

## ARC BRIEF

By ARC Advisory Group

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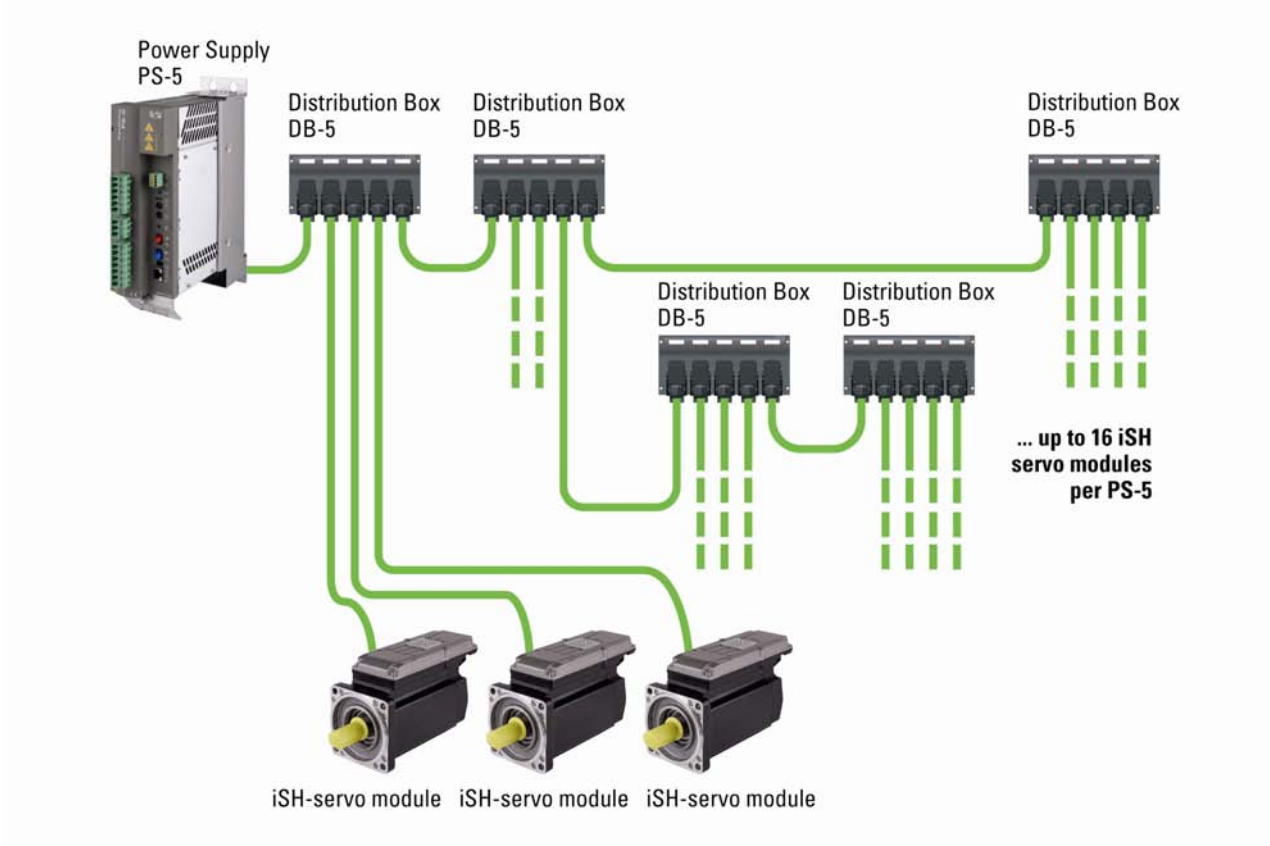
# ELAU's iSH Technology Takes Modularity to the Next Level in Packaging Machine Design

Innovations in drive and motion component integration create opportunity



ELAU's iSH Technology





**iSH Technology Takes Modularity to a New Level**

## Taking Modularity to the Next Level in Packaging Machine Design

Electronic motion is a core element of a machine control solution that enables both the packaging machine builder (OEM) and consumer goods manufacturer to satisfy the business requirement for greater agility and higher productivity in packaging plants. Motion control solutions have moved to a new level in machine design as machine builders continue to take advantage of the technology to add flexibility, rapid changeover and lower overall life cycle costs in machinery. However, innovations in the motion control market have reached a plateau as the majority of automation suppliers have effectively reached parity in the market with automation solutions that have integrated motion, logic and information management. Until recently, that is to say. **ELAU has developed its Pac-**

**Drive iSH technology, a truly innovative motion control solution, by leveraging the latest semiconductor technology, servo motor design, physical configurations, and networking to reduce complexity and installed cost.** Complexity has been substituted with a pragmatic automation solution that will allow a new generation of automation visionaries to place their stake in the evolution of packaging machinery design.

The first primitive integrated drive and motor products appeared on the market from several suppliers where these early versions simply attached the drive onto the motor frame. Ugly, poor form factor and quite frankly a value proposition that was difficult to identify. Elau's iSH Technology has thankfully taken us light years beyond this and is showing the motion control market how to design product. They have taken the systems view to the integrated drive and motor solutions which effectively leverages all the benefits of bringing the components together. The design is innovative and deserves a closer look by packaging machine designers simply to appreciate the way they leveraged the latest silicon devices, addressed power distribution, and considered aftermarket maintenance and support."

Many OEMs would prefer to stay in their comfort zone with new machinery designs as actuator selection, mechanical configurations, and final integration rarely come together flawlessly. However, it is becoming increasingly apparent that for a

packaging machine builder to gain a competitive advantage -- both in performance and by leaning their internal costs -- they have to seek modular and flexible automation solutions. The machinery market has evolved to the point that the demand is for smaller footprints along with modular subsections that can be suited to a specific manufacturer's requirements. Many OEMs with this vision have moved in this direction, but with automation solutions that are not quite suitable for implementing modular solutions.

ELAU's iSH technology is centered on automation components that radically reduce the wiring, components, and electrical cabinetry on packaging machines. The iSH technology, which ELAU describes as Intelligent Servo Modules, is a new automation product from the packaging automation supplier, however it is fundamentally based on the control platform used in ELAU's current generation of PacDrive systems using separate servo motors and drives.

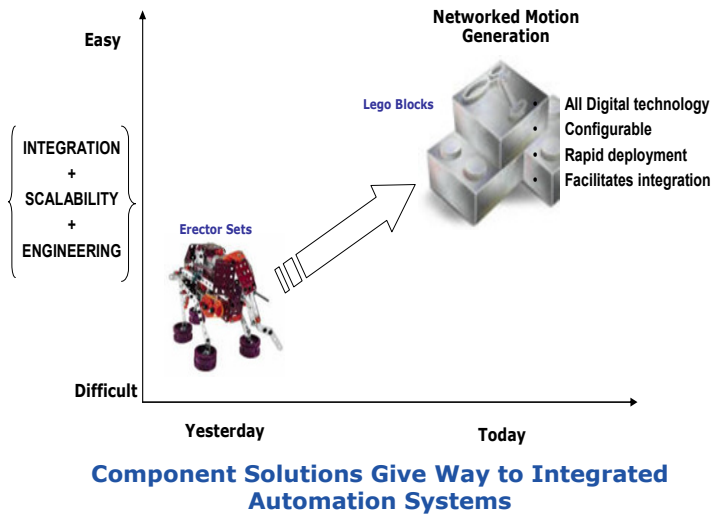
Thus, the deployment of iSH modules on a new machine can actually be proven out with a PacDrive system today and later implemented with iSH technology to benefit from the overall reduction in wiring and component count. By partnering with ELAU before the widespread commercial availability of the iSH technology when production ramps up in summer of 2007, OEMs can expect to be supported from the early conceptual phase throughout the application programming and engineering phases.



This is important because as of this writing, there is still sufficient time before the Interpack Show in Europe (April 24-30, 2008) and PACK EXPO Las Vegas in the United States (October 15-17, 2007). These are the premier global packaging machinery shows that help define an OEM's place in the market and drive the business pipeline for up to a year. To be competitive on a global scale, it is an imperative to evaluate iSH technology because otherwise an OEM's machine designs will end up lagging the state of the art in the market. The first prototype machines with iSH technology were demonstrated at the PACK EXPO and SPS/IPC/Drives shows in 2006, leading to tremendous interest from the consumer goods manufacturers. It is our belief that at the next series of international shows, customers will be seeking out machinery that has leveraged the capabilities of iSH technology. OEMs should not be satisfied with what they have always delivered, because their customers certainly will not be.

### **Erector Sets Dominated Motion Control System Designs**

The selection of automation platforms, sensors, and actuators that are used to control the machine mechanics remains an important facet of the machine builder's value proposition. More importantly, the market trend is for manufacturers to place greater value on OEMs who are able to make the optimal selection, especially as status quo control specifications fall by the wayside. However, there is relatively little value placed on the integration



of third party components and integration should therefore not be viewed as a core competency of an OEM. Effectively, OEMs need to apply a lean methodology assessment in this area of their business; OEMs should be asking themselves the question, “**Are integration activities necessary or simply wasteful in my business?**” The challenge is that OEM engineering leaders may be faced with an internal culture that has preconceived notions when evaluating new solutions.

It wasn’t too long ago that virtually every OEM employed the “erector set” approach to motion control system deployment for the machinery. In particular, the motion control solution in many instances relied on multiple suppliers for the servo motor, servo drive and motion controller. There was a period of time when taking on the integration responsibility of a multi-vendor component solution resulted in a lower initial cost, but the overall lifecycle costs can be much higher as the engineering design team is required to support this long past the shipment date. Support, service and engineering changes continue for over a decade in most cases. Meanwhile, automation suppliers have developed automation solutions which have matured into integrated, pre-configured platforms that enable the OEM to purchase off the shelf automation controller, power supply, servo drive, motor and cabling all from a single source. The impetus is to lower the total design costs for OEMs.

### **ELAU’s Technology Takes Motion Integration to the Next Level**

ELAU’s iSH technology has shattered the erector set approach to motion control. The goal is to provide the OEM the opportunity to install all of the components within the machine envelope, thereby reducing if not eliminating the electrical cabinet.





There are three key innovations employed by iSH technology that reduce cabling, component size and complexity.



**Elau’s iSH Technology Displays Engineered Solutions that Exceed Machine Builder’s Requirements**

At the heart of the design is physically integrating the latest semiconductor power components of the servo drive di-

rectly onto the motor frame. ELAU's experience with integral motor and drive systems dates back to 2003 with the PacDrive SCL-055 solution designed specifically for capping and labeling machines.

iSH Technology	Benefit
System Power Supply 	Shared power supply eliminates redundant power supplies commonly used for each axis. Capable of up to 16 servos. Reduces power capacity required for entire system.
Distribution Hub 	One cable for servo power supply distribution signals. All feedback and command signals reside in a single cable.
Servo Module 	Servo drive directly mounted on the motor in a slim form factor. Eliminates cabling between the motor windings and drive. Eliminates signal cabling between feedback devices and drive. Motor used as a heat sink on drive.
Integral Signal & Power Cable 	Eliminates one cable per axis in a system. One connector and cable per motor for a lower cost and higher reliability system.

**Elau's iSH Technology Revises Motion Integration**

However, the iSH technology has leveraged this experience for a much broader range of machinery. iSH technology is a system approach and as such is more than just an evolutionary step in integrated drive and motor designs. The power supply is now a shared resource rather than a dedicated resource for each drive, thereby reducing redundancy in power allocation for the overall system. What you readily see is a drive and motor form factor combination that has not been available in the automation market until now.

Each component of this system, with the exception of the automation controller and power supply, is IP65 rated, allowing each element to be mounted on the machine itself, even in washdown applications.

Machinery can be delivered with much less cabinet space along with easier maintenance of the drive and motor components when service is needed. Instead of disconnecting multiple wires and removing a drive from a cabinet, a single snap-fit quick-connect cable



**Cabinet Space Reduction and Modularity Achieved in this Design**

connector and four mounting bolts are removed, separating the servo module from the machine frame.

There are no motor feedback cables running back to the cabinet, and there is only one cable drop to each module integrating power, I/O and synchronized motion instead of three separate cables. The same single quick-connect cables connect the power supply to each distribution module, and the distribution module to each motor. There is no daisy-chaining of servo

The hidden benefit is motion control performance. The drive and motor are matched and serialized at the factory such that nonlinearities in the motor are compensated digitally in the drive.

modules, which would lead to a single point of failure for the network.

The hidden benefit is motion control performance. The drive and motor are matched and serialized at the factory such that nonlinearities in the motor are

compensated digitally in the drive. Thus, motor-specific parameters are permanently stored on the integral drive module which alleviates any concern over disparity in the motor characteristics when making a replacement in the field. The system-specific parameters such as servo gains are retained in the automation controller, making field service much easier and resolutions more predictable. Machine builders can implement a solution with the iSH technology that makes it perfectly feasible for the end user to service their own machine.

### **iSH Technology Allows Machine Builders to Focus on Core Competencies**

iSH technology is directly aligned with the business issues challenging machine builders today. The design of proprietary computing platforms and integration of the actuators and sensors are generally not considered value adding activities in OEM engineering operations. Machine builders are realigning their engineering resources such that their core competency is focused on solving application-specific problems in their domain. Today, optimal machine control solutions require a partnership with controls suppliers to achieve solutions that are affordable and meet the performance

Factor	Description
Initial	Comparative cost of purchasing components without factoring in any mechanical, wiring layout or coupling factors.
Installed	Comparative cost of components after factoring in the cost of cabling, mechanical connections and wiring.
Total Lifecycle	Total Cost of Design plus the cost of operating and maintaining the equipment is factored.

#### **Cost Factors of Machinery Design Components**

goals required by the consumer goods manufacturing community. Those organizations that have taken the first step are now carefully evaluating where value is created in their engineering resources.

It is patently clear that engineering each and every element of the machine is no longer a best practice in this business. This is simply wasteful in terms of the way engineering resources are used. An effective approach is to determine the area of the machine design which maps to the OEM's key competitive advantage in the marketplace or is regarded as Intellectual Property. Organizations are systematically evaluating low value-adding or

non-core engineering activities in order to optimally utilize their human resources.

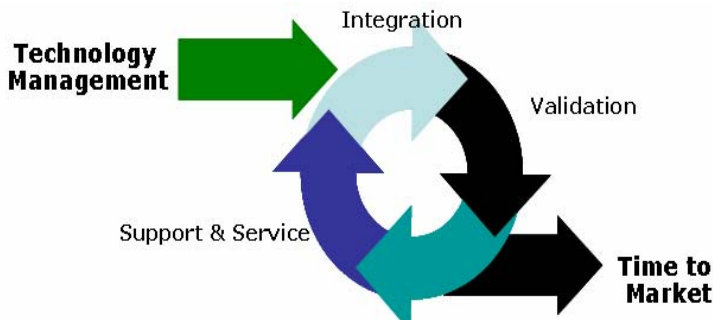
A partnership between OEM machine builder, automation supplier and the consumer goods manufacturing customer is critical to achieve performance and time-to-market targets. With packaging machinery's

strong predilection toward motion control architectures, many automation and specialized motion control suppliers continue to expand product lines and seek cost reductions to allow machine builders to continue to cost-justify motion control. But, simply trying to take cost out of an existing drive and motor design has finally approached the limit in most products on the market.

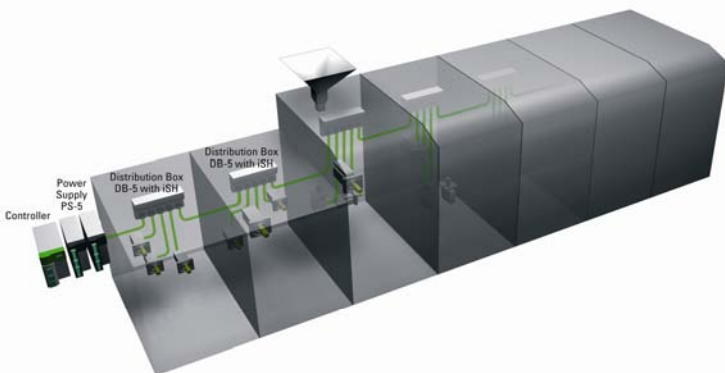
### iSH Alters the Market Landscape of Integral Drives and Motors

Servo drives and motors are typically purchased as separate components even when sourced from the same vendor. However, motion control suppliers have

trial ballooned products that have integrated the servo drive, power supply, and motor as a homogeneous unit. The advantages are clear as there are tremendous reductions in cabling because the motor windings and feedback signals are all enclosed within an integrated package. Over the last 10 years there has been a definitive expansion in the availability of integral drives and motors as several sup-



**Lifecycle Factors in Managing Technology Integration**



**Modularizing Machine Mechanical Layouts that are Faster and Lest Costly to Produce**

pliers seek to overcome the implementation barriers associated with these types of designs. Unfortunately, most integral servo drive and motor product designs end up being relatively poor implementations because they are inherently a repackaging of existing electronics to fit the motor



**iSH Radically Reduces Wiring and Electrical Power Components for Servo Based Machinery**

form factor. Consequently, there are some marginal cost advantages in these solutions, but much of this is lost because the motor must be oversized for the application due to the difficulty in heat dissipation. Currently, the dominant share of integral drive and motor product lines are under 1KW in power, indicating the difficulty in dissipating heat in these tight mechanical configurations. The relatively low power range of these products certainly limits the domain of applications for these products.

However, for packaging machinery, medical equipment, and machine tools an integral motor and servo drive package enables OEMs to lower the cost of wiring the electrical cabinet and reduces the floor space required.

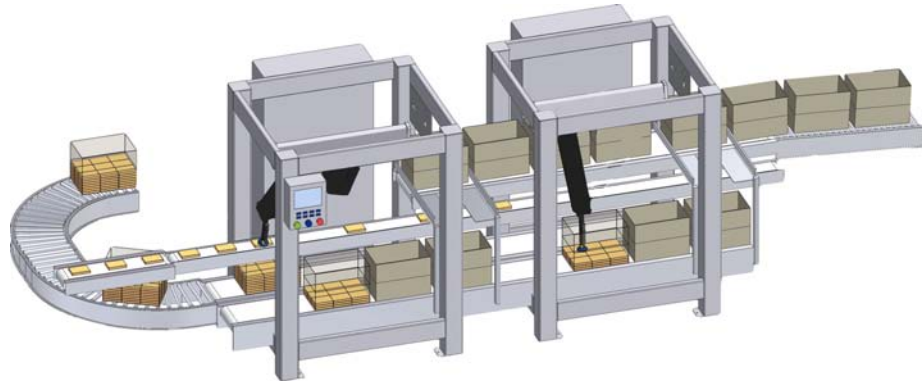
Despite all the benefits that integral drives and motors have to offer, the market demand for these products has simply not taken off. These products were broadly marketed and simply did not address the real business issues facing the machine builders. This is about to change. With ELAU's introduction of their iSH technology, they have optimized the integral drive and motor concept by taking a holistic approach to the implementation. In fact, iSH has approached the problem from the ground up and has created a system of modular components that clearly optimizes the solution for machine builders.

The machine safeguarding solution is now integral with the motion control solution further reducing component count for the overall automation.

First and foremost, iSH technology is a system of modular components that enables machine builders to cut component count and wiring complexity. While the servo drive and motor are an integral unit, it is the modularity of the complete system that has revolutionized the deployment of motion control onto machinery. The modularity of the system allows for the

extension of functionality to the servo module; specifically an optional Safety module can be added. Thus, the machine safeguarding solution is

now integral with the motion control solution further reducing component count for the overall automation.

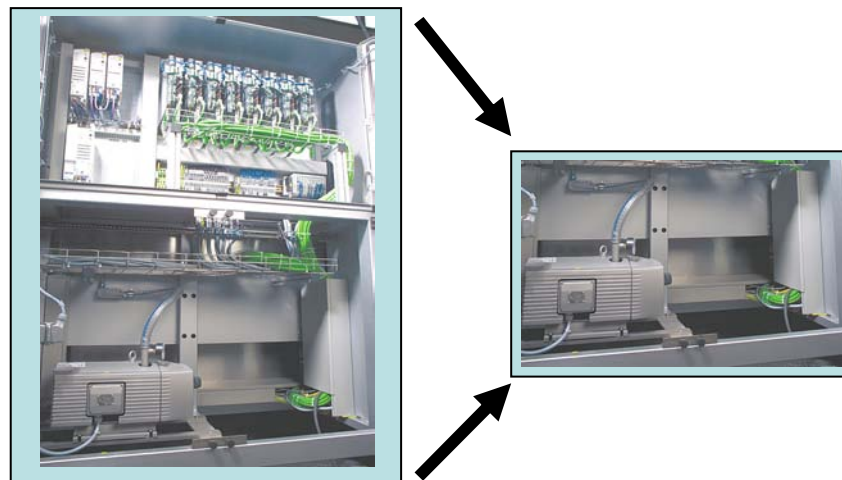


**This modular robotic cell concept becomes truly plug and play when iSH servo modules are connected to a central PacDrive automation controller.**

At the heart of the design is the shared, centralized power supply which delivers the DC bus through modular distribution hubs to all the servo drives. The distribution module is unique in that the cabling system distributes the DC bus and the digital network signals all in one cable to each of the servo drives connected to this hub. The modular distribution hub has reduced three cables per motion control axis into a single cable termination.

### **Reducing Machinery Footprints with Smaller Panels**

iSH technology is providing machinery builders an alternative to designing large, free standing control cabinets with unwieldy cabling interconnections. Today, a greater emphasis is placed on the labor and physical cost of



**Electrical Cabinets Alone Will Be Radically Reduced In Size**

cabling a control cabinet. Control cabinets are becoming distributed or simply eliminated as controls decrease in size and mechatronic designs open up space in machine cavities. Modular motion control systems that radically reduce cabling provide a solution when seeking to lower the cost of building machinery.

### **Conclusions**

The ELAU Intelligent Servo Module design is innovative and deserves a closer look by packaging machine designers to appreciate the way they leveraged the latest silicon devices, addressed power distribution, and considered aftermarket maintenance and support.

OEM engineering managers should define their critical path to understand the potential of this technology and deploy modular machine designs leveraging iSH technology without delay to gain first-mover advantage at upcoming packaging trade shows

Consumer goods manufacturers should evaluate iSH technology to determine the impact of increased flexibility and maintainability in their packaging operations.

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