

From start of harvest to early March, British Sugar's factories run continuously

Large gearboxes replaced, to improve performance

Article and photo by: Hägglunds Sales Team, United Kingdom.



►► The sugar manufacturer British Sugar has a number of factories in the UK, processing sugar beet. Once harvesting starts, the factories run continuously from around September to early March to keep up with the deliveries of beet from the farmers.

At British Sugar's Newark factory, the diffuser gearboxes were installed in 1975. Over the years these gearboxes had become less reliable, requiring high levels of maintenance. The very high gear ratio from the electric drives to the final speed at the pinions, combined with the unforgiving nature of electro-mechanical drives, gave problems when faults arose inside the diffuser tower*. The enormous inertia prevents the system sensing a problem that has occurred and so with the massive forces at work, the possible damage to the plant and gear components is high.

Gearbox failure expensive

The limited headroom and hoist capacity at the top of the tower and the difficulty to get mobile cranes to this place in the factory made the cost very high, if a gear box need-

ed to be repaired. Especially since the large gearboxes had to be dismantled to be able to lift the components. This, and the delivery time for spare parts meant if a gearbox was suspect, or failed during the processing season, it could lead to considerable loss of production.

British Sugar knew of Hägglunds, following the replacement of the diffuser drives at the company's York factory in 2001.

There, two Hägglunds MB 1150 motor pinion drives replaced a large four stage gearbox single pinion drive on the horizontal drum diffuser.

Ensuring smooth operations

The compact Marathon drives from Hägglunds offered Newark the possibility to control the forces on the diffuser, and to give infinitely variable speed from zero, at full torque, up to maximum speed. This meant that the diffuser could start up under full load without having to spend time relieving the load by flooding the tower.

The drives would also improve the efficiency of the system and need very

little maintenance, mainly changing filter elements from time to time. The versatile drive can be stopped and started as often as required without limits, using the pump stroker. This provides accurate control of ramp times to ensure smooth operation.

Both diffusers were served by a single power unit with two pump sets. One large pump set served two motors per diffuser which also gave the possibility of isolating one motor in the event of failure (driving at higher pressure with one motor until replacement).

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/Phil Maltby
Project Manager,
British Sugar, Newark.

Precise torque control

A wider speed range was provided, which was ideally suited for the splined Marathon motors that are relatively easy to remove from the pinion shafts for inspection, if ever required. Pressure switches were added to sense when a high torque condition was experienced. If this pressure continued for more than a few seconds the system would drop the torque to a lower level, by simply switching in a relief valve with a lower pressure setting. This feature reduced the possibility of wear and damage in the dif-



* Tower Diffusers

The first stage in processing is the diffusion of sugar from the beet in plant called diffusers. The diffusers at British Sugar's Newark plant are very large cylindrical towers (20 meters high), called Tower Diffusers. Newark has two of these vessels.

The drive system for the diffusers is at the top and traditionally the drive is two or more pinions driving a girth gear, attached to the main central drive shaft. These pinions are often driven by large gearboxes with various types of electric motors.

1. The beet is first sliced into so called cossettes and fed into the bottom of the tower.
2. Hot water around 70°C is pumped into the top of the tower.
3. Inside the tower the sliced beet is moved by rotating a central shaft with many arms arranged in a spiral design.
4. As the diffuser rotates, the beet moves upwards through the hot water and the sugar juice is diffused out of the plant cells.
5. The juice then of course goes through various other processes to purify, thicken and crystallize into sugar.
6. The remaining beet coming out of the diffuser is mechanically pressed to extract as much of the remaining sugar and water as possible before being dried to produce animal feed.

fuser and the girth gear. It would likely stall the diffuser, but also raise a warning signal to enable the operators to reduce the needed torque level in the diffuser by known means.

User friendly control system

Infinitely variable speed is a big improvement on the previous system, because the diffuser speed can be fully adjusted to the ideal processing speed to match upstream and downstream conditions. Hägglunds control system, the Spider, can also provide constant power control, which controls the speed of the drive to ensure the system stays within a set power level. This can ensure that the machine is operating at its power capacity so fully utilising the installed power capacity of the plant. It also ensures the power demand never exceeds the installed power capacity.

Successful commissioning

The drive system from Hägglunds was ordered in March and delivered to site in May. All components were standard. Cold commissioning, prior to going into full production, was carried out over a couple of days. Hägglunds power units and control

systems are fully tested and programmed prior to delivery, so there is little work needed on site to commission them. Hot commissioning was carried out in September and the unit went into production successfully.

Commenting on the new drives, Phil Maltby, British Sugar's Project Manager

at Newark said: "We are pleased with the service we have received from Hägglunds. The hydraulic drives are a change from existing variable speed drive systems currently installed at British Sugar Newark Factory. Early indication has shown on this application that the new Drive System from Hägglunds is very successful".



To the left, Hägglunds two Marathon MB 800 motors in position that replaced the large gearboxes. The compact design and splined shaft mounting produced a very compact arrangement providing better performance and creating a lot of extra space in the tower. The photo below shows the huge gearboxes that were replaced.

