of the option however is the cost of the labour involved in operating the forklift.

A high percentage of the workers at the currently operating sites consist of new employees i.e. they have not been redeployed from other operations centres within the company. This has often meant that they had minimal or no exposure to the food handling and manufacturing environment and this has entailed a high degree of training in hygiene and HACCP procedures.

Aside from supervising the automated machinery as it mixes and cooks product, measures and fills packs, the workers must also unload raw material. Most of the manufacturers

Manufacturers reported that the major OH&S issue in the environment is injury and strain from manoeuvring the product crates on entry into the retort and again on removal. Because of the reasons reviewed earlier in this section most sites have not automated or cannot automate for space reasons the handling of the crates into the retort and instead must try to ensure that safe work procedures are described and followed.

The second OH&S issue mentioned, though less frequently than the worker strain issue, was that of scalding from steam and handling of hot product. This is normally remedied by use of heavy gauge safety gloves where workers need to be in close contact with the cooked products.

10.2 Services Requirements

The operation of the retort itself requires access to three-phase power; water connections and wastewater disposal.

11 Markets for Shelf Stable Product

Figure 9 gives an indication of the approximate production share in 2005. This is based on estimated usage of red meat material in the production phase. Note that as market conditions change processors may swing production away altogether from shelf stable meals towards dedicated vegetable or pasta production in which case red meat usage will fall. It should also be noted that meat usage by one

processor is extremely low compared to other manufacturers and, while the capital investment in the plant and equipment has been large-scale, red meat usage is marginal.

11.1 Retail

11.2 Institutional – contract feeders, bulk feeders

The principal market to date for the product in shelf stable packs has been the export market. It is estimated that approximately 75% of all packs produced in the period 2003-2005 were destined for the export foodservice market, primarily in the United Kingdom for distribution to pubs, clubs and café situations.

11.3 Foodservice either direct or through broker

11.4 Issues - Product Availability (shanks, overall supply, yield issue)

Figure 9 - Estimated share of production by site

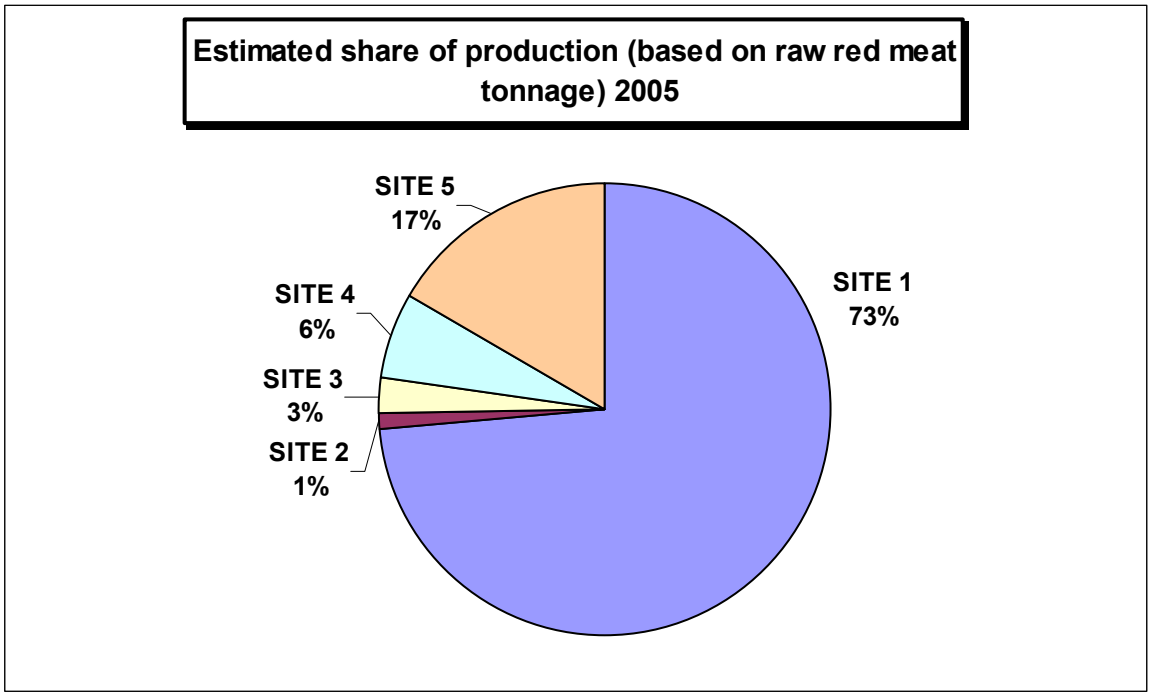


Figure 10 - Estimated market destination

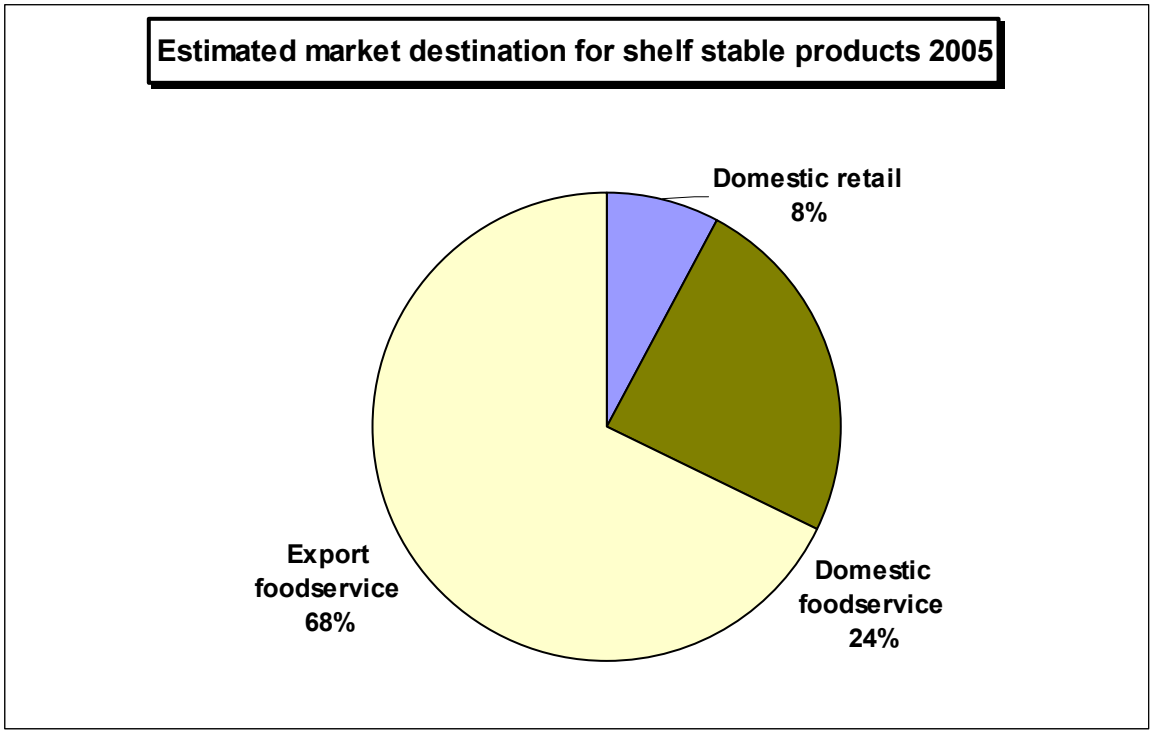


Figure 11 – Projected Financial Performance of Mid-Sized Shelf Stable Processing Plant

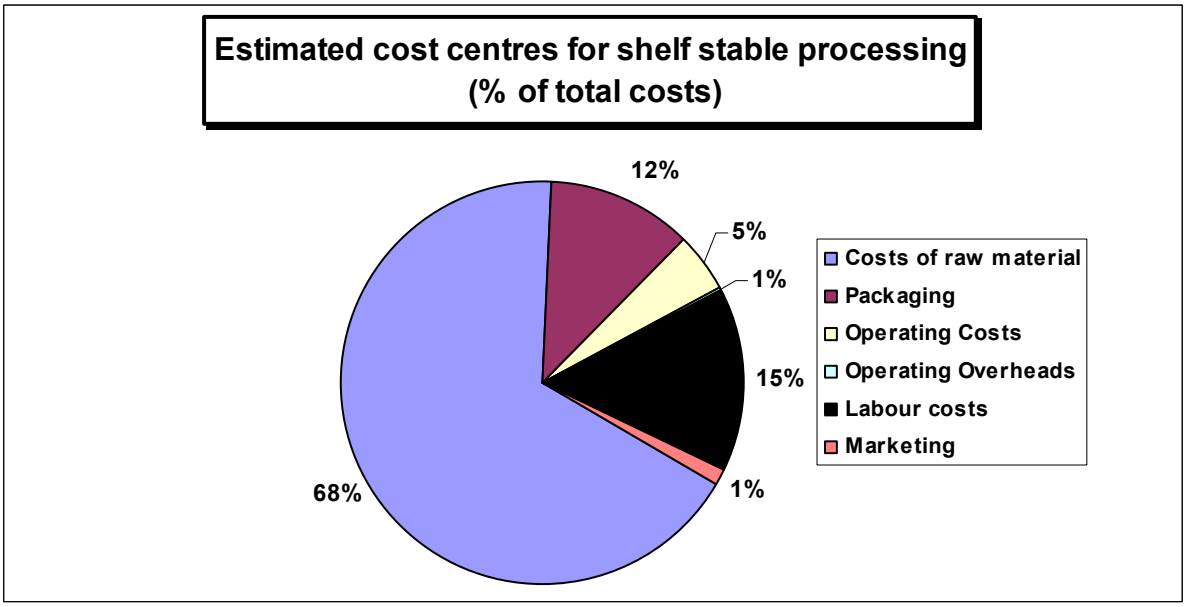
Capital Costs	***$2,200,000***					
Revenue per annum						
Value of Finished Product	***kg/day***	***Days/year***	***Tonnes/yr***	***$/kg***		***Value***
Pouch product: meat strips in sauce	4000	240	960	$	6.10	**$ 5,856,000**
Costs per annum		***Days/year***	***Tonnes/yr***	***$/kg***		***Cost***
Cost of raw materials	4000	240	960	$	4.10	**$ 3,936,000**

	$/tonne raw material	**Costs per annum**
Operating costs		
Steam	$ 22	$ 21,120
Electricity	$ 17	$ 16,320
Waste	$ 3	$ 2,880
Water	$ 3	$ 2,880
R & M	2% of capital costs	$44,000
Interest @7% pa		$154,000
Total		**$ 241,200**
Labour costs		
15 workers @$33,000 ea		$450,000
Management (2)		$130,000
On-costs		$116,000
Total		**$696,000**
Operating overheads		**$25,000**

Operating Statement		
Capital Costs	**$ 2,200,000**	
Revenue per annum @$6.10 kg		**$ 5,856,000**
Costs of raw material	$ 3,936,000	
Packaging/wrap/bags@$.25/unit	$ 600,000	
Operating Costs	$ 241,200	
Operating Overheads	$ 25,000	
Labour costs	$ 696,000	
Marketing costs	$ 58,560	
TOTAL COSTS	**$ 5,556,760**	
Estimated Profit/Loss	$ 299,240	
Return on Investment	0.136	
Payback period (in years)	7.4	

Source: Composite figures

Figure 12 – Cost centres for Shelf Stable Processing (%)



Source: Composite figures

12 Estimating the Value of the Market

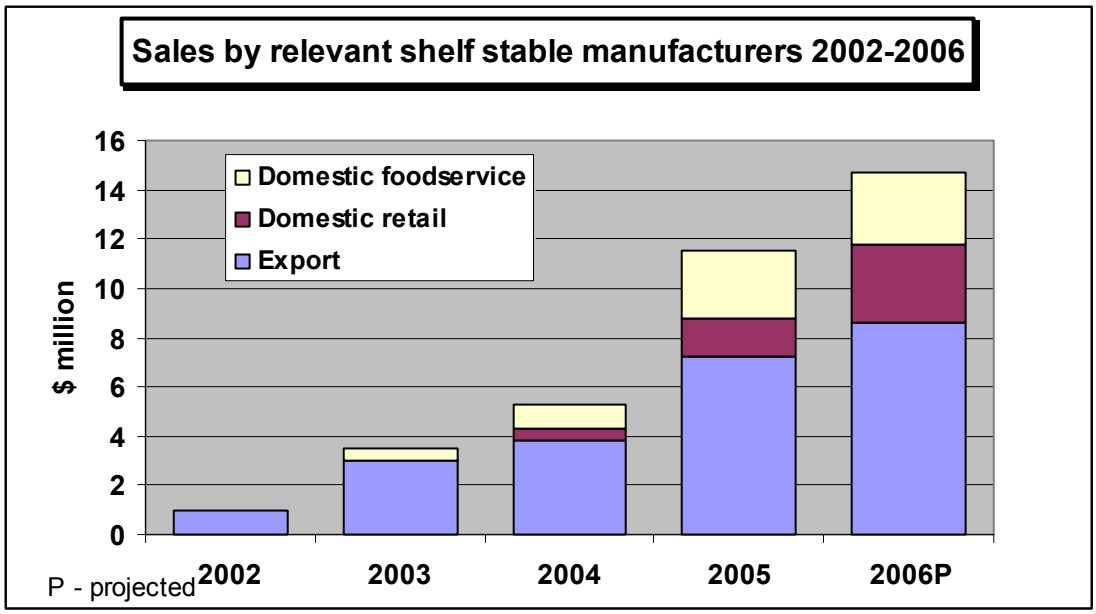
12.1 Product Sales

As noted earlier it was difficult to separate out the sales and other outcomes for the IFA-licensed manufacturers from the total group currently using modified retort processes to produce meals or side dishes containing red meat. There is also the issue that some products currently in the marketplace contain significantly less red meat than others, sometimes to the point of it being almost undetectable. It is recognised, however, that the use of value added red meat by leading consumer brands can probably only enhance the chances of the technology's uptake overall and increase consumers' acceptance of this product concept.

Figure 13 shows the reported sales figures for the relevant manufacturers of shelf stable products during the period 2002-2005 and projections for 2006, across three main market headings: export, domestic retail and domestic foodservice. While there is a very limited quantity of branded shelf stable product going to retail sale in export markets, most product in the export category is presumed to be destined for foodservice customers.

It should also be noted that since 2002 the total number of players in the market has increased and several of the manufacturers involved now produce products for export and foodservice. The category has also been made more dynamic by the entry into the marketplace of the Sunrice SunCreations retail products. Its estimated sales figures tend to swell the retail and foodservice sales figures although, as noted earlier in this report, the product's actual red meat content tends towards the lower end of the range.

Figure 13 - Sales Figures 2002-2006



Source: Manufacturers

Most manufacturers, not surprisingly, report a seasonal trend with stronger sales in the period May to August when foodservice demand for warm, hearty fare is generally stronger and retail buyers also seek hot, filling product choices.

All manufacturers were cautious about providing sales estimates beyond the current year. Most did not expect any significant increase in demand in the short to medium term, attributing this to what they regard as the high cost of raw materials. There was also some agreement among the parties that acceptance of the flexible pouch for products other than pet food and sports drinks is still to take hold in the Australian retail marketplace. This is where the presence of a major brand such as Sunrice in the market will probably assist the overall acceptability of shelf stable meat products as consumers gradually come to terms with the convenience and versatility of the flexible pouch medium.

12.1.1 Export Market Sales

Exported shelf stable product is primarily bound for the UK market where it is in strong demand for consumption in pubs, clubs and other foodservice situations. As anticipated at the commencement of the partnership with IFA, the growing trend in the UK away from full-service kitchens has provided a strong market for a shelf stable product which is easily handled by less experienced staff and is quick to prepare and serve. The added advantage, which was also identified at the start of the project, is that the product escapes the high tariff normally applied to meat imports because it qualifies as a preserved product.

Besides the UK, smaller market opportunities have also been identified for the product in SE Asia and in Japan. Sales figures by export market were not available from all sources but it is estimated that the UK takes around 85% of total shipments with the balance going to Japan, Singapore, Malaysia and other

SE Asian destinations. In 2005 total export sales were estimated at approximately $7.3 million.

12.1.2 Domestic Retail Sales

This category was initially dominated by the Enjoyo-meal range which comprises approximately five product lines containing beef, lamb and chicken. The company has secured shelf space in both major supermarket chains in addition to regional chains. The product is normally placed in either the hot pot section (along with canned items like baked beans, corned beef etc) or adjacent to rice and pasta products. It differs from other shelf stable products in that it is presented in a rigid tray with a clear plastic laminate seal. More recently the Enjoyo-meal product has been joined by the Sunrice side dishes comprised of rice and added meat e.g. lamb, beef and chicken. Sunrice launched its SunCreations in 2005 and now markets ten pre-cooked, ready-to-heat rice side dishes and main dishes. There is also competition from an imported shelf stable meal from India (MTR). As noted earlier the uptake of the technology by a major consumer brand will probably assist consumer acceptance of the concept of unrefrigerated, fully cooked meals.

The RetailWorld annual publication has noted the growth in the number of flexible pouch products across a wide range of categories. RetailWorld is based on scanned sales data from the major national and regional supermarket chains and tracks product sales by brand and product for approximately 350 product categories. The product is normally promoted as convenient and has a fresh, novel appearance. Retort pouches available in supermarkets – whatever the actual product category - feature vivid, full-colour packs with high quality graphics and extensive information about product nutrition and preparation.

Retail sales in 2005 were estimated at around $2.7 million, however, it should be noted that the Sunrice product line – predominantly rice by volume - would represent much of this growth. Forecasts for 2006 are only moderately higher. In retail, the major impediments identified for the shelf stable product are competition from frozen prepared products (pies, pastries, snack items) and the growing popularity of cooked product, still requiring refrigeration, but occupying strategic positions in the supermarket where the consumer is more inclined to be looking for a meal solution. It should also be recognised that the persistent emphasis on selection and preparation of fresh ingredients does not necessarily assist the cause of shelf stable products in the retail marketplace, no matter how fresh the ingredients at the time of processing. On the plus side, occupying space in the drygoods area means that shelf stable foods attract considerably less shelf rent from the supermarkets compared to that applicable in the chilled or frozen section of the store.

No data was available from the major supermarket chains on sales projections for this product category. There is, however, a distinct trend emerging towards the flexible pouch in the pasta, rice and staples section as well as petfood, health and energy drinks which will likely have a beneficial effect on acceptance of shelf stable meals.

12.1.3 Relevant Domestic Market Research

Recent quantitative consumer research for MLA on value added cooked red meat[3] included responses about shelf stable products. The research was designed to assess the domestic market potential for cooked red meats: shelf stable, pre-cooked meal concepts were among 40 value added products explored with consumers.

A primary conclusion from the report was that, while there may be potential for value added red meat sales to exceed $4 billion per annum, much of this would conceivably be 'cannibalised' from fresh red meat sales and the incremental benefit to industry would need to be carefully monitored.

The report concluded that there is some potential in shelf stable products, largely because of convenience but that "*there are significant barriers to acceptance, as many [consumers] cannot understand how the meat can be safe*." This was evidenced by the fact that nearly two-thirds of the respondents in the survey found the idea of shelf stable products to be a "turnoff." These consumers cited the lack of a need to refrigerate the product to be a barrier to trial in and of itself.

The second significant finding in the NTF report was that the degree of fragmentation currently existing in the market means manufacturers offering value added products (whether pre-cooked or uncooked) must offer variety of flavours, pack size and consistent quality. Conceivably the technical ramifications presented by this challenge may keep immediate uptake at a minimum.

12.1.4 Relevant Overseas Retail Trends

The National Meat Case Study 2004 (NMCS) conducted on behalf of the National Cattlemen's Beef Association had as its objective to identify emerging retail meat marketing trends at the national level. One of the principal findings of the 2004 study was the growing penetration of heat and serve products and value added products throughout the retail meat case. The second major conclusion was that the space allocated to fresh meat and poultry's share of linear feet in the supermarket has decreased by 6 % since 2002. Increases in shelf space were recorded for processed meats such as sausage and ham, "heat and serve" categories (chilled products) and, importantly, ready-to-eat value added meat products. Simultaneous studies found that the ready-to-eat products, presented in flexible pouches, were becoming popular with consumers for convenience and wide product range.

US food processing magazines have also noted the migration of the slow cooking phenomenon into consumers' kitchens with items such as crock pot classics and Slow Cooker Helper showing real promise. These have come from Con-Agra's Banquet retail brand and feature frozen components in a stand-up pouch that cook all day in the slow cooker. There have been similar product releases from General Mills convenience product range. Both companies assert that home meal preparation is becoming important again, moving away from quick-serve

[3]The NTF Group. Demand for Value Added Cooked Red Meats Quantitative Report. March 2006. The research involved 304 face-to-face interviews conducted in Sydney NSW. Appropriate quotas were set on the key variables including household structure, household income and ethnicity.

restaurants or takeaways, and that consumers want to be able to offer their family a proper meal that is also easy to prepare.

They also noted the advent of fully pre-cooked rice from national brands like Uncle Ben's with the addition of savoury or meat ingredients in stand-up pouches similar to the Sunrice product range. The fact that they are re-heated in the pouch is promoted because it saves on clean-up time. The technology in the US is increasingly being used for the marketing of side dishes such as rice, red beans and wild grain rice.

12.1.5 Domestic Foodservice Sales

Figure 13 indicates the growth in sales of shelf stable products to foodservice outlets over the past two years. Manufacturers and distributors do not expect this to increase significantly over the next two-three years and feel that the initial impact of shelf stable products for the foodservice area has now 'plateaued' for the time being. Nevertheless the technology has made an impact in the foodservice area where operators are clearly struggling with staffing and cost issues.

Sales in 2005 into the foodservice sector were estimated at $2.7 million with some growth anticipated in 2006. In contrast with retail, currently sales into retail comprise mainly meat based products particularly chicken items and lamb shanks or similar bone-in product.

12.1.6 Relevant Foodservice Trends

The BIS Shrapnel[4] study of the Australian foodservice sector highlights the enormous growth potential of the market, estimating its value in 2004 at $30 billion of which restaurants alone accounted for 30%. Consumer expenditure of food and beverage in the foodservice segment has increased from 34.8% in 1996 over 37% in 2004. This increase has been at the expense of supermarkets and other smaller food retailers. Foodservice share of total expenditure is expected to grow in line with developments in overseas markets and the influence of changing lifestyles. Consumption patterns are altering as consumers become busier, less skilled in traditional cooking methods and travel more widely. The other main trends are that consumers are demanding 'healthy' foods and beverages, are more inclined to Asian cuisine and an ongoing rationalisation of the supply chain and allocation of tasks within the foodservice enterprise.

In 2004 there were approximately 74,000 foodservice outlets consisting of 16,000 institutional outlets and almost 58,000 commercial enterprises. Average turnover in the restaurant and café sector has increased around 11% in the past three years and a decline in the number of operations is expected to occur over the next five years.

A number of factors mean that the potential in the foodservice sector for uptake of the shelf stable technology is quite high and it is a market where consumer concerns about freshness, appearance and safety, which are raised in regard to product offering at retail, need not occur.

[4] BIS Shrapnel. Australian Food Service. 2005-2007. 8th Edition. May 2005.

Given the forecasts provided by the BIS Shrapnel research it is concluded that the shelf stable technology has good potential for increased sales here in the domestic market but will likely be impeded by continuing strong competition from frozen products, cook-chill products and the ready availability of refrigerated facilities to most foodservice operations.

12.2 Product Impact

12.2.1 Effect on Prices for Residual Cuts

One of the objectives in developing the shelf stable technology was to attempt to improve returns for less valuable cuts off beef and lamb carcases: the very basis of value adding. Speaking to manufacturers involved in production .over the past three years it seems plausible that specific cuts have profited while others have not. As well these developments have taken place during a sustained period of higher lamb and beef prices so it is difficult to distinguish the follow-on effects from technology efforts. Certainly the manufacturing grade product which is used in the strip and cubed product lines have shared in the upward price movement of the past three-four years but the manufacturers regard this not as value adding but as increases in the cost of their raw materials. In the interviews conducted for the review this factor was often cited as the major impediment for further growth: uncertainty about the future price of raw materials.

The case of lamb shanks provides an interesting case study because it is not substitutable with other lamb cuts. This product category, along with most other lamb products, has shown upward price movement for the past three-five years and it seems clear from anecdotal evidence as well as a narrow price series that the growth in the export of shelf stable lamb shanks has helped to fuel strong and sustained demand for the product.

Figure 14 - Lamb Foreshank Price $A/kg

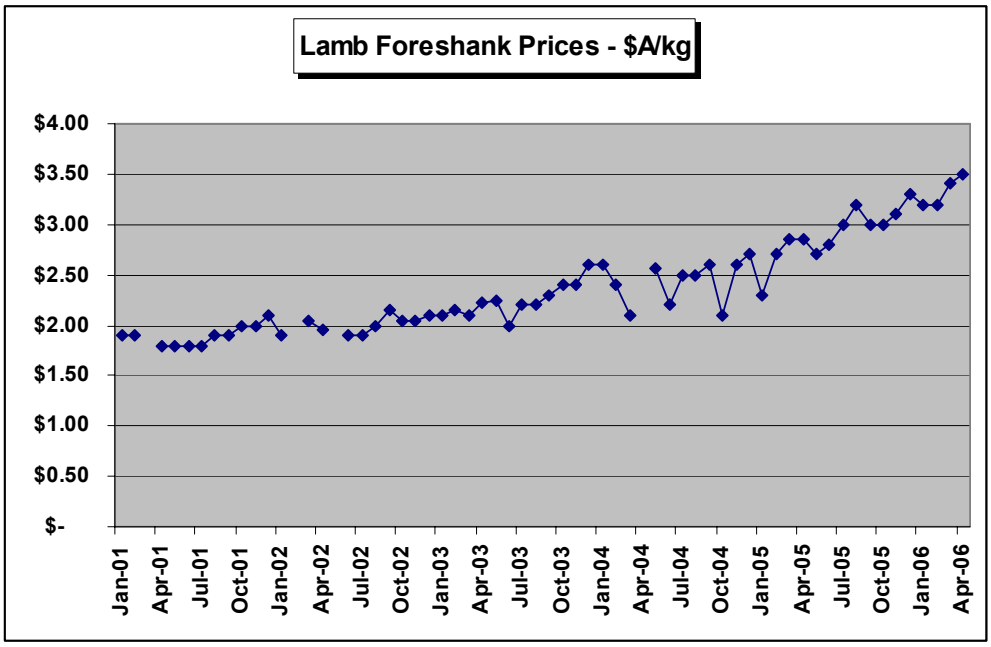


Figure 14 indicates the increased values for lamb foreshanks over the past five years. It is fair to claim, after confirmation with several abattoir operators, that the shelf stable product range has assisted this price increase but, equally, it has been assisted by similar products available as cook-chill items and a general consumer trend for "comfort food" for which shank meat is a key ingredient. There is a virtual shortage of these items for domestic foodservice and for export production into shelf stable and frozen bulk packs.

12.2.2 Impact on Transport

A significant feature of the shelf stable product is the fact that it is "freed" from the cold chain logistics. Consequently it attracts lower transport and handling fees. In terms of export markets this amounts to a reduction of between 30%-37% on the standard frozen tariff to the UK (nominally $US.43/kg delivered Tilbury). On an estimated export shipment level of , say, 1,200 mt/annum this amounts to freight savings of approximately $A170,000).

12.3 Other opportunities

13 Findings and Conclusions

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