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The Weetabix Food Company drives down its energy costs

Accurate end-product sizing, lower maintenance costs, quieter operation and reduced energy bills are the results of replacing DC drives and motors with their AC equivalent across two extruder lines used in the production of the breakfast cereal, Weetos.

Product is fed into a hopper and is measured into the extruder screw. The extruder mixer transfers the product forward through the barrel under a controlled temperature and pressure through a faceplate. From here it is extruded into a long hollow tube before being cut into short lengths prior to cooking. There are two types of extruders, named as BC92 and BC72. Extruder BC92 uses two motors rated at 250 kW and 132 kW respectively while BC72 consists of four, 64 kW and two, 90 kW motors. A speed signal from the system's PLC to the motors, synchronises the extrusions with the rotating cutter.

As part of The Weetabix Food Company's ongoing improvements program in partnership with system integrator MCS Control Systems Ltd, energy and productivity reviews are undertaken on various aspects of the electrical, mechanical, control and automation systems throughout the year. It was during one such review that MCS Control Systems suggested inviting its variable-speed drive partner, Sentridge Controls, to carrying out an energy appraisal. Whilst looking at all applications from vacuum packing to air compressors, an area of high energy use was the extruders. Up to 30 percent of the site's energy consumption is taken up by the extruders. Portable energy loggers were installed to the incoming supply to monitor and measure kW, kVA, kVAr, power factor, current and voltage.

As a result, eight ABB industrial drives, five ABB general purpose drives and low voltage ABB motors, rated from 0.75 kW to 250 kW were installed during a two week phase, part of which was the plant's shutdown period. The equipment was selected as the incumbent drives supplier is not able to offer a drives and motors matched pair.

Following the installation, further measurements were taken and a 20 percent drop in energy consumption was observed. The results showed that by changing to AC drives, Weetabix has saved some £28,000 per year, with a payback within three years.

From an engineering perspective Weetabix have eliminated maintenance on the drive train, as there are no carbon brushes to replace, no forced cooling, and feedback devices are eliminated as the gearboxes are protected by implementing a torque limit control on the AC drive. It is estimated that engineering maintenance cost and plant downtime are reduced amounting to nearly £20,000 per year.

This provides an overall estimated cost saving of £48,000 per year

Apart from energy savings, there were other benefits as Dave Chapman, MCS Control Systems' site engineer describes: "The new AC drive technology brings greater torque control and speed accuracy, thanks primarily to the motor control platform, direct torque control (DTC). Unlike DC drive technology which needed a tachometer feedback arrangement to maintain accuracy, using DTC, no encoder feedback is needed, which reduces complexity and cost; yet we are able to get a far better control of the process resulting in a constant extrusion rate."

"The benefit of the repeatability function," explains Allan Norman, Manufacturing Manager at Weetabix's extruded line, "is that the end-product – the Weetos – are produced with consistent length, thickness of

the tube and density. DC drive technology is subject to surging which affects the product output. Because the speed and torque control are now so accurate, the rotating knife that cuts the extruded wheat, can do so in a more uniform manner. This means that the cooking time of the end-product is optimised; there is minimal temperature fluctuation which further saves energy.

Using the old DC drive technology, installed in 1980, lead to carbon brushes being replaced every two-and-a-half weeks, with total reconditioning taking place every 18 months.

Meanwhile a by-product of the AC motors is that the noise and heat levels have fallen. Working in the area of the DC drive train would require ear defenders, with noise levels as high as 130 dBA, yet now the levels are within the regulation 80 dBA.

“A key factor in our choice of drive and motor controls remains the engineering skills of the people involved,” says Allan Norman. “MCS Control Systems and its drive partner, Sentridge Controls, have excellent engineers, that know what they are looking for and offer sound and timely advice. They provide the same team and are prepared to tackle and explore any new engineering avenues that might benefit our production.
The overall installation was supplied with guaranteed cost savings- or money back to the difference.

“This probably accounts for the fact that, following installation, we started the extruders on Sunday evening and they ran without a hitch until turned off on Friday night.”

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