

FOOD INDUSTRY GROWING TO NEW LEVELS OF AUTOMATION

UK food prices have risen 12 percent in the last five years, while incomes have fallen 10 percent. There were seasonal shortages this year and experts are predicting worldwide food shortages by 2020. Clearly the food industry needs to think hard about the future, reducing waste and increasing efficiency, as a recent food and beverage conference hosted by Mitsubishi Electric discussed.

Food processing and distribution in this country are already very sophisticated but improvements must be found if we are to face the future with confidence. Fortunately the industry is able to demonstrate a willingness to invest and innovate, upon which it can build.

"The UK food industry spends £1bn/yr on research and development," said Chris Buxton CEO of the Processing & Packaging Machinery Association (PPMA), first speaker at the conference. "This produced 8500 new products last year and contributed to the 16 per cent drop in carbon dioxide emissions since 1999. Quite a track record!

Buxton noted that over 85 percent of his members already supply to the food industry, and that many food processors are looking at increasing their level of automation. There are several reasons for this, including a desire to reduce wastage, a skills shortage, increasing costs, hygiene, food safety, security and environmental considerations.

Expressing all this from the perspective of an automation engineer, the needs are to reduce costs and increase yields, improve ingredient handling, enhance traceability and increase utilisation of plant and machinery, space, energy and staff.

This then links into the customer driven issues of product quality, agility with product changeovers, rapid product redesigns, extending product shelf life and keeping prices down.

"There is a constant drive for improvements in food processing, often fuelled by the demands of the major retail chains," said Buxton. "The food manufacturers have already done wonders with automation and lean manufacturing, and increasingly they are discovering a new weapon in their armoury – robots!"

Ten years ago there were very few robots in the food industry, and many production engineers were wary of them. They thought robots were expensive, complicated, unreliable and put people out of work. However a few slowly crept in, often in the packaging section, and they are now increasingly spreading across the whole plant.

"The old robot myths are evaporating fast. They typically cost £5/hr to operate, compared to £10/hr to employ a person and because they don't lose concentration or need rest breaks they are more productive. The typical return on investment time for a robot can be as little as 18 months.

"But the most important thing to understand is that rather than destroying jobs, they create them. Robots need people to look after them and to work alongside them, say inspecting or organising and if robots secure a company's future, they ensure jobs too."

Robots create jobs

A recent international study undertaken by the International Federation of Robotics, (IFR), calculates that on average a robot installation creates 2-3 jobs and that the alternative to a robot is often outsourcing work to an overseas supplier.

"Robots have some attributes that are particularly well suited to the food industry," observed Buxton. "They are very flexible and can be programmed to switch from one production task to another. And they don't breathe pathogens into the workplace, thus lengthening product shelf life.

"They can also have a very delicate touch, reducing product damage. One of my members, for instance, has recently built a robot for packing poppadoms and thus reduced breakages to virtually nil – something that human operators have never been able to achieve."

Another example of a successful robot installation was discussed by Graham Thomas of cake and dessert maker Grencore. When slicing their iced fruit bar cake, some of the fruit would smear onto the white icing. They considered several solutions for achieving a clean cut with no smearing and found the best to be to use an ultrasonic knife mounted on a multi-axis robot arm. This could generate a complex motion profile to simultaneously cut through the cake while following its movement along on a conveyor.

"We were able to achieve a fast payback on the costs, reduced product giveaway and wastage, speed up throughput and lower labour costs," said Thomas. "There were a number of issues to consider, such as guarding and cleaning, and we gained a lot in terms of ease of set up and changeover. We also gained the flexibility to use the robots on other tasks when we were not producing bar cake, which tends to be a winter product."

The investment into the robot system was about half the price of a more conventional servo solution.

"We are now sold on the idea of robots and will always consider them for future projects," enthused Thomas.

In control of control

Automated food processing plants inevitably reach a point where they need modernising, a subject considered by Adrian Caton of Niscam. The first observation of his presentation was that most machinery has a life expectancy that is far greater than its associated control system. "Often the control system is still operating well but newer technology with greater capabilities comes along and opens up the option for significant increases in productivity," explained Caton, "Hence the desire to upgrade."

"The problem is that after a time a plant can be using several different generations of control hardware and software. The management of this can quickly become very difficult. You need to keep an increasing number of spares, several sets of programming tools, maintain expertise on aging systems and keep accurate records of everything."

He noted that this sort of system evolution is inevitable. A good plant engineer will understand this and have management procedures in place to cope. It is a good idea to do regular site audits, having an inventory of all hardware and software (including spares), reassessing risks and emergency procedures and prioritising future actions.

"It is inevitable that automation systems will develop in-situ," he concluded. "So you have to set up proper systems to manage them."

Putting data to work

Automated production systems work best when the OEE (overall equipment effectiveness) is well managed. This involves two steps, collecting data from all around the plant and analysing it to produce clear, concise reports.

David Bean, speaking to the conference on behalf of Mitsubishi Electric, explained that production efficiency looks at many different aspects of a machine, line or process but is essentially the need to minimise downtime,

increase quality, reduce scrap or rework and maximise availability. OEE not only indicates how efficiently a plant is running, it also looks at trends to predict future issues.

"Only with improved, time-stamped data, continuously collected can production management be statistically analysed so that machine availability and product quality can be improved," he said.

On a single machine, problems can be quickly identified and rectified. Logging and monitoring fault codes and error messages will highlight recurring problems and enable appropriate actions to be taken. Trends in production tolerances can be monitored and corrections made before they impact detrimentally on product quality.

"The benefits of effective data logging quickly ripple through from improvements on a single line or cell to significant enhancements or refinements to the wider facility."

Another function of OEE data logging is that it provides, almost as a by-product, perfect product tractability data – an absolute requirement in modern food operations. It is also very good for energy management and other high level functions.

Dataloggers used to be separate pieces of equipment that had to be bought, installed and maintained. Nowadays they are a function within a modern PLC, such as the new Mitsubishi L-Series, so are an integral part of the control system. Indeed, some PLCs are able to process data and produce local reports, with the facilities to store this data to an SD memory card and/or communicate it to other parts of the control system.

"APLC's built-in data logging function provides a simple means for OEE monitoring, energy management, sequencing and production traceability. It also means that a plant's datalogging capability is automatically scalable and able to grow and adapt with the plant's evolution.

"There is a saying in control engineering: If you are not measuring it, you are not controlling it. Now we can add that with integral dataloggers "measuring is a piece of cake!"