WARRINGTON, UK, MARCH 30, 2005

Three can do the work of seven

Sectional drives sharing a common DC bus can be a cost-effective option in applications at somewhat larger powers, from about 100 kW. DC bus drives use common components to control and supply power to the inverter sections of AC drives, reducing overall costs. A single rectifier can supply several inverter sections from a common DC bus, rather than using one rectifier per inverter as is the case with standalone units. Up to 25% less space is needed owing to the smaller components count. This is important where space is at a premium.

The common DC bus solution is also a very effective way to reuse the mechanical energy when one motor may need braking while others are operating in motoring mode. The DC bus is used as the channel to move braking energy from one motor to benefit the others.

At British Sugar's Newark factory, ABB MultiDrives are being used to drive three centrifuge units, which spin off sugar crystals from solution. Using a DC bus system, all the inverter sections for each centrifuge are supplied from the same common DC bus, which itself is supplied from the common regenerative rectifier.

Since the centrifuges are sequenced such that one can be accelerating while another is decelerating, the regenerating current from one inverter section can be used directly from the DC bus to accelerate another centrifuge via its inverter section. This reduces the likelihood of overloading the rectifier section and power line.

Also, since only one rectifier is in use, at minimum loading the kilowatt losses are also reduced, in comparison to the case where individual drives are used on each centrifuge. In decelerating from top speed (1100rpm) to plough speed, over 95% of the power is recovered by regeneration.

"Our original seven centrifuges were installed in 1976. Although we are using the same supplier – Broadbent of Huddersfield – the older models are not as efficient as modern equipment," says Jim Donovan, of British Sugar.

"We have now invested in three of Broadbent's largest centrifuges and we asked Broadbent to put the drives tender out to ABB, because we have other ABB inverters in the plant."

Using larger centrifuges and reducing the number from seven to three improves the throughput of sugar crystals.

In the British Sugar application, Broadbent manufactures its own motors – those in use are 500kW models of a specialised high duty motor used to drive a high inertia load, with characteristics vastly different from those of a standard industrial induction motor.

The basic motor parameters (volts, frequency, rpm, current and power) are entered into the ABB inverter parameter set. The drive will then perform a motor identification run which allows it to build an equivalent circuit model for the motor. This gives the drive the information it requires, to be able, to control the motor. The only other parameters to enter are then the input/output (I/O) ones for control and output signals.

According to John Thewlis at Broadbent, only discrete inputs to the ABB drives are used – volt-free contact for start-stop and a 4-20mA signal for speed reference. No communications protocol is used between the motor controls and the drives.

Thewlis says that the new centrifuges supplied to British Sugar Newark have been vastly improved both mechanically and electrically from the machines that they have replaced. The total throughput of the three new machines is greater than the total throughput of the seven machines they have replaced. The old machines were driven by three-speed pole-changing motors, which demand large current peaks at the introduction of each of the three speed windings. This is not particularly efficient, says Thewlis, and causes power surge demands on the customer supply network.

With the single winding inverter motor, however, the current during acceleration and deceleration is kept constant by the inverter drive. Also, the voltage applied to the motor is varied in proportion to the required frequency, such that the motor flux is constant throughput the speed range. This has the effect of allowing the motor to be designed around this flux level for optimum performance and efficiency.

ABB (ABBN: SIX Swiss Ex) is a pioneering technology leader in power grids, electrification products, industrial automation and robotics and motion, serving customers in utilities, industry and transport & infrastructure globally. Continuing a history of innovation spanning more than 130 years, ABB today is writing the future of industrial digitalization with two clear value propositions: bringing electricity from any power plant to any plug and automating industries from natural resources to finished products. As title partner in ABB Formula E, the fully electric international FIA motorsport class, ABB is pushing the boundaries of e-mobility to contribute to a sustainable future. ABB operates in more than 100 countries with about 147,000 employees. www.abb.com

Caption: ABB multi-drives are being used to drive three centrifuge units for the spinning off of sugar crystals from solution at British Sugar Newark's factory.

—

For more information please contact:
Layla Hewitt
Marketing Communications
Phone: 01925 741517
Email: layla.hewitt@gb.abb.com

ABB Ltd.
Daresbury Park
Daresbury
Warrington WA4 4BT

Emma Jenkinson
Armitage Communications
Phone 020 8667 2218
Email: emma.jenkinson@armitage-comms.co.uk