Managing hygiene with stainless steel conveyors

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One hundred years ago this year, a metallurgist in the steel city of Sheffield, England completed the world's first commercial casting of a material that would have an impact far greater than he could ever have possibly imagined.

His immediate objective was to solve the problem of premature wear in the barrels of guns used by British soldiers. However, and by no means uniquely in the annals of history, innovation driven by aggression would have an impact across more benign applications.

The alloy that Harry Brearly created in August 1913, a mix of iron and chromium, was of course stainless steel and it went on to transform the worlds of construction, manufacturing and – of particular relevance to readers of this publication – food processing and handling.

And while subsequent developments, notably the addition of nickel to the alloy (by Brearly's successor at the laboratory, one Dr W. H. Hatfield) would progressively improve the performance of stainless steel, its core properties are the reason why it remains the material of choice for so many food related applications.

The fact that stainless steel does not corrode or rust means there is no risk of a reaction with or contamination of the foodstuff being stored or processed. And, critically, it can be steam-cleaned and sterilised for maximum hygiene.

For our company, the arrival of stainless steel opened the door to new markets, enabling us to extend our expertise in steel, conveying and steel belt-based processing across the food industry.

In 1858, Sandvik founder Göran Fredrik Göransson became the first person in the world to successfully produce steel using the Bessemer process.

In 1901, we produced the world's first steel conveyor belt and Sandvik Process Systems was born. And in 1921 we commenced production of stainless steel.

Food applications

Throughout the 20th century, we have been responsible for introducing stainless steel belt-based processing to a whole range of food applications, from fish cutting and meat boning to ice cream freezing and chocolate conveying. Today, food products as diverse as fruit, vegetables, nuts, confectionery, shellfish, poultry, cookies, tea, coffee, fats, emulsifiers and more are processed on stainless steel belts.

For some of these applications, the thermal properties of steel are key to its use. Processes such as freezing, cooling, steaming, dehydration and baking (the latter based on carbon rather than stainless steel) all benefit from the belt's ability to conduct heat and operate in different conditions, whether intense hot, cold or humidity.

What is common to them all though is the superior cleanliness – and hence hygiene – of a steel belt compared with other materials. A textbook example of the importance of this is the meat cutting line.

Over the last year or so, horse meat and associated beef/pork mislabelling scandals have shaken consumer confidence in the meat industry throughout Europe and beyond. While the health risks resulting from this story have actually been negligible, they have once again put food standards firmly under the spotlight.

The meat industry therefore faces the challenge not only of compliance with strict legal regulations in terms of health, hygiene, safety and traceability, but also being seen to be taking every step possible to distance itself from the practices of the past. Meat cutting operations – with their multiple stages of handling, cutting, transporting, carrying and re-handling – are right at the heart of this.

Good food hygiene practices must be maintained, hazard prevention plans implemented, and every precaution taken to minimise the risk of bacterial build-up. In terms of equipment, anything that could come into

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contact with meat products – directly or indirectly – must be easy to clean and, where necessary, disinfect (both in terms of 'cleanability' and ease of access) and in reasonable condition (not scored or worn).

These guidelines cover all surfaces on which meat is handled, and one of the most critical pieces of equipment in this respect is the conveyor used to carry materials away from trimming or deboning lines.

Choosing the right belt

The major component on a conveyor – the part that comes directly into contact with the meat being processed – is of course the belt, and in broad terms there are three types to choose from: solid stainless steel, solid plastic and modular plastic.

As we have already noted, stainless steel's chemical and bacterial neutrality with food means it poses no threat to either human health or to the taste of food. Durability and corrosion resistance are other important factors; stainless steel systems last for years, even decades.

For meat conveying, the structure of the steel belt is another key advantage. Flat and solid, there are no gaps or textures in which bacteria can hide. Steel belts are installed in what is called 'endless' form, meaning the two ends are welded together to form the conveyor loop, then ground to remove any trace of the joint.

But the greatest advantage of a stainless steel conveyor in meat processing is its cleanability.

It can be sanitised in whatever way is most appropriate to the operation: hot water, pressure, brushes, detergents, chemicals or any combination of these.

Clear case for stainless steel

The case for the use of stainless steel conveyors in meat processing facilities has been enhanced by the publication of research by Finnish food laboratory VTT Expert Services Ltd confirming that the risk of problems caused by bacterial build-up can be reduced, simply by upgrading to a stainless steel conveyor.

The research looked at the 'cleanability' of the three basic conveyor types: a stainless steel (AISI 301) conveyor belt, a solid plastic belt, and a plastic conveyor of slat construction. All three were tested in pristine condition and also with knife damage to replicate everyday wear.

A suspension of three types of microbes – Pseudomonas fragi, Candida albicans and Listeria innocua – was applied to the belts and left for predetermined periods.

The various belt samples were then cleaned, visual observations made (dirt was clearly visible on the damaged plastic surfaces), swabs taken, and microbial loads assessed using scanning electron microscopy (SEM).

The results were clear. VTT Expert Services' research scientists concluded that stainless steel is more cleanable than the two different plastic surfaces tested according to the culturing results. The difference is more significant for damaged surfaces.

Of course, the threat to hygiene conditions is different when processing other product types, but the overriding case for stainless steel remains the same.

There are good reasons why foodstuffs are stored, handled and processed using equipment made of stainless steel and this applies as much to conveyors as it does to knives, mixing bowls, tanks and pipework.

There are commercial benefits too. The cleanability of stainless steel means conveyor belts can be cleaned and sanitised significantly faster, ensuring high availability – important in multi-shift operations.

Short cleaning times also represent best practice in ecological and economical terms, with low water consumption and low use of detergents and other cleaning chemicals.

So, while implementing best practice in food conveying may involve a higher initial cost than other technologies, stainless steel-based conveying makes sense from every other angle: hygiene, durability, productivity and environmentally. ■