



## Meet the Rigorous Demands of the Mobile Equipment Market

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Introducing Power-Packer's  
Smart EDU Actuation System

***POWER-PACKER***<sup>®</sup>

PROGRESS IN MOTION

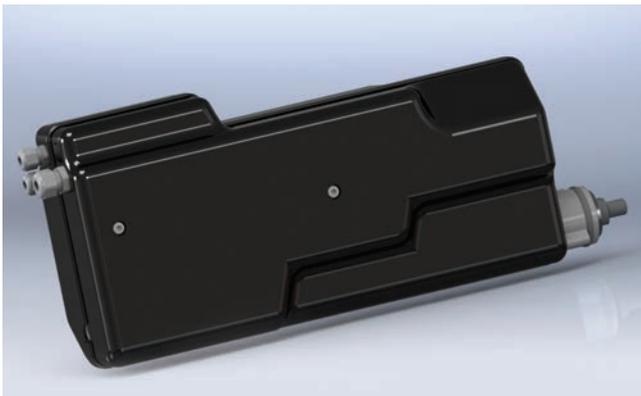


Power-Packer's new Electric Drive Unit (EDU) system combines an integrated hydraulic pump, valves, a cylinder and an electric motor, with optional sensors and controls.

## Background

For many years, hydraulic systems have been used in a variety of applications in the demanding mobile equipment market. The durable, robust power and high-energy density of hydraulic systems made them an ideal solution for motion control in combines, harvesters, seeders, forestry equipment and other high performance industrial applications.

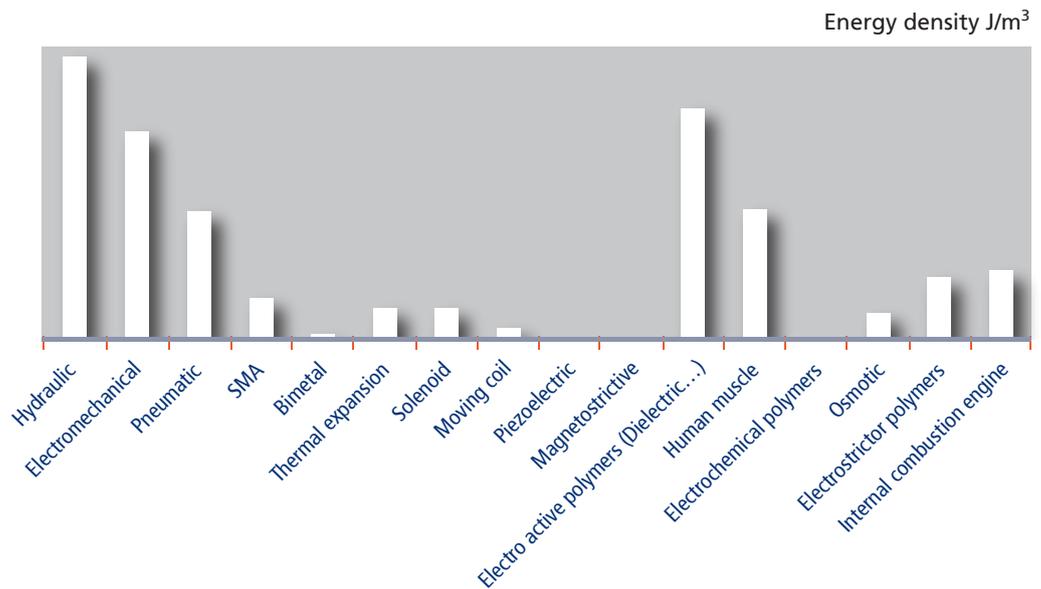
More recently, electromechanical (EM) and pneumatic actuation systems have found their way into the design of mobile equipment, as engineers looked for ways to reduce energy consumption without losing power or performance. These standalone actuation systems function independently of other components in the equipment, striving to provide the rugged power needed for periodic movement, while optimizing energy use. Unfortunately, EM and pneumatic actuation systems have their own limitations.



## Introducing Our New EDU

Power-Packer is pleased to offer a smart, minimal configuration solution for the mobile equipment market. Our new Electric Drive Unit (EDU) system combines an integrated hydraulic pump, valves, a cylinder and an electric motor. In addition, this versatile design includes the option of integrated sensors for position or force, control systems with controller area network (CAN) bus interface, and touch screen displays. Power-Packer's EDU system brings you the rugged durability you need, along with significant energy efficiency and built-in intelligence, for usage in the most demanding applications.

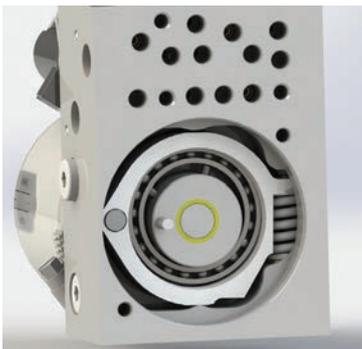
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### Energy Density

When comparing the use of hydraulic, electromechanical and pneumatic technologies in actuator design, energy density, or the power output per volume, is clearly highest with hydraulic systems. Hydraulics are known for high forces in small envelopes. That’s why hydraulic actuation systems have consistently been the go-to choice in high power mobile equipment applications.

New pump technologies, like Power-Packer’s Varex pump, have made it possible to dramatically decrease the sizes of motors needed. Our patented Varex pump has been in use for several years in the OEM automotive market, a market where weight, robustness, reliability, size and noise are critical.



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As changing legislation limits the total allowed weight of mobile equipment, manufacturers in this market are looking for ways to reduce the weight of their products. Power-Packer’s new, lighter-weight hydraulic systems can help to address this problem far better than other technologies.

### Robustness

Hydraulic systems remain the preferred choice in equipment used in harsh environments. Hydraulics are rugged and durable because of their simple design. Unlike the gears in an electromechanical system, there are few moving parts. As a result, hydraulics have minimal compressibility and are still able to absorb shocks far better than EM technology. When strong materials, such as induction hardened stainless steel, is used for cylinder plungers, environmental damage becomes nearly impossible. Hydraulic cylinders are able to resist wear and retain their performance and accuracy.

While pneumatic systems absorb shocks as well as hydraulics, their energy density is far lower which requires the size of the actuator to increase. As an oversized actuator is impractical in most applications, pneumatic technology is often not a good option.

Power-Packer has more than 40 years experience designing and manufacturing maintenance-free systems for the automotive and truck markets. Our systems truly require no tune-ups, oil changes or other routine maintenance.



### Transmission Ratios

Hydraulics also allow better transmission ratios than EM technology. It is easy to achieve a greater ratio simply by changing the pump size or, in the case of the Power-Packer Varex pump, the excenter of the system.

### Dynamic Behavior

In some applications, an actuation system's dynamic range is very important. In these cases, hydraulic systems again perform better than EM or pneumatic technology. Pneumatic systems can deliver some dynamics, but mostly with low forces. While EM actuators can deliver strong dynamics, a high-performance special motor, such as a servo, is needed, making them physically larger and less cost efficient in most mobile equipment applications. Again, hydraulic actuators are the clear choice, as they deliver high dynamic power in a compact design.

### Safety

Many applications call for an actuator that can shut off and hold its position. In a hydraulic system, the simplicity of design allows this to consistently occur. An EM actuator relies upon spindles or ball screws, a more complicated design that requires additional safety measures at high speeds, such as special brakes or mechanical construction, to ensure safe performance.

### Maintenance

In the agricultural machinery industry, designers and maintenance workers understand how to use and service hydraulic systems. A poorly designed actuation will always cause problems in the field, and even well designed and manufactured systems, may need maintenance.

Power-Packer has more than 40 years experience in designing and manufacturing maintenance-free systems for the automotive and truck markets. Our systems truly require no tune-ups, oil changes or other routine maintenance. Our hose designs, featuring small diameter hoses, are tested up to very high pressures (>1200 Bar), and incorporate Power-Packer's patented quick connect system. These small diameter hoses provide easy routing on the equipment and easier handling during the mobile equipment's manufacturing process. Smaller hoses also mean less weight, helping to ensure a lighter overall product.

### Discover the Best of All Worlds with Power-Packer's EDU

In the previous paragraphs, we touched upon the advantages of hydraulics compared to EM and pneumatic technology in actuation systems.

Hydraulic technology uses a simple architecture that has changed little over the years. One central hydraulic power source distributes energy to several actuators, which are typically linear, but may be rotational. On/off, proportional or a similar types of valve controls these actuators. Hoses are usually used to connect the actuator to the valve. The pump and the valve may also connect through a hose, or they may connect directly to each other.



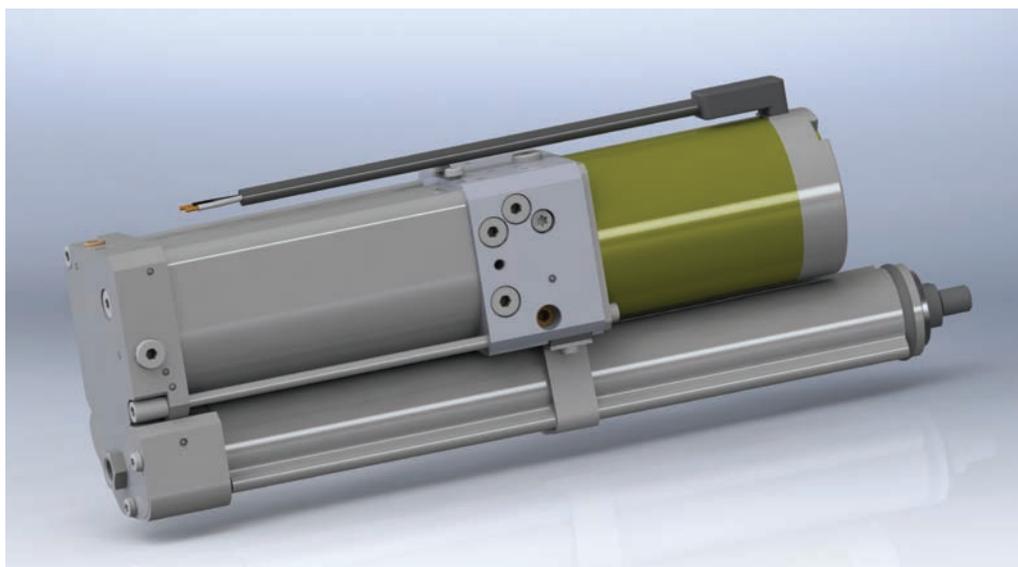
While the benefits are strong, there are some disadvantages with traditional hydraulics architecture:

- Mounting of the hoses can be very expensive and complicated. Hoses may need to go through construction parts, some have large diameters and minimum bending radiuses that are difficult to achieve in the final construction.
- In some applications, a pump must run continually to maintain a constant pressure output. Although efficiency has increased somewhat by using more advanced control strategies, typically a large pump must run continually to deliver lesser amounts of energy to small actuators. This is not energy-efficient and decreases the pump's overall life.
- Every proportional valve used results in energy loss. Long hoses lead to a loss of pressure.

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An electrical connection is all that is needed to run Power-Packer's reliable, high-power, energy-efficient actuation system.

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### **Power-Packer's Super Smart EDU Design**

Power-Packer's EDU system relies upon a small, decentralized power pack, which means a big pump isn't needed to drive the actuator. What's more, no hoses are required. An electrical connection is all that is needed to power this reliable, high-power, energy-efficient actuation system.

Our innovative EDU consists of an electrical motor, 12 or 24 VDC, a reversible pump and a double-acting cylinder, all completely integrated into one simple and compact unit. The cylinder uses a pilot operated check valve (POCV) in both directions to assure that positions are guaranteed fail-safe, even without electrical power.

Gear pumps, plunger pumps and Vorex pumps are used. By altering the type and size of the pump specified, along with the type of electrical motor, Power-Packer's EDU system can achieve a wide range of forces and speeds.

The EDU cylinder and pump are constructed of high-grade, lightweight aluminum. Our EDU makes use of Power-Packer's proven design elements that have delivered more than 40 years of consistent performance to the automotive and truck markets.

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### *More EDU features and benefits*

- Mounting points can be equal to normal cylinders and special connections are an option.
  - Installation is easy. Simply connect the EDU mechanically, connect to electrical power and go!
  - System is closed and prefilled, which means there is no need for filtering.
  - Every unit is tested prior to delivery to ensure the quality you expect from a high-ranked automotive actuation systems supplier like Power-Packer.
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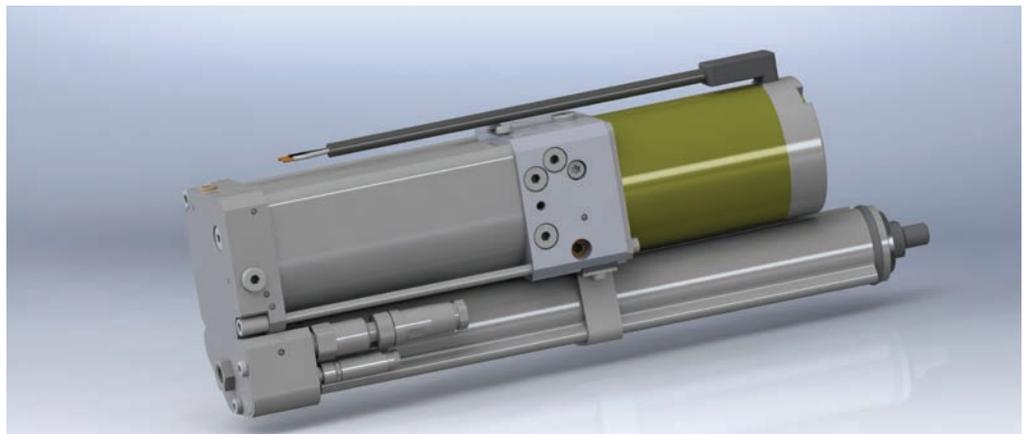
### **Take Our EDU to the Next Level**

Power-Packer's EDU is an efficient, easy-to-use, maintenance-free system. But we haven't stopped there. You have the option of adding sensors, which are fully integrated into the design. Choose a Power-Packer EDU with force measurement and with position measurement, or with a combination of the two. If desired, you can also add temperature measurements. With this sensor integration, your EDU system is not simply an actuator, it becomes a powerful information tool to relay valuable real-time data about your application.

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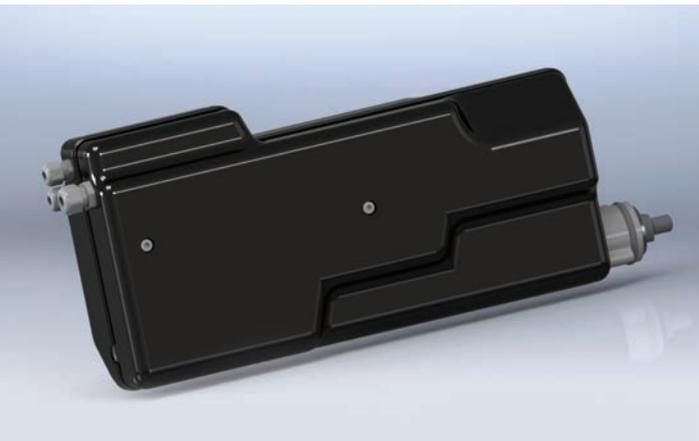


At any time, you can check the position of the actuator and see the force it is delivering. This information allows you to make sure your equipment is working well, is not overloaded, and is being used in the right ranges. A temperature sensor can show you how the surroundings of the system are functioning to help you maintain optimal control and keep your workers safe.

When you choose these powerful options, the sensors are completely integrated in the EDU, the classification is IP67, and you can easily connect them by using the rugged connectors built into the EDU.

You can also easily manage operations by integrating the sensor signals and the motor power control into your control system, which gives you the opportunity to develop your own control strategy to maximize your efficiency.

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#### *Add sensors and a control system*

Want even more information and power at your fingertips? You can integrate controls directly into your Power-Packer EDU. When you do, you'll have the ability to see all sensor information either through a bus system or through individual signals. You can send a position set point to the system, and the actuator will automatically go to that position with a speed you specified using a PID control strategy. The controls are capable of having a soft start and soft stop for the actuator. These settings are adjustable for your applications.

We can provide either a LIN bus or CAN bus systems. Other bus systems are possible on request. Talk with us about your specific needs, and we'll work to provide a system that works best for your application. With this architecture, actuators can be controlled at the same time in an evenly distributed manner. You are able to establish controls to ensure safe movements and no overload will occur.



#### *Add controls and visualization*

For optimal efficiency and safety, Power-Packer's EDU system can be enhanced so that each actuator has a power supply and a CAN bus. By connecting an actuator to the bus system, it automatically identifies itself to the master system, which is a visualization unit from our sister company, maximatecc. Here's an example of how it works. If two different EDUs receive the instruction that they must move at the same time with the same speed to a certain position, the master system can identify the maximum speed and traveling range for each individual EDU. The available forces can be shown, to ensure that no overload of an EDU will occur. Through a simple interface, all parameters of all actuators can be easily seen and changed. And of course, all of this power is password-protected for optimal safety.

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#### **About the Author**

Marcel Nieuwenhuis is the Engineering Team leader of the New Concepts & Technologies group of Power-Packer Europa B.V. He has extensive experience in control systems, mechanical engineering and hydraulics. Marcel has studied Applied Physics at the Saxion University in Enschede The Netherlands.

Power-Packer is a leading supplier in customized hydraulic motion control systems. We serve a broad range of markets, including automotive; truck; medical; marine; construction; agriculture; mining; and other special vehicles and equipment. Power-Packer proudly supplies all major OEMs in these markets.

For more information, please visit [power-packer.com](http://power-packer.com) or contact us at +31 541 584 500.



[www.power-packer.com](http://www.power-packer.com)

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