Servo technology aids forming machine innovation

Rolf Themann describes the latest servo technology-based glass container forming equipment development from Sklostroj.

ISS is a so-called Individual Section machine. The additional 'S' in the ISS name stands for 'servo', making it an Individual Section Servo machine.

The servo concept is not new but compared to other industries, the glass container business was comparatively late with its implementation. Over the last 10 years, very few mechanisms have been developed using servo technology but because Sklostroj already had good experience dating back to 2002, this approach was considered when developing an entire IS machine platform.

The company's ISS machine features a large number of servo axes and depending on customer set-up and requirements, there can be up to 20 servo axes per section. This is the highest number of individual servo motors per section when compared to other IS machine suppliers, creating the lowest consumption of compressed air and saving up to 40% energy costs compared to conventional pneumatically-driven IS machines. Customers using the equipment have confirmed these figures.

SPECIAL FEATURES

ISS machines provide low energy consumption, reduced noise levels, high speed production, quality improvements and downtime reduction because of superior accessibility to all servo axes and modules and therefore, the best price/performance ratio. The entire HW and SW timing and drive system is based totally on 100% standard Siemens components. Because these components are widely available, no expensive dedicated spare parts need to be kept by glassmakers, thus further lowering costs, without compromising fast access to spare parts and local service.

TECHNICAL PARAMETERS

ISS machines are supplied with high tech servo-controlled type DSP5-2 feeder mechanisms. The servo plunger mechanism has an individual

Sklostroj 8-section DG/TG ISS machine.

Servo-controlled type DSP5-2 feeder mechanism.

servo axis for each plunger, the mechanical moving parts of which are in a permanent oil bath. Servo motors are water-cooled and individually controlled for each gob.

The servo feeder can provide between one and four gobs, including a multi-weight gob feeding function, rotary tube with graphite bearing and servo micro-lifting in increments of 0.01mm for NNPB and PB production. Attached to this advanced feeder mechanism is a servo parallel shear, which can handle up to 240 cuts/min. As a basic precondition for quality cutting, the shears are designed with good stiffness, while automatic high pressure lubrication assures long mechanism lifetimes. Gob weight consistency is +/- 0.5g repeatedly and an exchange of shear blocks takes only three minutes during a job change or exchange of shear blades.

All centre distances are possible on a single ISS machine platform (SG, DG, TG and QG). For double gob for example, this includes $4^1/_4$in, 5in, $5^1/_2$in, 6in and $6^1/_4$in; for triple gob, 3in (6in), $4^1/_4$in ($8^1/_2$in) and 5in (10in) are feasible; and in quad gob, 70mm, 3in and 95mm centre distances are possible.

On the ISS section itself, there is a servo baffle mechanism and a servo parallel mould opening and closing mechanism on the blank and blow mould sides. In addition, there are servo-controlled invert and neckring mechanisms, a servo or proportional valve-controlled plunger mechanism, servo-controlled takeout and blow head mechanisms, as well as servo-controlled 360° axial cooling with adjustment possibility for each mould half and each mould quarter by servo- controlled flaps. None of the servo motors are located in the section box. Therefore, they are not in a hot area with bad accessibility, allowing electro, maintenance and service personnel to work without the danger of hot glass. This permits better and faster service, with lower risks and fewer production losses.

ELECTRICAL ENERGY CONSUMPTION

Despite the many servo axes involved, low energy consumption is achieved with the help of a so-called Active Line Module (ALM), which comprises a controlled energy infeed and recovery unit and works with sinusoidal input currents, practically without circuit feedback. The DC link voltage is controlled and can be set. With $\cos\phi=1$, this is also the most economic variant.

Besides the advantages of smart line modules, this also includes other benefits such as: Operating safety increased through the compensation of line breakages; up to 30% increased utilisation of mains cables and transformers, resulting in cost savings due to reduced connection power, reduced cable cross-sections and weaker transformers; superior torque quality; good field weakening operation; compliance with the applicable regional standards due to lack of circuit feedback; and comprehensive diagnostic features, enabling network monitoring.

In addition, the higher voltage in the DC link affords an opportunity to increase the dynamic of the fast mechanisms. Furthermore, it increases voltage stability during line voltage fluctuation. ■

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