Push on energy efficiency puts The drive on drives

A TECHNOLOGY THAT TOOK OFF IN THE 1980S SHOULD NOT STILL BE DEVELOPING RAPIDLY, NOR REGULARLY GAINING NEW MARKETS. BUT THAT IS PRECISELY WHAT VARIABLE SPEED DRIVES OR INVERTERS ARE DOING. BOB DOBSON REPORTS.

Drives have been growing in popularity for 20 years or more and have really become flavour of the month with the big push on energy efficiency and carbon reduction. And if that were not enough, there are a couple of technical developments that are extending their reach into whole new areas.

Let's looks first at the topical energy questions. If you want to reduce the energy bills and carbon footprint associated with a particular machine, chances are that fitting variable speed drives to some or all axes of motion is going to be the most effective option.

Drives allow you to slow a motor down or speed it up. This can be useful in very many different ways, for example speed matching of adjacent conveyors, positioning the various components on an assembly or packaging line, increasing a pump's output or speeding up a fan to aid cooling.

Increasingly, drives are being used to reduce motors' energy consumption, by slowing them down. The energy saved is equal to the cube of the speed reduction, so savings can be significant.

Indeed, more and more machine users are asking their machine builders to guarantee energy performance before they will place an order. Conversely, machine builders can use energy saving guarantees to win orders from customers, or can generate steady revenue with a programme to retrofit drives to existing plant and machines.

But doesn't reducing the speed of a machine impact its productivity?

The short answer is: no. Most machines operate cyclically with the motor, or motors, idling or working under part load much of the time. These periods are ideal for energy saving, while full power can be called up when needed. Drives are intelligent and can be programmed to follow a time-based cycle or to react to sensor readings to vary speed in perfect synchronisation with the needs of the machine.

Motors driving pumps and fans in particular are good candidates for energy savings. Many of these run at full speed all the time, with the excess flow being dissipated through a valve or vanes. Matching speed to flow requirements is an obvious route to savings.

Further, motors are often oversized so that they can cope easily with maximum loads, which occur only vary rarely. This increases wasteful energy consumption further, another case where a drive will pay for itself in a short period of time.

In summary, drives are an excellent way to reduce energy consumption, carbon emissions and machine running costs. This makes them highly appropriate for inclusion in machine designs, while end-users' new focus on energy efficiency means the market is keen to realise their potential.

Expanding universe

The use of drives is also set to expand on a performance front. Several manufacturers are now claiming that their latest offerings provide such high performance that they compete with servo drives.

Servo drives are typically far more expensive to buy and more complicated to install than conventional industrial motors. But their ability to run at incredible speed, accelerate and decelerate in an instant, position axes with incredible accuracy, follow complex operating cycles and react to sensor inputs have made them a firm favourite in applications such as packaging machines and assembly robots.

Now, it seems, similar performance is available at far lower cost through the use of a standard industrial motor and a top-end drive. This would pull considerable costs out of machine building and machine ownership.

Traditionally, there has been a clear divide between applications for drives and applications for servos, but this is increasingly becoming blurred – a trend that is predicted to continue, with as much as 25 per cent of servo applications likely to switch to drives. This will mainly be on axes of above 7.5kW, on machines used in converting, packaging, textiles, printing, guillotines and flying shears.

Cool display: *Lenze froze an smc drive into a block of ice to demonstate its working capabilities*

Other technical developments clearly underway see drives with extra capabilities built into them, notably a programmable logic controller (PLC) for general control or a motion controller for synchronising multiple axes into complex process cycles and for positioning duties.

With so many new uses being found for drives, Mitsubishi thought it sensible to bring out a new heavy duty version of its most popular drive, the

F700. Designated the A700 it is aimed squarely at energy centred installations likely to experience frequent shock loads. Such current spike-inducing events tend to trip out normal drives, bringing production to a standstill.

The A700 has a high speed algorithm in its control circuits that responds quickly and effectively to sudden increases in load experienced via the motor and gently rides through them. The drive and motor remain operating and production continues. By contrast, in conventional drives, shock loads push a high current through the drives, which then trip to protect their internal electronics.

Energy savings of 35 per cent

The new drive is already finding favour in the aggregate industries, which previously has had to balance the benefits of installing drives with increased possibility of interruption to production. An early application is reporting 35 percent energy savings following the installation of A700s.

The drive is available with a range of overload settings from light to super heavy duty and for motors from 0.25kW to 450kW.

Another new offering from Mitsubishi is the E700. This uses the popular variable frequency operating principle and is packaged so that it can be a direct replacement for the earlier E500. However it is packed with new features and improvements compared with its predecessor. Its dynamic performance includes 200 per cent torque at 0.5Hz, a speed range of 120:1, multiple communications options and RoHS compliance.

Significantly, its control unit can be autotuned to match the exact dynamic characteristics of machines that have previously been fitted with an E500, so that in retrofit applications, replacing the drive is a plug-and-go operation.

A feature packed general machinery drive has also been introduced by ABB with ratings of 0.37 to 7.5kW. The range is aimed at machine builders, panel builders, system integrators and end users and is ideal for a wide range of machinery applications in applications such as food processing and materials handling.

The drives are claimed to be much smaller than comparative drives in this segment, up to 60 per cent smaller than units from some competitors. This makes it easier to design compact control panels or increase packing density in existing panels.

Significantly, all the drives in the range from the smallest 0.37kW to the largest 7.5 kW are the same height and depth, with only the width varying between sizes, enabling easy side-by-side mounting. No additional space is needed for air circulation and DIN rail mounting is possible. When cabinet depth is extremely limited, the drives can even be mounted with one side to the back of the cabinet.

Latest range: *Baldor's H2 AC motor drives now include higher powers, washdown-duty variants, and expansion cards*

Size is also reduced by using a new generation of power semiconductors which gives lower power losses and reduces the need for cooling, enabling the use of smaller heat sinks.

The drives are available as single-phase 200-240V, 0.37-2.2 kW; three-phase, 200-240V, 0.37-4kW; and three-phase, 380-480V, 0.37-7.5kW.

Baldor has extended its H2 family of drives with new higher power options, washdown-duty variants, and more plug-in expansion cards. The 26 new models extend the range up to 93kW.

H2 drives are available in open or closed-loop variants, plus units for servo motor control applications up to 18.5kW. The closed-loop variant features a fourth-generation space-vector control algorithm for fast and steady motor control as temperature and loading conditions fluctuate. Positioning software and an on-board mini PLC are available within the range.

To illustrate how tough its new IP65 smv AC vector drive is, Lenze-ACTech International had a 0.75kW unit frozen in ice before demonstrating its working abilities. The drive remained fully functioning at the launch, running demos while encased in ice throughout a two-day international conference.

The smv drive is intended for use in outdoor or washdown conditions where moisture is present, such as food processing and packaging applications. The smv delivers fast dynamic torque response, sophisticated auto-tuning and impressive low speed operation from a compact, low cost and simple to use package.

The smv range is also designed specifically for use in small motor applications where dynamic speed and torque control are required, such as conveyors, food production and packaging lines.

Omron-Yaskawa has taken a different tack with its new V1000. Rather than highlighting an array of new features, it has focussed on improved product quality and reliability.

The innovative design together with modern manufacturing techniques means that the V1000 is said to be good for 10 years maintenance free operation. Beyond this, a field-failure rate of less than 1 in 10,000 is being claimed. One reason for the improved reliability is a 50 per cent reduction in mechanical components which, in turn, has lead to a reduction of almost as much in the size of the unit. ■

For further information:

ABB Drives and Motors
T: 01925 741111
E: info@gb.abb.com

Baldor UK
T: 01454 850000
E: sales.uk@baldor.com

Lenze
T: 01234 321321
E: sales@lenze.co.uk

Mitsubishi Electric
T: 01707 276100
E: automation@meuk.mee.com

Omron Electronics
T: 01908 258258
E: oeeuk_sales@eu.omron.com