Hydraulic actuators provide exponential force increases with small increases in cylinder diameter – e.g. from 2.5” to 3.25” dia. (a 30% increase) the force increases (69%) 

\[ A = \pi r^2 \]

\[ F = A \times PSI \]

Hydraulic actuators provide exponential force increases with small increases in cylinder diameter – e.g. from 2.5” to 3.25” dia. (a 30% increase) the force increases (69%)

Hydraulic Cylinders (HC) are a well-established actuation solution, however new technology from Kyntronics combines the high force density of hydraulic cylinders with the precision dynamics of servo motors, variable-speed pumps, electronics and software into an All-in-One solution called the SMART Hydraulic Actuator.

A Hydraulic Cylinder Actuation System requires many components and design considerations to provide precise motion control. Components typically include:

- Pumps and Motors
- Cylinders
- Fluid tank, accumulators and filters
- Hydraulic Lines and fittings
- Servo control valves
- Electrical components and connections
- Pressure transducers and position sensors
- A control system

In addition to component costs, an HC Actuation System requires significant time to engineer and build, including; selecting the proper components, developing a detailed bill of materials, allocating proper mounting space for the components, providing for position/force control, incorporating hose/wire routings plus other supporting infrastructure.

A HC Actuation System infrastructure is typically over-sized to accommodate application requirements and HC systems generally run continuously, wasting energy and creating unwanted noise. They also require a considerable amount of hydraulic fluid and are susceptible to leaks due to the number of connections associated with this type of system which create reliability issues and environmental hazards.
Kyntronics SHA - Comparison with Hydraulic Cylinder Actuation System (Continued)

Often referred to as an Electro-Hydraulic Actuator (EHA), Kyntronics SHA is a drop-in, All-in-One solution. After simple mounting and hook-up of electrical connections, the SHA is ready to start producing. The SHA’s efficient method of converting electrical power to mechanical force results in a smaller, cost-effective package and it’s “power on demand” feature provides significant energy savings. In addition, savings in component costs and space are substantial compared with a Hydraulic Cylinder Actuation System.

**Kyntronics SMART Hydraulic Actuator (SHA) System**
- High-Resolution Position Sensor
- Servo Drive / Motion Controller
  - 120, 240, 480 Vac
  - Fieldbus Interface
- Valve Control / Manifold
- Heavy-Duty Rod / Cylinder with Patent-Pending Rod Compensation Design
- Precision Controlled Brushless Servo Motor
- Precise Displacement Bi-Directional Variable Speed Pump
- Pressure Sensor for Force Control Operation

**SMART Hydraulic Actuator (SHA) vs. Hydraulic Cylinder – Actuation Technology Comparison**

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Kyntronics SHA</th>
<th>Hydraulic Cylinder Actuation System</th>
</tr>
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<tbody>
<tr>
<td>High Force Density</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Variable Speed Servo Control</td>
<td>✔️</td>
<td></td>
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<tr>
<td>Energy Efficient</td>
<td>✔️</td>
<td></td>
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<tr>
<td>All-in-One System / Small Footprint</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Quiet Operation</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Cost Effective / Lower Equipment Cost</td>
<td>✔️</td>
<td>All-in-one design of the SHA eliminates the HPU, hoses and hydraulic infrastructure. The SHA is sized for the application... No more oversized HPUs.</td>
</tr>
<tr>
<td>Reliability/Leak Prevention</td>
<td>✔️</td>
<td>The SHA eliminates hydraulic hoses and connections, thus preventing leaks.</td>
</tr>
<tr>
<td>Simple Fieldbus Control Connectivity, IoT Integration</td>
<td>✔️</td>
<td>The SHA has several standard control interfaces available (CANopen, Ethernet TCP/IP, Ethernet CAT, Ethernet IP, Modbus TCP, Modbus RTU, etc.) to enable simple integration to control systems and support IoT connectivity</td>
</tr>
<tr>
<td>Eliminate Actuation System Design and Build Time</td>
<td>✔️</td>
<td>The SHA is shipped from the factory fully configured as a standard product ready to install.</td>
</tr>
</tbody>
</table>

Kyntronics SMART Hydraulic Actuator (SHA) addresses many of the shortcomings of Hydraulic Cylinder Actuation Systems. SHAs are a very cost-effective solution for a multitude of applications ranging from simple applications requiring a load to be moved from point A to point B, to higher precision applications with position, force and speed control and multi-axis synchronization.

To discuss your application and start saving money, contact Kyntronics at:

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07/2018