

The Meat Plant of the 21st Century

Summary

The meat processing industry is in a constant state of change. These changes will continue to meet the requirements of the 21st Century. The meat plant of 100 years hence will probably feature a high degree of automation. But this will be beyond our lifetime. If we focus upon the immediate future the meat plant of the 21st Century will probably incorporate many of the current trends or developments.

Operating margins will remain small with the emphasis upon high productivity and enhanced revenue. We may see the rise of the mega-plant linked with a national or international network of specialised added value operations.

The international demand for meat and proteins is expected to grow. The challenge of the meat plant will be to meet this demand and produce a range of products to the exact requirements of the customer.

Concepts discussion

'In the public eye, the Freezing Worker is one of the lowest status individuals in our society. A rough, irresponsible layabout who jeopardises the economy for sheer greed and goes on strike at the drop of a hat. He earns high wages for very simple work. He's at a key point in the economy, responsible for processing one of our biggest export commodities. He can hold the country to ransom. So runs the popular myth.

No-one who has not seen what a freezing works is like, and the kind of jobs freezing workers do is in a position to criticise. The industry carries mass production to its extreme. A freezing works is a giant dis-assembly line along which carcasses and organs roll with a deadening inevitability while the men scuttle to keep up. The machine is truly king. A butcher on the chain must carry out the same operation over and over again, day after day until the season ends. Not for him the carpenter's pride in his skill, the watersiders variety of tasks, the shearers' sense of completing a meaningful job. Instead endless, mindless, meaningless work, often standing in the same place all day using a dangerously sharp knife, surrounded by hundreds of other men doing the same thing, and by the unedifying sights and smells of freshly dismembered animals.'

This was written in 1977 by Kerr Inkson of Otago University. Maybe nothing much has changed in the last 20 years. The question is how much change will take place in the next 20 years?

The meat processing industry must constantly evolve to meet the ever changing market demands, hygiene requirements and tariff constraints. We only have to

look at the recent past to gauge the rate of change. To date there has been an emphasis away from frozen to chilled product, more emphasis upon food safety, more efficient transport systems and moves to mechanical assistance in processing.

The meat industry will continue to be an important economic base for Australia and New Zealand. There must, therefore, be increased investment to develop new plant concepts and operations to cope with the changes.

It is easier to predict what the meat plant of 2095 may look like than the plant of say 2010. We can predict what we wish for 100 years hence because we will not be around to be proven wrong. I suggest the plant of 15 years hence will largely be a development of what we have in 1995.

Generally, change in a meat plant design or concept is brought about by reaction to an anticipated event. Concept design of a new plant allows space to be allocated to a future process. This future process must be added at a later date with little or no interruptions to the ongoing process.

Following are current trends or developments which will probably continue into the 21st Century.

1. Genetic engineering to produce animals that grow faster, eat less, are leaner with consistent meat quality characteristics.
2. There will be an increased demand from developing countries with increased incomes for meat and proteins.
3. There will be increased market competition as developing countries establish their own meat processing plants.
4. Meat processors will need to produce better products at lower prices.
5. The industry will continue to have relatively small margins.
6. Large amounts of capital will need to be spent in response to consumer and market demands. Only large companies may be able to afford the capital input.
7. The customer will require meat in a more convenient form. The portions may be smaller and sold in a prepared form. The meat may be mixed with other items in a supermarket.
8. Meat will still be refrigerated but more in the fresh or chilled state than frozen.
9. There will be a growing emphasis on quality and HACCP systems with an aim to produce an aseptic product for the consumer.
10. The degree of automation in the plant will be limited due to the variability of raw product and the harshness of the environment.

11. Labour will continue to be employed. It may be cheaper to continue employing people on wages than installing expensive machines which need maintenance and down time. People will be needed to supervise equipment and plant.

There are three different ways in which the Meat Processing Industry of the 21st Century may operate. These are:

1. operations structured as existing;
2. centralised operations;
3. de-centralised operations.

We shall discuss each of these scenarios.

1. Development of Existing Operations

There would be a number of competing meat companies operating a variety of small, medium and high capacity plants. Each plant would have a degree of automation in direct relation to the size and cost effectiveness of the operation.

There would be strong competition for livestock and markets. Each meat plant will perform on-plant added-value operations as it sees profitable. The scenario would have support industries of fellmongery, hide processing, rendering, cutting etc., to support the small to medium plants.

There would be multi-shift operations for maximum utilisation of the capital facilities.

2. Centralised Operations

This may take the form of concentrating all operations into a small number of large high production facilities. The development concept would be similar to that in the Dairy Industry. This could signal the birth of the mega-plant.

Opportunities for centralised operations may be greater with a lesser number of companies. A monopolised or state controlled industry would be an ideal climate for the development.

These operations would feature:

- a high degree of automation and productivity;
- high plant utilisation with 24 hour, seven days per week operation;
- programmed livestock supply with an adjacent feed lot supported by a highly structured transport industry;
- concentration of production, labour, management and technical resources;
- concentration of services, water and effluent systems;
- single desk selling and marketing;
- potential for industrial disruption to have a heavy impact on production;
- maximum processing of products to a finished customer-ready state.

Each plant would feature a single highly automated cattle processing unit with a similar small stock unit. High productivity is maintained with the units operating continuously at maximum capacity.

Current studies of processing units tend to show high productivity in low and very high throughput rate lines. The majority of processing plants fall between these parameters and cannot match the productivities.

A variation of the scenario could feature a number of high productivity low throughput rate processing units located within the same premises. Each of the processing units would be largely independent but enjoy

the advantages of centralised management, technical and marketing support.

We could consider the following features of this option:

- opportunity for each processing unit to be owned by competing companies;
- in times of seasonal fluctuations, livestock supply and market variations, a complete unit may be shut down without affecting the overall plant productivity;
- centralised production, management, technical and marketing support;
- centralised by-product, freezing and refrigerated storage operations.

3. De-centralised Operations

This concept involves a network of meat plants located within the state, nationally or internationally. The idea is that each plant is located close to the raw material supply, i.e. livestock.

Each processing plant would slaughter and prepare the product into a basic bulk form. Each of these units would probably be small to medium size and highly productive.

The bulk processed product would be transported onto a further more concentrated network of finished product plants. These plants would be fairly highly automated, operating at multi-shift and concentrate upon further processing or adding value to one species or type of product.

Such plants would be located near population and shipping centres. The product finishing plants would be individually designed to process food and non-food products and highly specialised.

This concept has a number of interesting possibilities. The primal processing (slaughter and bulk product preparation) may take place in the country of origin. The finished product processing may take place in the country of end use or a developing country.

Finished product processing in the consuming country will be dependent upon labour rates and operation profitability. However, the concept does allow fast response time to customer requirements and the ability to prepare product exactly to market demands.

A further development may be to perform finished product processing in a developing country and on-ship the product to the consuming country. The developing country may be in the process of building its own meat processing industry and offer cheap labour and processing rates. Australia would provide production know-how to the operation and offer assistance to the developing country. In the future the product from the developing country will be in competition with that from Australia.

By designing the finished product processing plant to also incorporate locally produced meat there will be a consistent, quality product to the end user. From a quality and presentation point of view the consumer country would not be able to identify the origin of the raw product.

Through assisting with development of the meat processing and marketing, Australia will have an intimate inside knowledge of the developing country's product. The developing countries will eventually have an export meat industry with or without Australia's assistance.

There is a further refinement which incorporates decentralisation with a degree of centralisation.

Take the case of a company with several slaughter plants in one or adjoining states. Each plant slaughters and processes small stock. Instead of each plant duplicating plant and equipment, two of the plants would be selected to further process products.

One plant would be devoted to high quality added value products. The other plant would be devoted to bulk processing of low value products. Both plants would be capable of a 24 hour per day operation with high automation, utilisation and efficiency. These sectors of the plant would operate independently of the main plant. The volume of the product processed means more sophisticated plant can be justified than would be the case on an individual plant basis.

The system may also work with a number of companies having several slaughter and process plants. A joint venture company or consortium could be established to further process added value products.

Future Developments

What are some of the main developments we can expect to see within the meat plant?

1. Lairage

The emphasis in the lairage will be upon animal welfare, cleanliness of animals, elimination of bruising and the reduction of stress to avoid high pH meat. As the cleanliness of the skin is an important factor in relation to carcass contamination, some form of pre-slaughter hygiene will be necessary. The pre-slaughter holding time may be longer with animals housed in a darkened lairage. Humane slaughter of animals will be essential if conflicts with animal rights organisations are to be avoided.

2. Slaughter

A degree of automation is inevitable within the slaughter areas. We believe the error with recent and current attempts at automation are largely due to the equipment being designed to replicate manual slaughter operation. Carcass presentation with current slaughter systems is in a manner to suit a human being standing on the floor. The ideal way to hygienically slaughter and process an animal may be starting at the top and progressively work to the bottom. A robotic system may be located above, beside or below the carcass to suit the aseptic dressing operation.

The focus should be upon reduction of unskilled labour while maintaining essential skilled labour. There may still be tasks a human can do better and more economically than a robot.

3. Further Processing

Processing of carcasses after slaughter will be necessary to add value to the product and meet the requirements of the customer. The emphasis will be upon chilled product. This will need high capital equipment to process and manage a sensitive product.

The fluctuating seasonal supply of animals for slaughter will largely remain. A means must be found to evenly distribute chilled products to the market place over 12 months.

The current processing trends are toward:

- more complex specifications;

- smaller packages;
 - vacuum and controlled-atmosphere packing.
- These trends are likely to continue.

Meat plants are currently seeking to increase the percentage of processed chilled product and structure their further processing facilities for the future. If current design and operational practices are followed this will lead to an increase in largely unskilled labour. The bottom line is the additional cost per carcass which means added value becomes added cost.

Further processing is one of the few areas in which a meat plant has an opportunity to enhance its revenue. In the last 20 years there has been extensive research and development into slaughtering operations. While the cost per carcass in further processing is much higher than slaughter, there has been no strategic plan or target set to address this cost. We have a number of equipment supply and mechanical development companies individually producing marvellous machines, but they all appear to be reacting to an immediate demand. A slaughter concept was produced by MIRINZ 15 years ago. This ensured all were working toward the same target. The targets have been reached and we are now moving toward the third generation slaughter systems. The overall further processing operation target has not yet been identified.

The further processing operation is probably the most important to the meat plant and must ensure:

- added value does not become added cost;
- the customers specifications can be economically met;
- direct labour cost reduction;
- development of processing and packaging equipment to meet the expected complex production needs;
- supply of chilled product to the market place over 12 months.

4. Refrigerated Product

The emphasis will be upon fresh and chilled product. The customer will require the product all year round yet it is desirable for the meat plant owner to keep inventory at a minimum. The customer will also demand the products be bacteria free. Manual handling of meat is one of the largest contributors to contamination. High volume automated processing combined with aseptic packaging will be an inevitable result. The quality storage of the meat product from production through to end use will be critical.

5. By-Products

By products from meat plants will continue to be of high revenue importance. There will be an emphasis upon further refining of unprocessed by-products to a market-ready form – in much the same way as meat. The dairy industry leads the meat industry in developing systems to recover valuable materials from its waste streams. Efforts must be made to gain increased revenue from reduced costs and better products.

What the meat plant in the 21st Century may ultimately look like is really anybody's guess. The Industry will continue to be growing, dynamic and exciting. The structure, shape and operations within the meat plant will ultimately be dependent upon the needs of the market and customer. We already have the signs and the technology to plan the meat plant for the 21st Century. The Industry will continue to change and the challenge will be a willingness to invest in change.

