Processing challenges and *solutions*

In the highly competitive poultry processing industry, everyone from producers to processors and equipment manufacturers have driven design of ever bigger and better operation systems to supply a voracious market.

The chicken processing procedure starts with the arrival of broilers ready to be slaughtered. The broilers are driven together and put in crates or containers and transported, generally by truck, from the broiler houses to the processing plant.

The transport of live birds in both crates as well as containers is subject to strict governmental regulations. The number of birds transported varies according to these regulations, but also depends on the climate and size of the crate or container.

At the slaughtering department, a stunner is used to render the broilers unconscious before they are slaughtered and bled, passed through a scalding tank to loosen feathers and plucked. Next the heads and feet are removed.

Feeding the growing demand for chicken offal has called for the introduction of more and more sophisticated automated evisceration systems fuelled by speed, capacity, hygienic handling, and ease of operation whilst delivering maximum yields.

Following evisceration, intestine packs are transferred manually or automatically to pans on a pan conveyor, where they are presented together with their corresponding birds for quality and health inspection.

There are two stages in the chilling of eviscerated poultry: pre-chilling prior to cutting, weighing, deboning and packing, and final chilling or freezing after packing. Pre-chilling not only stabilises the product microbiologically, but also assists processing by presenting the optimal temperature for cutting birds into portions and deboning, the next steps after evisceration.

The products are then chilled frozen or used for further value adding such as crumbing, cooking and marinating. Products are then packed and move on for distribution.

Processing chicken into value-added products such as drumsticks, fingers and nuggets places hefty demands on temperature control. IQF (individually quick frozen) processed products are sold by weight. The quicker they are cooled or frozen the more weight and quality they retain.

Many chicken processors prefer to use spiral systems rather than expensive trolley freezing, and red meat processors of, for instance, hamburger patties and sausages, are picking up on the trend.

Two local companies specialising in spiral freezer systems for the poultry industry are Dale Spiral Systems and Bakery Automation and Albrecht Machinery, which represents Stein cooking and coating systems and has many systems installed throughout South Africa producing a range of value-added products.

Dale Spiral has installed many of its large spiral freezers (five and six ton per hour systems) in chicken abattoirs around South Africa. Albrecht Machinery, who represents world leaders Frigoscandia freezing systems locally, has the largest installed base in South Africa with over 130 systems running and many of its freezers serving the injected poultry industry with throughputs ranging up to six tons per hour.

How does spiral freezing work? Products are evenly fed from the production line directly onto the loading freezer belt, which quickly transports the product into the low temperature-freezing zone. The belt spirals up or down along the rotating drum until it reaches the top or bottom, where the frozen product can be gently discharged.

In many processing facilities there is a requirement to package products before freezing for items such as braai packs or bulk catering packs. These packs are typically packed into bulk cartons of 600 x 400 x 150 before freezing. Albrecht Machinery is a manufacturer of a carton freezer which is specifically designed to freeze cartons with retention times ranging from four to12 hours and capacities from two to 16 tons per hour.

Marel, leading global provider of advanced equipment and systems for the food processing industry, services the poultry industry with an extensive range of processing equipment including processing lines, and bone detection and brine injection systems. Tried and tested in the fish industry for decades, Marel's flow lines have also been welcomed in the meat and poultry industries with great success.

StreamLine, the innovative new poultry processing line, is extremely flexible and can be used for most deboning and trimming operations. With no limits on the weight distribution of the birds fed onto the line, advance grading is not required to achieve maximum yield. This integrates seamlessly with Innova, Marel's state-of-the-art production management software, which monitors and collects data on yield, throughput and quality throughout the entire processing cycle. Yield and throughput of individual operators is monitored in real-time, enabling managers to make the necessary adjustments to ensure that the line operates at peak efficiency.

Bearing in mind and the serious repercussions of marketing a product as 'boneless' and a consumer finding a bone in a product, Marel SA has announced the local availability of its SensorX bone detection technology for scanning deboned poultry meat. The machine automatically identifies bones and other foreign objects in poultry meat. It scans the product using advanced X-ray technology.

Brining is a common chicken processing method worldwide. The term 'brine injection' refers to the practice of tenderising chicken breast meat by phosphate solution injection, but the practice is also being used on other portions of chicken meat, which is in contravention of the relevant regulations.

The much publicised December 2010 media reports regarding chickens returned to a producer being reworked by thawing and re-injection with brine and then freezing it for resale have caused a public outcry, but Kevin Lovell, executive director of the SA Poultry Association, said in response that relatively few local chicken producers rework their returned chicken in this way and it is debatable whether the practice is good for the industry or even economically viable.

Lovell continued that even for those producers which do rework chicken (like Supreme Chicken, a subsidiary of Country Bird), returned chickens may be a total of 1% of their production, and of that 1%, half may be suitable for reworking as claimed in the media.

Astral's CEO, Chris Schutte, said that South African IQF chicken pieces are injected with 30-60% brine, but Lovell commented that what is important is the amount in the final product.

"For instance," he said, "you have a 1 kg chicken; you inject 30% brine before it is frozen, and some of it drips out. So the end product is a 1.25 kg chicken, which means it has 20% brine."

At a February 2011 meeting to "iron out differences" over findings in an interim report on brine injection into chicken meat, the Department of Agriculture, Forestry and Fisheries (DAFF), the Department of Trade and Industry (DTI), the Department of Health (DOH), and representatives of the SA Poultry Association agreed that the poultry industry must be regulated.

However, consensus has yet to be reached on the interpretation of the two statutes concerned: the Meat Safety Act 40 of 2000 and the Agricultural Product Standards Act 119 of 1990. With this in mind, the parties have agreed that further engagements should take place "as a matter of urgency" while the Agricultural Research Council completes its report.

Under section 15 of the Agricultural Product Standards Act, Regulation 4, item 9(a)

stipulates the solution concentration and the percentage mass increase allowed "in the case of the breast meat of a carcass that is treated with phosphate or any other chemical".

The meeting concluded that there were different pieces of legislation that impacted on food sales, and not only were the departments aware of overlapping mandates and different standards around enforcement, but there was lack of sufficient monitoring and control, which meant that acceptable brine levels of 8% were not being followed.

DAFF noted that the Quantitative Ingredient Declaration stated that chicken product should contain 92% chicken and 8% water, and this should be specified on the label. This department had already commissioned research to determine the extent of the problem with brine injections, with preliminary indications showing high moisture and sodium content. DAFF recommended a review by all three departments present of the regulatory regimes, looking to international best practice.

The DTI stated that it was more concerned with consumer safety and while, accepting the health risks of high salt concentrations in brine, wanted to ensure that consumers would be able to make an informed decision about their purchase.

The DOH said that brine injections had been standard worldwide practice for around 25 years, and was intended to enhance taste and preservation. It did, however, concede that more attention should be paid to labelling, health risks and consumer awareness. It cited lack of inspectors and control mechanisms as prime difficulties to monitoring.

And yet more processing challenges persist. Poultry is a common vehicle for food-borne illness. Healthy chickens ready for processing carry a variety of bacteria, which are present on the surfaces of feet, feathers, skin and also in the intestines. During processing, a high proportion of these organisms will be removed, but further contamination can occur at any stage of the processing operation.

The procedure for converting a live, healthy bird into a safe and wholesome poultry product provides many opportunities for micro-organisms to colonise on the surface of the carcass. During processing, opportunities exist for cross-contamination from carcass to carcass, the contamination of the carcasses from the environment, the process in the plant itself, and contamination via knives, equipment and the hands of workers.

ECA (Electro Chemical Activation) technology is a replacement for traditional chemical cleaning processes. ECA-treated ready-to-eat meat products stay fresher for longer and reduce the incidence of food-borne diseases. Additionally, the application of ECA products in the meat processing environment will result in:

- Eradication of spoilage micro-organisms
- Shelf-life extension
- Decontaminated offal and sausage casings which result in extended shelf-life of value-added products
- General carcass decontamination
- Working surface disinfection
- General food safety compliance.

Research has confirmed that food-borne outbreaks of Listeria can be traced to recontamination of the meat products during peeling, slicing, repackaging or similar procedures. ECA solutions have been shown to be repeatedly effective in reducing microbial counts by a minimum of 99.999%. Further studies confirm that the remaining microbiocial activity of ECA after application will also control general microbial build-up and limit the cross contamination of further products.

Radical Waters, which manufactures, produces and installs ECA hygiene management systems for food and beverage plants worldwide, says that independent studies have proven that their natural ECA sanitation solutions can safely be dosed into processing water or added to the final dip or spray before packaging. The company's ECA is approved by both Beth Din (Kosher) and SANHA (Halaal) for use within processing environments.