Low voltage AC drives

Inspiring ingredients for food and beverage
Improving productivity and quality with minimal energy use
Competitiveness in the food and beverage sector is highly dependent on the efficiency of the entire value chain, with the primary focus being on the performance of the production processes. Examples of today’s increasing challenges are high process uptime, permanent traceability, uncompromising hygiene and unbroken cold chain. Additional requirements include lowering energy consumption and minimizing maintenance costs. This leads to increased demand for ways to boost process control throughout the supply chain.

As the world’s number one supplier of AC drives, ABB’s products bring superior process control, savings in energy consumption as well as in operational and maintenance costs. Modern AC drives can help offset the squeeze on profits caused by changes in buying behavior and increased quality demands, whether in processing, packing, transportation or storage.

Automating the future
Recent years have seen a dramatic increase in the level of automation and, in particular, the use of low voltage AC drives. Automation leads to less errors in production, while optimizing processes and making them easier and faster. In addition, automation products can help solve challenges, such as:

- the demand for increased reliability, process uptime and productivity
- the requirement for higher quality final product
- increasing energy price
- replacing existing machinery with equipment that provides better control and flexibility
- ever stricter regulations on food hygiene and safety
- growing public concern for both health and lifestyle
- the need to improve traceability of ingredients and shipped consignments

ABB drives – highly reliable, energy and cost efficient
AC drives are primarily used to adjust the speed and/or torque of AC motors. AC drives replace many traditional techniques
For over 30 years ABB has been supplying AC drives to the food and beverage industry. Today, AC drives are used widely in all kinds of processes from the raw material handling to pumping and mixing of ingredients; from processing to conveyor and fan control; as well as during packing and storage. The benefits of AC drives are considerable improvements in plant efficiency, energy savings and reduced wear on moving equipment. In addition, ABB drives bring:

- higher quality of final products through more precise control of conveyors, pumps and other machines, achieving optimum flow rates, pressures, temperatures and volumes
- increased level of automation leading to better control of the entire process
- minimized energy consumption
- additional energy savings thanks to the high efficiency
- accurate dosage of ingredients
- improved electromagnetic compatibility (EMC) and low harmonic emissions

All this has a major impact on the financial running of the plant and can help to:

- increase plant throughput
- reduce energy costs
- maximize process up-time
- minimize maintenance costs
- comply with legislation and regulations

**How ABB can help**

Throughout all stages of food and beverage production, ABB offers:

- wide product range from pushbuttons to complete automation systems
- versatile services from technical support to plant engineering and energy appraisals
- global presence and local support in over 100 countries
ABB drives bring together a world leading and recognized brand, which has carved a niche as a global number one supplier for low voltage AC drives, together with a product range from 0.18 kilowatts (kW) up to 100 megawatts (MW) that is simply the widest available from any manufacturer.

ABB drives is a reference for drives users the world over and signifies reliability, simplicity, flexibility and ingenuity, throughout the life cycle of an AC drive.

**Cutting edge reliability**
Food and beverage processes require high reliability. All ABB drives undergo extensive testing prior to customer delivery. Furthermore, to increase reliability, drives are equipped with coated boards which protects the electronics and circuitry from wet or humid environments.

For the food and beverage industry ABB manufactures motors and drive systems, from sub-kilowatt to megawatt ratings in low- and medium- voltages.

**Minimized operational and maintenance costs**
An ABB drive can typically pay for itself through energy cost savings within months. By using the correct process speed, energy is saved, waste is reduced, and quality costs are kept under control. For example, the high electrical costs of operating cold storage systems can be reduced by varying the compressor’s motor speed, depending on the true temperature measured. The reliability of ABB drives reduces mechanical wear and downtime leading to increased process output.
Drives for harsh conditions
With combustible dust found in flour and grain handling industries, the risk of ignition is high. Special requirements are set for machine surface temperatures, bearings and critical components. For these special protection areas ABB offers dust ignition proof (DIP) motors that can be used with ABB drives according to ATEX certification.

ABB provides an IP66/67 drive that meets the stringent NSF/ANSI standard aimed at special purpose food equipment and devices used in wet and dusty environments.

Meeting Machinery Directive requirements
Safety functions are an essential feature of today’s AC drives and can bring benefits throughout the food and beverage industry. They control human and machine safety, and stop, automatically or manually, the machine process when the machine operator’s safety is an issue.

ABB's AC drives with built-in functional safety comply with the requirements of the European Union Machinery Directive 2006/42/EC. This directive is associated with standards such as IEC 62061 (Safety Integrity Level) and ISO 13849-1 (Performance Level), which require a well documented system and proven safety performance, as well as life cycle approach to safety.

Freedom to interface with plant control systems
ABB has expertise with the most commonly used fieldbus communications interfaces and protocols. Fieldbus technology enables process equipment to integrate with plant control systems. This improves the process control as well as condition monitoring from the process. ABB drives can be connected with most of the commercial fieldbus and plant monitoring systems.

Fast response to increased processing demands
ABB drives’ flexible application macros, together with advanced motor control, ensure accurate and fast response times to process flow demands. For example, the application control macro for pumps commands the drive to start additional pumps in response to pressure drops, should there be a surge in demand. As well as dedicated pump control, the drive provides a pre-pressurization for process start-ups.
Challenge
LU Finland Ltd produces Domino, the country’s leading brand of biscuit.

Weighing of ingredients for the biscuit fillings is critical and must be very accurate. Screw conveyors dose the flour and sugar, needed to make these fillings, onto the weighing scales. The company needed an AC drive to achieve accurate acceleration and deceleration ramps and speed references for the screw conveyor so to give the required dosing.

The filling of the biscuits is a continuous operation and needs an AC drive capable of high static speed accuracy. The process can not tolerate any speed rippling or fluctuation. A good, initial fast speed ramp is important to prevent waste at start-up.

Solution
To meet these needs, two ABB general machinery drives are installed. One drive controls the screw conveyors that dose and sift the flour and sugar needed to make the filling. The other one is the main drive controlling the speed of the filling conveyor. The controlled motor is a 2.2 kW, 400 V ABB induction motor, with a speed of 1,430 rpm. The motor runs the belt conveyor on the filling machine through a belt transmission.

Benefits
Ari Ylitalo, engineering supervisor at LU Finland Ltd. explains the benefits brought by the ABB drives: “The reliability of the control is the most important feature to ensure a continuous flow in the process. The new ABB drives have been in operation for almost a year now and fully meet our requirement for 100 percent reliability. We feel it is fundamental to keep abreast of the new developments in control technology, because even the slightest new advance might turn out to be a decisive improvement for our process.”
Challenge
With 15 production plants, Valio is Finland’s leading manufacturer of dairy products. Hygiene is of overriding importance to the company and the tanks and pipes used in dairy production are cleaned before each use.

Valio needed an effective system to control the motors driving the pumps in the washing process. The plant uses a variety of different types and combinations of washes, with all wash recipes stored in the plant automation system.

The clean-in-place (CIP) wash cleans the pipes with a wash solution taken from a reservoir, circulates it in the pipes and returns to the reservoir using return pumps. In the CIP wash, the nominal load in the pipes is a flow of wash solution which is approximately 30 cubic meters per hour. The average flow is about half of the nominal flow.

The flow rate and pressure in the pipes stay constant for most of the wash cycle, varying only during drainage periods and when the wash solution is being changed.

Solution
Two ABB general machinery drives are installed in the CIP10 and CIP11 wash lines for pipes. The drives control the wash pressure pumps. The ABB general machinery drives control the speed of the wash pumps through a speed reference supplied by the automation system as a 4-20 mA current signal to the analog input of the drive.

Benefits
The ABB drives’ communication facilities made them easy to integrate with the plant’s process automation system and PLCs.

Since the drives were installed in the wash lines, they have run non-stop with no problems and Valio has not needed to interfere with their operation in any way.

“The number one concern for our pumps and drives is 100 percent reliability to ensure full-time process availability. The ABB general machinery drives run trouble-free since they were put into service and we are completely satisfied with these drives,” says Matti Salmi, process manager.

If one of the drive supply phases fails, the drive does not simply stop operating – it gives an alarm and continues at a reduced output, allowing the problem to be noted and addressed.

The drives save space as they are about half the size of the previous drives.
**Applications**

**Catelli Food Beverage CFT, Italy:**
Tomato machine builder praises drive reliability

**Challenge**
Catelli Food Beverage CFT, based in Parma, Italy, is one of the world leaders in the manufacture of machinery for making tomato based products.

Because the tomato campaign is relatively short, running for 50 days between July and September, ensuring maximum uptime of its processing machinery is a key requirement. The company needs reliable AC drives to power and control its machinery. It purchases over 300 ABB drives each year, rated from 1.5 to 315 kW.

**Solution**
A typical tomato production line uses up to 10 drives for a variety of pumping applications including volumetric, extraction, transfer and mono pumps.

The key ingredient that Catelli Food Beverage CFT look for in its drives selection is reliability, as its machinery controls all phases of the production cycle, from raw material to finished product. This has given the company the leading position in the manufacture of continuous evaporators, having working capacities up to 13,000 tonnes per day of raw product, working non-stop over several weeks, without any loss in efficiency.

The company believes that ABB’s motor control platform, direct torque control (DTC), is instrumental in this particular application. Because mono pumps are of the screw-type, they require a high starting torque and current to overcome the friction. Without DTC the motor would burn out and the pump would fail to start.

**Benefits**
Many pumps suffer from solidification of the ingredients resulting in machine stoppage. Using an ABB drive, allows the pump to be restarted at a gradual speed, thereby avoiding the damage that would otherwise be incurred if the pump was started with maximum load. Maintenance costs are therefore reduced.

“We have never experienced failures with ABB drives and for this reason we will continue to use the ABB industrial drive range,” says Mr. Alessio Lazarri, technical director at Catelli Food Beverage CFT.

“We have been using ABB drives and motors for over 15 years. We have plenty opportunity to use drives from other manufacturers. But ABB has always been leaders with technology and is always available to service our equipment and needs in general.”

Unusually for an original equipment manufacturer (OEM), Catelli Food Beverage CFT views the energy saving benefits of ABB drives as a key factor in the sales of its machinery.
Applications

Bake-O Nomic, India: Reliability key for biscuit machine maker

Challenge
Bake-O Nomic is one of India’s leading OEMs of biscuit manufacturing lines, producing three fully automated biscuit production plants per year for sale mainly to Nigeria and other African markets.

Because biscuit making is a continuous process, with a number of stages feeding into each other, it is important that each stage is controlled at its own appropriate speed. All the machines, such as biscuit cutting, forming, oven and cooling conveyors are linked to each other, accepting materials or part processed biscuits and passing them on to the next stage.

One of the most reliable and energy efficient ways to control this sort of production line is through the use of low voltage AC drives. The company had tried locally sourced drives but had experienced many failures.

Solution
Bake-O Nomic decided to use ABB drives because of its reputation as a reliable supplier.

The drives are used primarily on biscuit cutting and forming machines, mixers, ovens and conveyors. About 20 drives are used in a single biscuit making line, most of them below 5.5 kW, although for mixers, drives as large as 30 kW can be used. Above 0.75 kW, ABB standard drives are used, while below this power ABB machinery drives are used.

Most are manually controlled individually, a method preferred by the company’s customers, who need a fine speed variation depending on the requirements of the type of biscuits being produced.

Benefits
As well as providing, efficient production for its clients for 10 years, ABB drives have been used by Bake-O Nomic to save energy in its own biscuit making plant.

Praful Dattaram Kale, owner of Bake-O Nomic, says: “ABB is renowned as a reliable supplier with a broad product range. Also, as ABB is a global player, we can benefit from its extensive service network. Should any of our equipment need repairing or maintaining as a result of a drive malfunction, then it can be fixed locally and efficiently.”
Applications

Heinz, UK: Canning line boiler plant gains 14 percent efficiency

Challenge
Food producer Heinz needed to replace the existing boiler plant at its site in Wigan, UK. The boiler plant was at the end of its operational life and unable to meet the latest environmental regulations for flue emissions.

The Wigan factory produces over 1.3 billion cans of food a year, requiring the generation of 100 tonnes of steam every hour for both space heating and sterilization of canned foods.

The plant operates six days a week and although steam demand is consistent, it ramps up slowly over a period of 36 hours and ramps down over a period of 24 hours. It also varies from summer to winter, when there is a greater demand for heating and more soup is produced.

Solution
To take account of these variations in demand and to meet the latest environmental regulations, the new energy center has four boilers installed, each with two gas-fired burners supplied by Hamworthy Combustion. The burners are fitted with fans to push air into the flame.

The eight fans are each controlled by 55 kW ABB standard drives which vary the speed of the fans to control the amount of air injected, depending on whether a high or low flame is needed. Heinz specified AC drives for use on the plant so that it could take account of the variations in demand.

Benefits
This ability to vary the flame to match steam demand is expected to make the energy center 14 percent more efficient than the old steam plant, which relied on mechanical dampers to choke off the air supply. AC drives are more responsive than mechanical dampers, which tend to introduce a time lag when demand changes direction.

Reducing the energy used also cuts the levels of nitrous oxide emissions, allowing Heinz to meet its obligations under the environmental legislation.
Applications

JMC Ventilation Refrigeration, USA:
Temperature and humidity precisely controlled

Challenge
JMC Ventilation Refrigeration, based in Washington state, USA, specializes in the design and manufacture of custom ventilation and refrigeration systems for potato and onion storage.

Company founder Joel Micka says: “Each potato and onion variety has its own temperature and humidity requirements for optimum quality and our systems need to hold very accurate settings – within a tenth of a degree – to allow food storage up to 12 months.”

Solution
JMC uses ABB standard drives to control fan-motor speed and airflow, keeping temperature and humidity at precise settings. The drives enable the fans to run more efficiently by matching air volume precisely to demand. When air demand decreases, the AC drive slows the motor down, saving energy and helping farmers maximize their sales margins.

Because storage facilities are often located many miles from the main offices, the new systems provide safety and efficiency through remote control and monitoring. Says Micka: “With the old systems using traditional motor contactors, if the motor current increased to a level that was too high, it would trip and shut down the motor and then shut down the whole system until someone checked on the building and restarted it.”

Benefits
In a typical installation, used in an onion store, six 18.6 kW drives use about 19.2 kWh at 100 percent speed. If the fans are reduced to 50 percent speed in the winter, when storage volumes are down and the outside temperatures are low, each of the fans use about 2.8 kWh. All six fans at 50 percent speed use less energy than one fan at 100 percent speed. If the six fans are kept at 50 percent during a one month period, savings of 70,848 kWh or $5,667 per month can be made.

With the optional intelligent Ethernet module, the drives can be monitored remotely, either through a modem or via the Internet, allowing faults to be quickly diagnosed and solved. Communications can be set up to send an alert via e-mail to the operators to warn them when a fault trip occurs.
Applications

Northern Foods, UK: Bakery saves energy on compressed air system

Challenge
Northern Foods uses compressed air in many of the processes at its Riverside Bakery in Nottingham, UK. As part of the company’s continuing efforts to cut energy costs, Northern Foods decided to investigate its compressed air system.

James Whieldon, maintenance analyst for Northern Foods, says: “Our monitoring and targeting software gives us profiles of the compressors and indicated that there were definite opportunities to improve the amount of energy they were using.”

Solution
An energy appraisal by an ABB Drives Alliance partner, confirmed the energy use figures recorded by Northern Foods and the use of a 45 kW ABB standard drive was recommended.

There are three compressors in total: two 30 kW fixed-speed assist compressors and a 45 kW duty compressor. The drive was fitted on this compressor, which is in operation all the time. One of the fixed speed 30 kW compressors is used to top up the pressure when demand increases, while the other is on standby in case one of the others goes down.

Because two out of the three compressors are always running, it was essential to ensure that the fixed-speed assist compressor only came online when the duty compressor, fitted with the AC drive, could provide no more air, that is, when it is running at full-speed.

This was achieved by installing a pressure sensor to provide accurate system pressure feedback for the drive’s built-in PID controller.

Benefits
Northern Foods is saving nearly 2,500 pounds ($3,960) annually on its compressed air system since installing the ABB drive.

Says Whieldon: “We calculate the actual payback time of the project is 1.5 years, achieving an annual saving of 2,450 pounds ($3,880). But with energy prices rising, the monetary savings will increase.”
Challenge
Northern Foods bakery in Nottingham, UK, produces chilled, pre-prepared foods for supermarkets, using large refrigeration units to store both the ingredients and the finished products. The refrigeration units are fed by cooling water pumped by three 75 kW motors.

Soft-start control panels have been used to control the motors since the plant was built in the early 1980s. However, as part of a wide-ranging energy saving plan, Northern Foods was keen to find a way to improve the energy efficiency of the pumping system.

Solution
A preliminary energy survey of the motors was conducted by the local ABB Drives Alliance partner. The existing soft-start control panels were removed and three 55 kW ABB industrial drives supplied in control panels.

Also supplied was a 4-20 mA analog temperature sensor connected to the drives’ integral PID controller, which uses the return temperature of the chilled water as its feedback signal. When the plant is working hard, the requirement for chilled water increases and the pumps run faster. When the plant is idling at weekends and holidays, the pumps run at a minimum speed, as the return temperature of the chilled water is already cool.

To save space, the drives are side mounted inside the control panels. The drives were installed individually which meant no lost production time as two out of three ran at any one time.

Benefits
Average power reduction was found to be 65.2 percent per pump, giving estimated energy cost savings per year of 30,000 pounds ($47,550) with a payback time of 10 months.

As well as the energy saving benefits, the system also provides accurate control of the chilled water temperature to the plant.

Says Northern Foods’ engineering manager Vernon Humphries: “Our ABB Drives Alliance partner could handle the entire project, from investigating and justifying the plans, to supplying, installing and commissioning. We are very pleased with the ABB drives and they have performed above expectations since installation.”

Applications
Northern Foods, UK: Refrigeration pumping system pays back in 10 months
Applications

Salt Union, UK:
Salt producer saves 1.6 gigawatt-hours a year on single fan

Challenge
Salt Union in the UK uses dryers to produce a million tonnes of salt every year. One of its dryers processes a coarse, granular product used in applications such as dishwashers.

However, much of the power it used was being wasted. The fan sucked air through the dryer at a rate controlled by a damper in the pipeline. During normal operation, this damper was 95 percent closed, so most of the fan’s energy was being used to suck the air through the narrow constriction.

The fan was badly oversized because the dryer was previously used to process vacuum salt crystals, which are much smaller than the spherical, 2-3 mm diameter particles in granular salt. The fine crystals created a far bigger pressure drop across the dryer than today’s coarse product.

The challenge was to find a way of cutting the energy wasted by the dryer because of the oversized fan.

Solution
An energy survey by the local ABB Drives Alliance partner was carried out to determine what potential savings could be achieved. The solution was to replace the single oversized fan with a smaller version equipped with speed control.

The original fan motor was rated at 337 kW, but the calculations carried out by the ABB Drives Alliance partner showed that 132 kW should be enough to create the draft needed by the dryer.

Benefits
The energy saving on the fan equates to over 1.6 GWh a year, a cut of over 60 percent. For an investment of just 20,000 pounds ($31,700), Salt Union is saving over 100,000 pounds ($158,500) a year.

At Salt Union, energy-saving initiatives are not confined to the process. Even the small amount of waste heat now produced by ABB’s AC drive is being put to work warming up the switch room in winter.
Applications

McDonald’s, UK:
Fast-food chain saves 50 percent on fan power

Challenge
During an upgrade of its UK kitchens, fast-food chain McDonald’s seized the opportunity to reduce wasted energy from its cooking equipment.

High air extraction rates in the kitchens caused an inrush of cold air whenever a door or window was opened. This affected the energy consumption of the cooking equipment as it attempted to maintain the cooking temperature. It also meant the air conditioning was working harder to maintain a comfortable temperature within the restaurant.

McDonald’s realised it could save energy and reduce its carbon footprint by controlling the speed of the large extraction fans using a low voltage AC drive. The company hoped to see a 40 percent energy saving and, through the soft-start feature of the AC drive, less wear and tear on the fan. It also wanted a reliable, easy to maintain drive from a well known, trustworthy supplier.

Solution
An ABB Drives Alliance partner was asked to look at the application and come up with the correct AC drive.

The solution was a 5.5 kW ABB standard drive for HVAC (heating, ventilation and air conditioning). Using the drive’s real-time clock, the partner made the fans run at full speed over the busy periods and at 80 percent speed at other times. On some installations, a boost button allows the fan to be speeded up to its full extraction speed if needed.

Benefits
The installation of the ABB standard drive for HVAC resulted in a 50 percent saving in energy, exceeding the customer’s expectation. The saving was even greater in locations that had oversized fan motors from the 1980’s.

Another major benefit is the reduced fan noise that the ABB drive allows, particularly important to McDonald’s at night. To avoid disruption, the fan would normally be fitted on one day and changed over in a quiet time the following day.
Applications

John Baarda Ltd., UK: Tomato grower doubles packing rate

Challenge
John Baarda Ltd is a company specializing in the growing of tomatoes. The company was experiencing difficulties with the mechanically interfaced conveyors on its tomato handling system, as their coordinating series of chains and sprockets are subject to wear and stretch.

This causes maintenance problems, with any timing adjustments having to be made mechanically, leading to production interruptions and reduced output. John Baarda needed a solution that would allow it to pack tomatoes more quickly and accurately while allowing quality inspection of the tomatoes.

The company asked D&D Engineering to develop a solution. Gavin Walker, Engineering Sales Manager of D&D Engineering (Hull) Ltd says: “The speed of the conveyer must be coordinated with the speed and timing of the wrapper to ensure that the tomatoes are delivered to the flow-wrapper at exactly the right time.”

Solution
D&D Engineering designed a conveyor system that uses ABB servo motors and ABB high performance machinery drives to control the speed of the tomato handling conveyors, matching the speed of the packing machine and ensuring that the tomatoes are packed quickly and accurately. An ABB component drive runs rollers on the conveyors, allowing the tomatoes to be turned automatically and inspected for quality.

The two feeder conveyors are each driven by an ABB high performance machinery drive in master-slave configuration, with the master receiving an encoder signal from the wrapper. This ensures that the drive knows where the wrapper is in its cycle and can control the speed of the conveyor precisely to ensure the tomatoes arrive at the wrapper at the correct time. If the speed of the wrapper changes, the drive can alter the speed of the conveyor accordingly to maintain the correct timing.

Benefits
Tim Howarth, Business Development Manager with John Baarda says: “With mechanical systems, we can achieve a maximum rate of around 60 packs per minute. With stoppages, this averages around 40 packs per minute. The ABB machinery drive based electronic control system gives us an average of 70 to 80 packs per minute.”

As well as quick and accurate packing, the drive’s programmed product menus allow different products to be run on the conveyor with quick changeovers. The AC drive system is also easier to build than the previous mechanical interfaced system and reduces operation and maintenance costs.
Applications

Cherry Valley Farms, UK:
Drives pay back in less than eight months

Challenge
Cherry Valley Farms is the largest manufacturer of duck and duck products in the UK, processing 45,000 ducks per day. Each duck is chilled so the chilling plant is a major part of the factory’s operation and accounts for a high proportion of its operating costs. Cherry Valley wanted to explore ways of reducing its energy costs using low voltage AC drives and so contacted its ABB Drives Alliance partner.

Solution
The partner conducted a seven-day energy analysis of the existing direct-on-line controlled condenser fans on the refrigeration plant, to establish operating costs at fixed speed. It found that the four fans had a combined measured power of 38 kW.

The refrigerant gas enters the condenser, where fans are used to help cool it down to atmospheric temperature and turn it back into a liquid, ready to expand and cool once again. The head pressure signal was used to control a low voltage AC drive to keep this pressure perfectly at its design point, varying the fan’s speed to meet the chilling demand. On completion of the project, a further seven-day energy analysis was carried out and the savings and payback periods calculated.

Benefits
It was shown that the drives on the four fans had saved 13 kW in total, representing an annual saving of 7,400 pounds ($11,750). As well as the energy saving on the condenser fans, the reduced on-off cycling of the refrigeration plant lead to a further 10 percent reduction in compressor power. It also significantly reduced fan noise, improving the environment for neighbouring properties.

Drives were installed on other processes including air compressors and water pumps and the facility is now making energy savings of 25,000 pounds ($39,690) a year after installing 16,000 pounds ($25,400) worth of ABB standard drives. The original forecast estimated that payback would be in 12.6 months; yet actual payback time was only 7.7 months.

Darren Bolton, Operational Improvement Manager at Cherry Valley, says: “The theoretical results were all backed up with good graphs and charts. We doubted the energy savings and needed ABB’s partner to prove each drive in turn. That also gives you trust in your partner because if the proof is not there, we simply did not have to pay for the drives.”
Applications

Pooles Pies, UK:
Pie maker set to cut 11 percent off refrigeration costs

Challenge
Pooles Pies of Wigan can produce 200,000 meat pies a day, as well as 80,000 other puff pastry products.

The installation of a new production line, complete with spiral freezer, designed for the manufacture of a variety of puff pastry products, prompted the company to look at improving its energy efficiency. For many companies in the food manufacturing sector, refrigeration can account for 70-80 percent of the electricity bill, so any savings made in this area are likely to be significant.

Solution
Installers Seward Refrigeration chose ABB drives to run two of the major components in the refrigeration system, which operates on pumped ammonia refrigerant at an operating temperature of -40 °C. The condenser is an evaporative type with the fan controlled by an ABB standard drive. Variable speed operation of the fan gives significant reduction in power even for a small reduction in speed. For example, a 10 percent speed reduction gives 30 percent less energy consumption.

A single 315 kW screw compressor is used to provide refrigerant for the spiral freezer. Using an ABB drive permits energy saving at part load conditions. The screw compressor can operate at speeds between 1500 and 3600 rpm at 100 percent slide valve position. With this mode of operation, the machine operates at optimum efficiency for any given speed.

“Although the full load efficiency of screw compressors is good, part load performance with slide valve control is generally poor. With variable speed control of the compressor at Pooles Pies we now have the best of both worlds: good efficiency at both part load and full load,” claims Brian Seward of Seward Refrigeration.

The screw compressor uses a low harmonic, ABB industrial drive, which minimizes harmonic interference on the mains supply and avoids the use of complex solutions to ensure conformity with G5/4 requirements.

Benefits
Pooles Pies expects an 11 percent cut in the cost of electricity following the installation of the ABB drives. The reduction will see costs cut by over 6,200 pounds ($9,845), giving a payback for the project of 2.3 years.

Other advantages of the ABB industrial drive include operation at unity power factor, allowing reactive power charges to be avoided. The standalone design of the drive gives it a small footprint, minimizing space requirements in the control room.
Challenge
One of Italy’s major pig farms, producing over 10,000 animals a year in large breeding sheds, needed a solution to ensure a continuous air exchange and strict temperature control within the sheds.

In the past, this type of operation has relied on fixed speed fans which can only be either on or off. Consequently, when motors are on, they operate at their top speed, wasting a lot of energy.

Solution
FR Sistems of Bagnolo Mella (Brescia) developed a system consisting of 126 fans of 1.5 kW, driven by low voltage AC drives, guaranteeing an appropriate air flow throughout the large shed areas.

ABB general machinery drives, rated 2.2 kW and with IP66/67 protection class, are arranged in groups of 5 or 6 units and control the same number of fans. Each group is monitored by a PLC, which varies fan speed according to ambient conditions in the breeding sheds. The PLC measures temperature in its area and adjusts the speed reference of the drives, preventing the wasted energy typical of traditional systems. ABB drives keep the motor speed at the correct level to ensure the best combination of consumption, speed and noise.

Benefits
The biggest benefit is the 60 percent reduction in energy costs, compared to the system that it replaced, giving a payback time of about 15 months.

The pig breeding sheds are a wet and dusty environment where pigs are sometimes washed with high-pressure warm water. With their IP66/67 protection class, the ABB general machinery drives are designed to operate in these challenging and harsh conditions.

The shape of the heat sink fins allows water to drain away, providing easy and complete cleaning. The multilingual control panel is included as standard and is placed behind a clear plastic window so that it can be used without opening the cover.

The drives are easy to install, program and commission and, as they have no external moving parts, they are also easy to service.
Challenge
The Village Bakery (Nutrition), of Wrexham, UK, is the most advanced gluten-free facility in Europe, manufacturing some 250,000 loaves a week.

An important part of the baking process is the depositing line, a conveyor-based system that divides the dough into the correct weights to make various rolls and loaves. When the company added a second depositing line, it realized that better speed control could improve the efficiency of the new line.

The company had identified potential savings of 10,000 pounds ($15,875) per year in energy and materials. “The old drive was so slow and inaccurate that the machine had to start spraying the greasing agent before it ‘saw’ each tin,” says Christien Jones, director and projects engineer.

Solution
An ABB general machinery drive, with high ingress protection IP66, was chosen. Designed to be quick and easy to install, the drive was installed by the Village Bakery’s own staff.

Benefits
The improved speed control brought by the new drive is saving the Village Bakery 20,000 pounds ($31,750) per year, double what the company expected. These savings are made in a number of ways.

The first saving is a 10 percent reduction in tin greasing agent. More accurate control means that more of the greasing agent ends up in the correct place.

The ABB general machinery drive also optimizes the speed of the conveyor to match the size and throughput of different products more accurately. In this case the unit is programmed with four different speeds, leading to savings of around 25 percent in the running costs for the line.

The new depositing line has reduced downtime at the bakery, since production staff can shut down each line independently for cleaning without halting production. As the drive is protected to IP66, frequent wash downs are no problem for the drives.

According to Jones, the drive has been “a roaring success”. He also praises the support that ABB has provided for the bakery: “The technical back-up was great, and ABB is always ready to help.”
Applications

The Sugar Cane Growers Cooperative, USA:
Sugar centrifuge cycle times improved by 20 percent

Challenge
The Sugar Cane Growers Cooperative of Florida is a 54-member sugar farmers’ cooperative. At its Belle Glade plant, 24,000 tons of sugar cane are ground daily, producing on average 350,000 tons of raw sugar annually. During the October through April harvest season, the plant operates 24 x 7.

The Cooperative decided to replace the drive control on a Titan 1750 centrifuge, which has a 450 hp (335 kW) motor. The existing drive was outdated, tripped frequently and was expensive to repair, resulting in shutdowns. Because space was scarce, the Cooperative wanted a drive system with a compact footprint that would work with the existing OEM-supplied control configuration.

Solution
Hummel Industrial Sales of Fort Lauderdale supplied an ABB regenerative drive for speed and torque control – the first of its kind installed in a sugar-processing facility. It offers a compact drive, regenerative capability and exact motor sizing.

Installation time was shortened because ABB matched the existing control system from the OEM without using any relays, outside control interfaces, or PLC’s. “The ABB regenerative drive was able to power the motor and match the input power supply precisely, eliminating any additional spikes or fluctuations,” says Chris Visage of Hummel Industrial Sales.

“Because the throughput has increased, the Cooperative will be able to use the existing motor to the fullest, instead of dissipating much of the energy, which was the case with their prior drive.”

Benefits
The drive provides precise and rapid motor-speed response based on exact variations of the centrifuge load. This cut the centrifuge cycle time from 44 to 32 seconds, a 20 percent improvement. Direct torque control (DTC) enables rapid deceleration at the end of the cycle, saving valuable seconds in unload and reload operations. Additional time and energy savings are realized, as the energy from the spinning centrifuge, which turns the motor into a generator, is recovered and transferred via the drive to an adjacent centrifuge. The ABB drive’s small footprint also results in space savings of 40 percent.

Whereas the previous unit failed at least once a year, costing thousands of dollars in replacement parts and crippling the production line, the new drive is highly reliable. Reliability was important in addition to a drive that could re-capture the power lost when the centrifuge recycled.
As the premier company for low voltage AC drive technology, ABB has dedicated experts who understand all details of food and beverage applications; who talk your language; and who can offer the quickest route to a profitable solution, without forgetting personnel safety and environmental responsibility. Here's how.

**Leading technology in design and production**

For over 100 years, ABB has consistently invested a large proportion of its turnover in research and development, working closely with some of the world’s leading universities and institutions. The result is the most advanced range of AC drives, designed to meet the specific needs of various food and beverage applications. This has also lead to several patents for leading-edge technology within ABB drives.

ABB’s reputation is further enhanced through its work with world-leading authorities and legislative bodies. This cooperation contributes to the safety of ABB's products and thus the personnel safety of the users.

Cooperating with its sub-suppliers, ABB can exploit the latest component technology when designing its drive products. This results in improved quality of ABB’s drive products and in enhanced component quality.

ABB’s drive manufacturing facilities are equipped with with the most modern production lines using the latest production techniques and advanced software. Precision robots, combined with fully automated material flow and testing routines, guarantee high quality of products and short throughput times.

As part of its supply chain management, ABB is the first manufacturing company in Europe using radio frequency identification (RFID) of components which considerably improves product quality and traceability.

Product reliability is further enhanced through stringent quality control procedures, with all manufacturing facilities operating to ISO 9001. Identical manufacturing facilities are located in Finland, the USA, China, India and Estonia.

**Complete technical advice from selection to installation and use**

ABB constantly monitors all legislation, regulations, directives and standards, not only ensuring that its products comply but by offering sound advice to customers. Examples of directives guiding the design and use of AC drives are the European EMC (electro-magnetic compatibility) directive and the low voltage directive.

Another example is ATEX, which became mandatory in July 2003. ATEX is the European regulation covering equipment intended for use in potentially explosive atmospheres. ABB is one of the first companies to gain blanket ATEX certification for its ABB industrial drives and flameproof and non-sparking motors, for use in hazardous areas. By gaining the blanket certification, ABB can provide combined ATEX-approved drives and motors packages that do not need further testing on site.

ABB's expertise extends throughout food and beverage plants’ entire electrical installation. ABB's engineers can advise on the correct selection, dimensioning, installation,
operation and maintenance of drives, motors, transformers, relays, switches and contactors through to transducers and meters. Advice is available on long cabling, weak networks, protection functions, harmonics, EMC, power factor correction, mounting options and air flow requirements.

Using harmonic filters developed by ABB eliminates the severe plant disruptions caused by harmonic disturbances in electrical equipment. ABB offers proven ways to assess the users’ vulnerability to harmonic problems and your need for filters.

In many applications there is a need to interface the drives with external systems. ABB has the expertise in all high performance communication protocols.

ABB offers knowledge-based publications which include a series of detailed technical guides covering harmonics, EMC, bearing currents and motor control platforms, through to single page FactFiles, offering the latest thinking on topical subjects. These, and much more, can be downloaded from www.abb.com/drives.

**Thorough process know-how for improved competitiveness**

Not only is ABB the leading supplier of low voltage AC drives but it has also built a formidable databank of all applications from pumps and fans through to conveyors, centrifuges, mixers and packaging machines.

This know-how has been honed in tackling many unusual applications across a variety of industries. As such, ABB boasts that no application is beyond its experts. Today, ABB has created an enviable team of dedicated industry specialists whose focus is on their chosen industry but who share the knowledge from other sectors to their benefit.

This pioneering spirit has its roots in the 1970s when ABB developed the very first high-power AC drive. In subsequent decades, ABB has lead a technology revolution, which is driven by the needs of its customers. ABB is recognized as the world’s leading application engineering organization.

ABB’s advice covers all aspects of process control and focuses on increasing production capacity, improving end product quality and reducing waste and maintenance costs.
Sustainable development for people and the environment
All food and beverage producers experience financial and environmental pressures to reduce energy consumption.

One of the biggest benefits of using AC drives is the energy saving opportunity over fixed speed motors or conventional speed control. As such, ABB is a world leader in assessing the energy saving potential within all industries.

A structured process that includes an energy appraisal, coupled with a series of energy saving tools, has been devised to ensure that customers can quickly see the benefits of changing to AC drives. Greenhouse gases are also reduced thanks to AC drives.

ABB has devised a replacement drive scheme for upgrading older, inefficient drives for new, space saving and highly efficient ones. Following an assessment of a plant, ABB helps select a replacement drive with improved efficiency and features for the application.

In some countries, ABB is able to remove the redundant drives, regardless of the original manufacturer and ensure that they are disposed of in accordance with the latest world standards. ABB’s commitment to the environment means that old drives are recycled whenever possible. All new products, even the packaging, are designed for recycling.

The ISO 14001, international environmental management standard, has been implemented and the Finland factory is certified since 1996. Life cycle assessment is applied continually to all product development. All certificates and declarations relating to environmental issues can be found at www.abb.com/drives.

Health and personnel safety is a fundamental part of ABB’s commitment to sustainability. ABB cares deeply about how its operations and products affect its employees, customers, contractors and neighbors.

Many of the industries in which ABB works – often on customer sites – are by their nature very challenging and, accordingly, ABB operates to the highest standard of occupational health and safety excellence, and remains constantly vigilant in carrying out its duty of care.

ABB’s ultimate aim is to prevent all accidents, injuries and occupational illness through the active participation of its customers, contractors and employees.

The successful management of safety starts with the involvement of everyone, from the CEO to ABB’s front line workers in a systematic and continual focus on hazard recognition and mitigation.

ABB’s combined efforts and commitment allows it to achieve continuing improvement in its safety record.
The ABB global technical partner network brings ABB’s products and services straight to your front door. The partners have in-depth knowledge of local markets and are conversant with the ABB low voltage drives products and processes. Many of them also have extensive industry and application knowledge and experience.

The technical partner network includes technical distributors, system integrators as well as electrical wholesalers. Each brings its own set of skills and services and, collectively, they can tackle all your diverse drives needs, and a lot more.

**Customer driven network structure**

ABB technical partners are authorized according to a global program. They provide a quality of services that are world-class and globally consistent.

All ABB technical partners are authorized for the relevant category of the partner program. The category describes the product line and services the partner is authorized for and promoted by ABB towards the end-customer.

Partner companies are regularly trained and audited to provide consistency in the services and support. Together ABB and the partners strive for continuous quality improvement for products and customer services.

**Maximized process up-time and energy efficiency**

The partners are fully conversant with ABB drives and many have thorough application knowledge. The partners can help with all kinds of drives and motors related issues to improve process efficiency, and offer support wherever and whenever it is needed.

The ABB drives technical partner network provides consistent and authorized quality in sales, support, service and engineering, both globally and locally.

Via dedicated sales engineers and authorized technical personnel, the ABB technical partner network provides the following services:

- Optimized product dimensioning and selection
- Technical product support
- Engineering
- Installation
- Commissioning
- Preventive and corrective maintenance
- Spare part services
- Training
- Access to an extensive stock of ABB products and spare parts

**Categories and main focuses**

All ABB technical partners are authorized for the relevant category of the partner program.

Find the members of the network at [www.abb.com/drivespartners](http://www.abb.com/drivespartners).
ABB has the largest service team of all drives suppliers. Field service engineers with experience within the food and beverage sector are located worldwide.

The service team works to the ABB drives life cycle management model. This model offers maximum profit for your investment by maintaining high availability, eliminating unplanned repair costs, and extending drive lifetime.

The life cycle management model comprises a palette of dedicated services for the entire life cycle of ABB low voltage AC drives. Services include:

**Energy appraisal**
The increasing interest in AC drives in the food and beverage sector is partly due to a greater awareness of energy issues and rising energy prices. In many countries, ABB offers energy appraisals that can rapidly determine just where and how much energy can be saved.

Power savings up to 50 percent can be reached by reducing the motor speed by just 20 percent, with payback as short as six months.

**Harmonic survey**
ABB collects data on harmonic currents and voltages interfering with the electricity supply network and details actions to minimize them.

**Selection and dimensioning**
Whatever the food or beverage application, ABB’s vast experience will help in the correct selection and dimensioning of the drive. This ensures the correct drive installation, powerful enough for your motor requirements.

**Installation and commissioning**
ABB’s certified engineers install and adjust the drive according to the application requirements as well as to instruct the user on how to operate the drive. All commissioning information and the production parameters are saved, should the engineer need to restore any information at a later date.

**Training and learning**
ABB offers dedicated drives training for service and operating personnel to acquire the skills to use ABB drives correctly and safely.

**Technical support services**
Technical support services provide accurate, consistent and responsive information and support to all ABB customers.

**Maintenance and repair**
ABB recommends regular preventive maintenance throughout the lifetime of low voltage AC drives.

Maintaining drives in accordance with the maintenance schedules, ensures maximum availability, minimum repair costs, optimized performance and extended lifetime of the drive.

Maintenance can be performed on a contract basis.
Drive preventive maintenance (PM) consists of annual drive inspections and component replacements according to the product specific maintenance schedules using PM kits which contain all the service parts and materials defined for a certain preventive maintenance.

ABB's certified engineers provide maintenance and repair services on site and in authorized ABB drive service workshops.

Workshop services include:
- Module maintenance and repair service - instead of performing maintenance or repair on site, modules can be sent to an ABB drive service workshop. It is often practical to recondition the drive at the same time.
- Exchange unit service - a convenient and fast way to fix a problem with a drive is to order an exchange module. A reconditioned drive is immediately shipped to the customer (subject to availability). The defective but repairable unit is returned to ABB.

Spare part services
Genuine ABB factory-certified drive parts are delivered quickly worldwide. They guarantee full compatibility and are available throughout the drive lifetime following the drive life cycle model.

Spare part services include:
- Parts OnLine - a web based spare part information and ordering system for quick and easy access from your PC around the clock. Address: www.abb.com/partsonline
- Conventional spare part service - contact your local ABB representative for spare part orders.
- 24-hour emergency spare parts service - provides spare parts 365 days a year.
- Preventive maintenance kits - contain all the replacement parts for a scheduled maintenance.
- Inventory Access - an ABB owned and maintained spare part inventory at the disposal of a customer. This spare part inventory is usually located at the customer’s site or at an ABB location. This service provides the customer with up-to-date spare parts with no capital investment for a fee that is based on the inventory value and duration of the contract commitment.

Upgrade and retrofits
Drives upgrade and retrofit offerings are designed for improved performance and extending the life cycle, resulting in the best possible return on your drive assets.

Replacement and recycling
ABB's replacement drive scheme provides a correctly dimensioned drive, while disposing of old equipment. The scheme covers any drive or motor, regardless of the original manufacturer.

ABB drive life cycle management model

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<th>Active</th>
<th>Classic</th>
<th>Active</th>
<th>Classic</th>
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<td>- The drive, with complete life cycle services, is available for purchase.</td>
<td>- The drive, with complete life cycle services, is available for plant extensions.</td>
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Complete life cycle services
To ensure the availability of complete life cycle services, a drive must be in the Active or Classic phase. A drive can be kept in the Active or Classic phase by upgrading, retrofitting or replacing.

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<th>Active</th>
<th>Classic</th>
<th>Limited</th>
<th>Obsolete</th>
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<td>- Spare parts, maintenance and repair services are available as long as materials can be obtained.</td>
<td>- ABB cannot guarantee availability of life cycle services for technical reasons or within reasonable cost.</td>
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Limited life cycle services
Caution! A drive entering the Limited or Obsolete phase has limited repair options. This may result in unpredictable process downtime. To avoid this possibility, the drive should be kept in the Active or Classic phase.

ABB follows a four-phase model for managing drive life cycles, which brings enhanced customer support and improved efficiency.

Examples of life cycle services are: selection and dimensioning, installation and commissioning, preventive and corrective maintenance, remote services, spare part services, training and learning, technical support, upgrade and retrofit, replacement and recycling.
From initial preparation to packaging and distribution, ABB offers complete integration of electrical, automation and instrumentation systems across the food and beverage industry.

Every day, ABB integrates complex IT solutions, process control and SCADA systems, sequential control, field instrumentation and analyzers, AC and DC drives and motors, medium and low voltage switchgear, building automation technology and cabling.

With innovative products and in-depth process and automation experience in food and beverage, ABB’s integration experts can deliver reliable and economical systems tailored to the exact production demands.

ABB supplies turnkey custom solutions, either as a sole supplier or in a consortium with civil and mechanical contract partners.

Motors
As a motor specialist, ABB can match drives and motors to ensure they are exactly right for an application.

Since motors account for a major part of the total consumed energy, increased efficiency levels are extremely cost effective. The EU has prepared legislation to introduce a mandatory EuP Directive 2005/32/EC Eco-design of Energy using Products for low voltage motors. The regulation covers almost all 2-, 4- and 6-pole single speed, three-phase induction motors with a power range of 0.75 kW to 375 kW. ABB has full range of motors in IE2 class. Also premium efficiency motors in IE3 class are available.

The ATEX directive is important to food and beverage manufacturers, especially those which produce or handle potentially explosive powders or fine dust, such as flour and grain, and those which have alcohol fumes in the atmosphere. With a range of motors designed to meet the demands of ATEX, along with compatible drives, ABB will make sure a plant complies with the legislation.
Instrumentation
ABB supplies a comprehensive range of measurement and control products and systems for use throughout food and beverage. Utilizing the latest communications technology, these products can help customers to ensure efficient, reliable and economical performance, from the plant floor to the control room to the boardroom.

ABB's measurement and control portfolio includes:

- Pressure and temperature sensors and transmitters
- Flowmeters, including a hygienic design for maximum protection against potential product contamination
- Analytical sensors and transmitters for accurate measurement of a diverse range of chemical and gas parameters
- Level measurement sensors and transmitters
- Recorders, controllers and indicators
- Actuators and positioners for reliable and responsive valve control

Low voltage products
ABB's extensive portfolio of low voltage products and systems can help optimize electrical performance throughout the food and beverage chain. All of these products have been certified to the leading international standards, enabling customers to count on safe, reliable and efficient operation.

Distribution and protection:
- Energy meters
- Circuit breakers
- Switches and fusegear
- Enclosures and cable systems
- Industrial plugs and sockets
- Modular DIN rail products
- Wiring accessories

Control products
ABB provides a range of control products, including:
- Contactors
- Electronic and overload relays
- Motor starters and soft starters
- Operator panels
- Pilot devices
- Programmable logic controllers (PLCs)
- Sensors
- Wireless devices
- FieldBusPlug (FBP) devices

Process and batch control systems
As the global leader in open control systems, ABB offers a series of scalable solutions for the full automation of food and beverage processes, including:

- Integration of pre-installed automation components
- Batch and recipe processing for multi-line and multi-product processes
- Charge tracing and tracking
- Branch-specific software applications
- Information management - data transfers to external systems, business systems
- Production planning, controls and protocols
- Data retrieval, archiving and analysis
- Trouble-shooting production software
- Uniform comprehensive engineering from field equipment through to user displays

Robot-based picking, packing and palletizing
Offering fast and flexible performance, ABB’s robots for picking, packing and palletising applications are ideal for meeting the fast changing needs of food and beverage companies. Whether it’s responding to a sudden increase in orders or handling a product with completely redesigned packaging, ABB’s robot products and systems can quickly rise to any challenge.