

## Korean machine builders ride the servopump route

By Stephen Moore

Unable to make significant inroads into the all-electric market, South Korea's injection machine builders are docking servomotors with hydraulic pumps to realize energy savings, as demonstrated at the Koplax show in late March.

As with their Taiwanese counterparts (see Tech Trends article this issue, p. ??), Korean OEMs are adopting cutting-edge hydraulic technology that brings processors many of the advantages of all-electric molding machines, at only a slight price premium over standard hydraulic machines. The NT-III 170-tonne press on show at the Woojin Selex (Incheon, South Korea) stand at the recent Koplax show, for example, employed two 11-kW servomotors to drive the hydraulics, which Woojin Selex claims helps processors realize energy savings of 65–70% compared to standard machines, and get a 60-msec response time in the bargain.

Dual pumps are adopted for a number of reasons, according to hydraulic system developer Daikin Industries (Osaka, Japan). “First, a 22-kW servomotor is more expensive than two 11-

Servo-driven pumps generate energy savings, among other traditional all-electric advantages.



kW units,” says Kazuhiro Ikeda, in charge of sales engineering at Daikin. “The dual system is also quieter and boasts a faster response time of 60 msec.” Furthermore, the pumps can operate in series or in parallel through separate hydraulic circuits, depending on the requirements for power and overlapping operation. Ikeda says one Taiwanese machine builder is actually using four 15-kW servomotors to drive the hydraulics in an 850-tonne press in order to minimize the cost of the servos and shorten response time, although this results in a complex hydraulic system.

Woojin has gone one step further with its NM 130H ultimate hybrid, where a servomotor is also adopted for plasticizing. The 130H also adopts dual servo-driven pumps that separately drive an accumulator that realizes 1300-mm/sec injection speeds, and the hydraulic circuit for movement. Woojin also offers an 1800-tonne two-platen press, with servo-

motor for screw rotation, that claims 30% energy savings and a 50% increase in plasticizing capability.

Vertical press supplier Heung Hwa (Kimpo, South Korea) also has a servo-driven pump on its HXV-80VS press. “The machine realizes 80% energy savings over a standard general-purpose presses, a maximum injection speed of 554 mm/sec, and offers the capability of molding 0.4-mm thin-wall LED holders,” says CFO Gi-Hwan Yoon.

### Electric options

LS Cable (Jeonju) is the only machine builder making a major impact on the all-electric scene in Korea. It extended its LGE II range of all-electric injection machines to include 450- and 550-tonne machines. Technical literature from the company puts machine performance on par or better than Japanese all-electrics. Previously, the largest machine it offered had a clamping force of 300 tonnes.



Tilting function converts horizontal press to vertical unit.

The company also now offers all-electric injection press-compression machines (the LGE BL series) specifically for molding LCD light guide panels. Clamping forces

available include 50, 100, and 150 tonnes. For larger machines, LS Cable is concentrating on two-platen types. LS Cable also showed its LGH1300S two-platen machine

with mechanical lock clamping. The series goes up to 3000 tonnes.

Ship builder Sunwoo Heavy Industries (Cheonan, South Korea) acquired machine builder Jinhwa Glotech in October 2007, and machines now ship under the Jinhwa Imposta brand. The company's ESM all-electric machines, developed jointly with motion control systems provider Moog, are now commercially available, but the company also sees bright prospects for its new MS series, which employs Tokimec servo-driven hydraulics. Sunwoo also showed its STL 1100NB machines at Koplax—a two-platen, direct-lock clamping unit with servo-driven screw rotation.

Perhaps tops in the 'uniqueness' stakes at Koplax was the vertical/horizontal "hybrid" IHV Series from Injection M (Incheon, South Korea). The entire injection machine can be tilted 90° from its bed to switch from a standard horizontal machine to a vertical one. Machines with clamping forces of 35, 50, 100, and 150 tonnes are available.

**The Gaven (Gas Vent Nano Technology) nozzle from Hando Steel (Ansan, South Korea) allows processing of nylon, polycarbonate, PBT, and PPS without the need for drying, even when 100% regrind is used. Positioned between the screw tip and the tool, the nozzle works to physically expel moisture and volatile gases from the wholly molten resin, including moisture contained within the pellets. Normally, five hours of drying at 120°C is necessary in order to fully remove moisture from nylon resin. Standard drying removes surface moisture effectively, but not moisture contained within the pellets, according to Hando Steel. The main components of the Gaven nozzle are a torpedo and vent ring, which work in conjunction with a vacuum pump to generate a 3-5-kg/cm<sup>2</sup> pressure differential. Moisture and gases are thereby removed via micron-dimension gaps in the vent ring. An ionizer and activated carbon filter between the Gaven nozzle and the vacuum pump treat the gases removed. Foreign particles are also removed through the nozzle's filtering function.**

The nozzle is held at the processing temperature, and also promotes mixing. The temperature of the hopper is regulated to 80°C in order to heat the pellets and minimize screw wear.

One Korean processor serving the home appliance industry was able to switch from using 30% regrind to 100% regrind by using the Gaven nozzle. Other processors have reported benefits in reduced mold maintenance due to reduced volatiles in the melt. For example, tool cleaning frequency was reduced from once every 10 days to once every 45 days at one molder. Other reported advantages are reduced in-plant odor levels, and eliminating the need to invest in drying equipment, which also opens up shopfloor space.



Gaven nozzle eliminates the need for pre-drying of nylon and some other plastics.

