



ABB

food quarter

Energy and utility savings

Issue **02**

SMARTER SYSTEMS FOR BETTER WATER

A roadmap for the future
of water

THE COST OF POOR POWER QUALITY

How manufacturers can protect
their plants against harmonics

FIVE MINUTE FOODIE

An exclusive interview with Arto
Liimitainen, technical manager at
Orkla Confectionary and Snacks

Energy and utility savings



In today's environment, food and beverage manufacturers are under a tremendous amount of pressure to not only meet consumer demand, be that through large quantities, varieties or custom products, but also to remain competitive when it comes to cost.

At ABB, energy efficiency is a topic that arises in almost all conversations that we have with manufacturers, so it was only fair that we dedicate the second edition of Food Quarter to this very topic.

With the industry being as diverse as it is, there is ample opportunity for plant managers to improve the energy efficiency of processes and activities. From the conversion of raw ingredients, to the packaging and delivery of products, all of these processes can be improved, even for the most efficient of plants. With over 130 years of energy expertise, and a broad portfolio of products, software and services, we understand the difficulties that plant managers face, whether they are an independent brewery or global manufacturer.

In this edition of Food Quarter we explore some of these difficulties, from the silent expense of food and how manufacturers can make big savings by going green, to how plant managers can protect their facility from poor power quality. In our Five Minute Foodie column we speak to Arto Liimitainen, technical manager at Orkla Confectionary and Snacks who has dealt with these difficulties head on by installing the latest YuMi robot to revolutionize its packing productivity and efficiency in its Finnish plant.

I hope that you enjoy the second edition for Food Quarter and that it not only gives you an insight into the importance of process efficiency for the food and beverage industry, but also some tips that you can use for your plant.

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Smarter systems for better water

It is surprising to hear that the principle ingredient that changes the taste of beer is water. Breweries in Burton upon Trent, an English town renowned for its beer, realized that the variety of minerals found in certain regions also leads to a change in taste. Here, Rob Terrell, principal consultant of ABB's food and beverage division, uses this discovery to suggest a roadmap for the future of water in the industry and explains how smart water grids can optimize manufacturing.

The breweries in Burton upon Trent discovered that, through a process called Burtonisation, they could modify the mineral content of different waters in order to mimic the water found in Burton upon Trent. This meant that the beer could be manufactured anywhere in the world without changing its taste.

“Advanced analytical software can be employed to continuously monitor the water distribution system and ensure the resource reaches maximum efficiency”

Having a system in place that optimizes water quality leads to a more efficient manufacturing process. Products are more consistent and the content of the water can be closely monitored. Although water is regarded as a cheap and plentiful resource, its impact on products such as beer is fundamental. Advanced analytical software can be employed to continuously monitor the water distribution system and ensure the resource reaches maximum efficiency.

Water in the food and beverage industry

Water is present in almost every step of the manufacturing process. Whether it's used in the growth and cultivation phase, for heating and cooling, for washing the raw materials,

or even to clean the manufacturing equipment, we couldn't operate without it. Despite this, water remains one of the industry's least cost-efficient materials. Water itself may not be a costly resource, but supplier options are geographically restricted and the rising prices of processes like water treatment contribute to ongoing costs.

Additionally, water is not cost efficient in food manufacturing because it is disposed of after a single process. Currently, contaminants that enter water during each manufacturing process are not effectively removed once the water is used, making it unsuitable for other tasks. With these limitations in mind, devices that continuously monitor the water distribution system need to be used to ensure that water can remain a plentiful, yet impactful, resource.

“By putting a properly instrumented water system in place, water can be distributed only when and where it is needed and with a better quality”

Smart water grids

A smart water grid uses instrumentation technology to closely monitor water distribution and to measure flow, detect



contaminants as well as to manage any additional processes that require water. By putting a properly instrumented water system in place, water can be distributed only when and where it is needed and with a better quality.

“Water use is not managed or monitored in the same way as other costs, there is little incentive to reuse or recycle it”

The biggest issue that water faces in the industry is wastage. As water use is not managed or monitored in the same way as other costs, there is little incentive to reuse or recycle it, not only because it is often thought of as a cheap resource, but because many people are wary of reusing potentially contaminated water. The introduction of smart water grids optimizes this wastage and ensures that used water is safely and efficiently repurposed. Even if the treated water is no longer suitable for consumption, it has the potential to be repurposed as gray water for use in equipment such as wet scrubbers or for cooling operations.

Technology that monitors and tracks water quality is also essential. In conventional water systems, the quality of the water is limited by the region it was sourced from. Smart

water grids liberate this quality and mean that water can be used in food production across the country. This is particularly useful when manufacturing food products that are predominantly stored in water, such as canned and jarred goods. By doing this, manufacturers can ensure that the taste of products will not be impacted by water quality, allowing for a better sense of continuity.

“Potential impact on the food manufacturing industry opens up many opportunities”

Looking ahead

In the same way that Burtonisation helps control the taste of beer, smart water grids can optimize the role of water in food manufacturing.

Although smart water grids are a fairly new technology, their potential impact on the food manufacturing industry opens up many opportunities for the optimization and improvement of water usage. While smart water grids helped give Singapore a greater degree of freedom in its own water distribution, they can also help to open up new avenues for manufacturers, whose manufacturing processes and product quality can benefit from a better regulated water system.

The silent expense of food manufacturing

Food manufacturers can make big savings by going green. Businesses in the food manufacturing industry typically have high product turnovers but low profit margins. This is partly due to their high energy consumption and increasing energy prices. Here we look at three ways food manufacturing plants can reduce the amount they spend on energy to increase their profit margins without compromising product quality.

As Industry 4.0 technologies become more popular and factories use more automated equipment, the demand for energy increases and as such, so do energy prices. Combined with the ongoing drive to boost environmental sustainability, food manufacturers need to focus their attention on energy efficiency and renewables.

Motors

Motors are used for many applications in food manufacturing such as conveyors and mixers. Traditional motors use fixed speed drives (FSDs) that run with a continuous maximum power input and are controlled with a braking system. They therefore use large amounts of excess energy that is not converted to useful output, making them expensive to run. Variable speed drives (VSDs) on the other hand are an energy efficient alternative that are controlled by varying the power input. They're useful for air compressors because applications in food manufacturing often have intermittent demands for air.

Boilers and heat transfer

Boilers are used to heat water and generate steam. The heat in the steam that is used to heat food is known as sensible energy. Once all the sensible energy has been used, the steam is condensed to water and removed from the system via condensate return equipment.

“Manufacturers must specify systems that allow 100 per cent of the energy in the water to be used”

This water contains heat energy that is then wasted. Manufacturers must specify systems that allow 100 per cent of the energy in the water to be used. This saves money by reducing the amount of steam generated and avoiding the need for condensate return equipment.

Additionally, all water in a food manufacturing plant, including waste water, must be treated to remove impurities and this requires energy.

Renewable energy

Renewable energy is a growing trend, accounting for a quarter of global energy demand growth in 2017, according to the International Energy Agency (IEA). Many food manufacturing plants are using renewable sources to supplement their energy supply — potato chip manufacturer McCain, uses the anaerobic digestion of waste water from potato processing to produce gas. This gas is then used to generate electricity.

ABB purchases electricity from renewable sources and has installed on-site solar photovoltaic (PV) power plants to supplement its energy supply. In addition, ABB uses low carbon transport options where possible, such as hybrid or electric vehicles.



The cost of poor power quality

Many food and beverage manufacturers are under significant pressure to protect their assets and critical processes from downtime and unnecessary costs that arise because of poor power quality events, like electromagnetic interference. Here we explain how manufacturers can protect their plants against harmonics.

Downtime in any industry can be costly. For food manufacturers, production downtime is estimated to cost between \$100,000 and \$1 million per hour. This is because loss of power resulting in unplanned downtime not only stops production, but also puts any product being processed at risk of going to waste.

Whether a plant experiences unreliable power or a complete electrical outage, not addressing the issue can lead to the failure of a plant's machinery, equipment or its components. In addition to this, depending on the process affected, costs relating to product loss and downtime can be significantly high overall. For example, New Zealand-based dairy manufacturer Fonterra produces over 22 billion liters of milk each year and the cost of four power quality events being incurred in a year is estimated to be £200,00 US dollars.

“A report found that nearly 60 per cent of power quality issues reported in the sample were caused by of harmonic distortion”

The vast majority of power quality issues occur because of harmonics and load imbalance. In fact, a report found that nearly 60 per cent of power quality issues reported in the sample were caused by of harmonic distortion. It was reported that the harmonics occurred because of the high usage and range of power electronics-based equipment and lighting in the manufacturing plant.

Harmonics, if unfiltered, interfere with the mains network, causing voltage disturbances, overheating, and electro-magnetic interference. Causing intermittent faults, short circuits or downtime, harmonic distortion reduces the overall operating efficiency of electrical networks and the lifespan of components.

To prevent these problems, manufacturers can protect their electrical infrastructure against harmonic currents by using active harmonic filters.



These filters work by providing harmonic mitigation, load balancing and stepless reactive power compensation for inductive and capacitive loads. With the ability to filter up to 20 harmonics simultaneously, this technology can be easily integrated into an existing network to retain a stable power supply.

Manufacturers can select from ABB's range of high, medium and low voltage capacitors and power quality active filters to mitigate any harmonics from the plant's mains network. Integrating these filters into a plant's electrical network lowers product quality variability, as the plant is continuously in operation without disruption.

With more and more businesses looking to find ways of reducing their own expenditures, addressing poor power quality can help manufacturers to increase their output and control energy consumption.



ABB launches food and beverage assessment portfolio

In food and beverage manufacturing, maintenance is the largest single controllable expenditure, with budgets often equaling 66 per cent of annual net profit. For many businesses, the cost of unnecessary maintenance is the same as total plant profit loss for one day of no production.

To aid manufacturers in identifying areas of productivity improvement and cost reduction, ABB has launched its new Assessment Portfolio, providing customers with a clear understanding of how to improve operational performance.

The assessments are broken down into three key stages. The first sees ABB experts conduct a comprehensive plant assessment on relevant processes, including water consumption, power generation, energy efficiency, power quality and electrification. Stage two comprises of results analysis and a report being produced, before stage three begins, where improvement plans are scheduled and implemented.

While every plant has its own areas for improvement, key focuses areas of focus for the Assessment Portfolio include safeguarding systems, food safety and contamination, electrical distribution systems, on-site harmonics and other power quality measurements.



“The new range of assessments provide companies with the ideal opportunity to combat some of the most common industry challenges,” explained Todd Gilliam, ABB US food and beverage segment leader.

“Whether companies are experiencing power quality issues or looking to increase productivity and reduce costs, the new range of assessments process will support them in finding the best solution for their business needs.

“ABB will help organizations complete assessments that range from safety and ergonomic aspects and electrical distribution systems, to on-site harmonics and a complete and comprehensive plant and factory assessment.

“The results of the assessments have already provided organizations with numerous benefits, including production availability improvements by more than five per cent, equipment life extension by ten per cent, and optimized plant process performance by up to 20 per cent. We hope that these new offerings will reaffirm our position as a key advisor and partner with our current and prospective clients.”

For more information about ABB’s Assessment Portfolio or any of its other products and services for the food and beverage industry, visit www.new.abb.com/food-beverage.

Five minute foodie

In an exclusive interview with ABB, Arto Liimitainen, technical manager at Orkla Confectionary and Snacks talks about how the latest YuMi robot has improved packing productivity and efficiency in the company's Finnish plant.



Food Quarter (FQ): Tell us about the latest robot technologies to be installed in your plant.

Arto Liimitainen (AL): Our Finnish plant has used robots to complete a variety of tasks for a number of years now. While the idea of the technology was not new, we wanted to explore new applications that could improve plant efficiency and productivity to strengthen the brand's market position.

FQ: How does YuMi differ to the other robots that you have in the plant?

AL: YuMi is a dual arm, small parts assembly robot with flexible hands, camera-based part location and state-of-the art robot control. Its biggest selling point to us is that it is a collaborative robot, meaning it has been designed to work side-by-side with factory workers without safety cages or fencing.

FQ: Can you explain how YuMi is used within your plant?

AL: YuMi is currently used as part of the end-of-line packaging process for our range of pick-and-mix candy. Built into a movable packaging cell, where candy from the production line is conveyed to the top of the cell and fed into a depositor, the robot uses its dual arms to select and move empty candy bins into place under the depositor. Once the bin is filled, YuMi then pushes the container forward where its second arm places a plastic lid on top. The arm then repositions and pushes the container forward into a lid sealer, where a label is applied before the filled bin exits the cell.

FQ: Did you face any challenges when integrating YuMi within your plant?

AL: YuMi was not initially considered for the job as, traditionally, the size of normal robots and the required safety equipment would prevent a person working side-by-side. Until recently, YuMi has mainly been used in the field of electronics, particularly in small parts assembly. Our Finnish plant is the first in the world to use a YuMi robot for end-of-the-line packaging of confectionary.

FQ: How has your team adapted to working alongside YuMi?

AL: YuMi is proving a great success within the plant. The robots take up far less space because you no longer require safety barriers and, problems, should they occur, are easy to recover from. It's not just the managers that YuMi has been a hit with. The plant's employees have quickly become comfortable working alongside the robots and have even named them.

FQ: What challenges can YuMi support you with over the coming years?

AL: The confectionary industry is a highly competitive sector, so, in order to compete and meet changing trends and consumer needs, we must maintain a strong focus on innovation. A demand for new products means that having a flexible production line is imperative to the success of the business and innovations such as YuMi allow us to maintain our competitive edge.

Benefits of energy saving

The food and beverage industry is consistently faced with challenges and is under increasing pressure to cut costs and increase production.

One area that is typically a large area of expenditure for manufacturers is energy.

Food and drink manufacturers account for more than 5% of industrial energy use worldwide.



Food and drink processing is the **fourth highest** industrial energy user in the UK



15.7% of energy use in the USA is in food related industries



In Australia, 17% of the country's manufacturing industry energy consumption is used on food manufacturing



Cooling is often a critical element of food and beverage manufacturing, but can be one of the largest areas for energy consumption.



Refrigeration, chilling and freezing can account for up to 50% of all electricity used at a facility.

Refrigeration processes use some of the largest motors found in food manufacturing plants.



Ammonia compressors use up to 450kW motors



Pumps use motors that average between 35-55kW

However, in many cases, motors are up to 20% larger than what is required.

Motors are a large contributor to energy inefficiency.



A fully loaded motor can consume its purchase cost in electricity in around 30 days of continuous running.



Carrying out maintenance on facility equipment can reduce energy consumption by up to 10%.



A plant that connects to everything.

Talk to us.

Are you thinking about digitalization but don't know where to start? Our comprehensive portfolio and consultative approach runs from power management to palletizing, and from automation to digitalization. So whether you need to start collecting data or analyze complete processes, we have the answer. Discover the possibilities at new.abb.com/food-beverage

