### POWER-PACKER®

## **REDEFINING TECHNOLOGY:**

# SELF-CONTAINED ELECTRO-HYDRAULIC AS THE NEXT GENERATION IN ACTUATION

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Energy efficiency, increased uptimes, simplified assembly, no maintenance and other key factors are major reasons helping electro-hydraulic systems lead the material handling and transportation market

#### **Actuator Technologies**



This whitepaper considers a drive unit as a device that delivers force in a linear motion. A manual drive unit requires physical force, while a powered drive unit uses electrical power.

Actuator technologies used in powered drive units can be classified into categories such as: pneumatic, traditional hydraulic, electromechanical, and electro-hydraulic. Such actuators are used across various industry verticals to ensure accurate movement in different systems and applications to exercise the required motion control.

#### **Pneumatic Actuators**

Pneumatic actuators consist of a hollow cylinder that contains a cylindrical piston. Air is pressurized by a compressor and is transported by hoses to these cylinders. The build-up of air pressure on one end of the piston results in a linear force in the axial direction.

The remote placement of the compressor and use of hoses makes pneumatic actuators vulnerable to leaks and loss of energy.

- ▲ Safe to use in extreme temperatures
- ▲ Low cost compared to other technologies
- Continuous running of compressor required
- Actuator size increases with high force

#### **Electro-Mechanical Actuators**

Electro-Mechanical actuators use an electromotor and a spindle. The spindle drives a nut that translates the rotation into linear movement.

- ▲ High precision and control
- ▲ Scalable from low to high force requirements
- Low noise emission
- ✓ Not suitable for all environments
- Actuator size increases substantially with higher forces

#### Traditional Hydraulic Actuators

Traditional Hydraulic actuators also consist of a hollow cylinder that contains a cylindrical piston. Instead of pressurized air, an incompressible liquid (mineral oil) is used. This allows for smaller size cylinders to deliver the same amount of linear force. Traditional hydraulics also use a remote pump to provide a constant flow of oil, transported by hoses to the cylinders. This makes hydraulic actuators potentially vulnerable to leaks and loss of energy.

- ▲ Can produce consistent high force
- More compact than other technologies
- Continuous running of pump required
- Multiple components required (fluid reservoir, pumps, cylinders, hoses, motors, etc.)

#### Next-gen Hydraulic Actuators: Self-contained Electro-hydraulic

Self-contained electro-hydraulic actuators combine the motor, pump, and cylinder—eliminating the need for hoses and only initiating the actuator when force is required.

- ▲ Extremely power dense
- ▲ Precise movement
- Zero maintenance
- Power-on-demand with high efficiency
- Self-contained design eliminates need for hydraulic hoses
- Overload protection prevents interface system damage
- Reduced total cost of ownership

### Key Differences Between Actuator Technologies

PARAMETER	SELF-CONTAINED ELECTRO-HYDRAULIC	SELF-CONTAINED ELECTRO-MECHANICAL	PNEUMATIC
System Weight	Lightweight; compact unit	Heavier than electro- hydraulic	Split aggregator; very heavy cylinders
Force vs. Envelope	Strong linear power in acompact package	Actuatorsize increases when high force is required	Lower lifting capacity: actuator size increases considerably when high force is required
Load vs. Speed	High linear velocity independent of force	High linear velocity for low forces, low linear velocity for high forces	High linear velocity for low forces
Smooth Operations	Fluidly controlled 'liquid transmission'	Fully controllable with desired precision, relying on gear ratios and spindle choices	Uncontrolled movements other than at the end or beginning of the stroke
Response Time	Direct drive with incompressible hydraulic oil	Direct drive using gears or spindle	Delayed response due to compressible air
Positioning Precision   Accuracy	Synchronous movements as 'natural effect' of hydraulics	Repeatable and accurate positioning; requires tuning and adjusting based on sensors and controls	Requires tuning and adjusting based on sensorsand controls; not precise
Reliability and Lifetime	Closed system; protected from outside contaminants	May overheat and reduce efficiency	Air can be contaminated, leading to downtime
Maintenance	Zero maintenance; seals are lubricated by thin oil film	Periodic lubrication required for gears and spindles	Maintenance to seals, due to the absence of lubrication
High Durability   Environment	High duty cycle; extreme environments; can handle shock loads	Cannot handle shock loads	Often used in areas of extreme temperatures; resistant to overheating, can withstand harsh environments
Safety	Fail-safe mechanism; overload protection	Often no fail-safe mechanism	By using air, pneumatic actuators avoid using hazardous materials.
Efficiency	Power-on-demand; only use power when moving loads	Power-on-demand; only use power when moving loads	Continuously running compressor
Installation	Ready to use; easy to install; ideal for mobile applications	Ready to use; can be complicated to install and heavy	Simple to install; difficult for hose routing



These limitations are favoring the use of self-contained

• Expensive and complicated process to route hoses in construction parts that have minimum bending

• Reduced energy efficiency due to pumps running

continuously to maintain constant pressure output

• Energy loss from the use of proportional valves

To counter these limitations, the industry is switching to

integrated solutions. This results in a small package,

simple mounting and only connecting to an electrical

• Pressure loss from the use of long hoses

hydraulics. Think of:

power source to operate.

radiuses and large diameters

## Moving from Traditional Hydraulics to Self-contained Hydraulics

Over the years, the applications of hydraulic systems across the fast-paced and dynamic mobile equipment market have increased manifold. Standalone actuation systems operate independently of other equipment and maintain optimal use of energy while providing the power required for periodic movement.

In recent times, the next generation self-contained electro-hydraulic actuation systems have become a popular choice in the design of mobile equipment, due to their reduced energy consumption and high performance without the limitations of traditional hydraulic systems.



#### <sup>01</sup> Maximum Power, Minimal Footprint Get the power you need regardless of

available space

#### Plug and Play

- <sup>02</sup> Only electrical power supply required for installation
- 03 Enhanced Performance High load capabilities, plus adjustable sensors for position detection

#### Safe Operations

<sup>04</sup> Integrated overload protection prevents damage to interface, manual override possible

#### **Proven Quality**

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Time-tested robust design built for maximum performance and long life

Ease of Installation

<sup>06</sup> No hydraulic hoses required

#### Lower Risk of Contamination

07 Self-contained design ensures protection of unit from outside contaminants

#### **Environment Friendly**

<sup>08</sup> High efficiency results in less energy consumption

#### <sup>09</sup> Hassle-free, Zero Maintenance Proven high quality, long life, high endurance, excellent corrosion resistance

 Reduced Total Cost of Ownership
Optimal cost due to long life without required maintenance of replacement

#### **Global Applications of Powered Drive Units**

The motion control industry is seeking new technologies that address the need for better energy efficiency and reliability at lower weight and size. Powered drive units offer new and innovative solutions suited to a range of industrial applications.

#### Technology most commonly used

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TURF CARE/LAWN &	EM EH	FORESTRY AND LUMBER	EM EH	RENEWABLE ENERGY	EM EH
GARDEN Deck lifts		Log clamping and debarking	•	Solar panel positioning	•
Mower blade lifts		Edge guides and saws	•	Wind turbine rotor locks	•
Golf course spraver/sweeper		Arbor gang systems	•	EOOD AND REVERAGE	
oon course sprayensweeper		Chippers and band mills	•	East and heverage production	
MARINE		Veneer peeling machines	•	Automated assembly lises	
lack plates		Flying saws	•	Automated assembly lines	
Jack plates		Presses and pre-presses	•	Conveyor belt systems	
Hatches		MOTION SIMULATORS &		Bottle filling	•
Yacht transom actuators	•			Processing machinery &	•
m		Flight simulators	•	equipment	
ৣ~ MATERIAL HANDLING		Heavy equipment simulators	•	<b>A</b>	
Pallet lifts		Space shuttle simulators	•	AUTOMOTIVE AND TRANSP	ORTATION
Lift tables		Interactive ride simulators	•	Vehicle assembly processes	•
Scissors tables		Animatronics	•	including pressing, elevation, and	
Light aircraft tug		Theatre set staging	•	conveying	
Glass container manufacturing	•	Camera sliders in film production	•	Opening and closing of	•
Clamping and positioning	•	MILITARY AND DEFENSE		vehicle doors	
Conveying	•	Door opening		Railway maintenance	
Sorting		Hatch lifting	-	Commercial airport jetways	•
		Cab lifts	•	TRUCK & ALL TERRAIN/UTIL	ITY VEHICLE
Chute positioners		Armored vehicle attachments		Tailgate locks	
Spraver arm lifts		Tank elevation adjustment		Utility vehicle attachments	
Feeding automation		Weapon positioning		Cart/trailer bed lifts	
Grain handling		Full scale training simulators			
Climate control systems		Aircraft elevator & landing gear		Attachment locks	•
Harvesting and picking			G	Skid steer bucket levelling	
Seeding and spraving		Stretchers & beds		Plough/blade positioning	
occurry and opinying		Ambulance cots			
		Wheelchair access ramps			
		Knoeling bandican yang			
		Kneeling nanoicap vans			



#### Conclusion

Self-contained electro-hydraulic actuators combines an integrated hydraulic pump, valves, a cylinder and an electric motor, and includes the option of integrated sensors for position or force. This does away with hoses and initiates the actuator only when force is required. These systems offer rugged durability, along with significant energy efficiency and built-in intelligence, required for some of the most demanding end-use applications.

Hydraulic technology is used to move heavy loads in a limited space and is the preferred choice for use in mobile equipment. The main factors influencing the growth of self-contained electro-hydraulic systems are their precise and efficient operations, low maintenance cost and high load capacity. The adoption of electro-hydraulic drive units, specifically in high load operations is increasing, as they provide optimum control where the speed of the driven load is required to be varied and precise.

#### About Power-Packer

INTERNATIONAL	PROVEN	ENGINEERING
MANUFACTURING FOOTPRINT	QUALITY	EXPERTISE
MULTI-FACETED, TEAM-BASED APPROACH	- joj- INNOVATIVE THINKING	

For 50 years, our designers have engineered a robust and innovative line of hydraulic position and motion control products that have become the gold standard in excellence for tilting, latching, leveling, lifting, and stabilizing systems used in some of today's most demanding markets, including automotive, on-highway, construction, agriculture, medical, and material handling equipment.

We serve customers from across the world, including OEMs and Tier 1 companies in diverse end-markets. To best meet unique market needs, we have headquarters strategically located in the Netherlands and the US, as well as manufacturing plants in the Netherlands, the US, Turkey, France, Mexico, Brazil, China, and India.

We specialize in custom-made solutions for mobile applications, such as drive systems for convertible roofs and truck cabin tilting. Power-Packer is IATF certified and a recipient of many supplier awards. No matter your application, design challenge, or geographic locations, we can work with you to develop the right solution to help you and your employees.

## TO RECEIVE MORE INFORMATION REGARDING OUR SYSTEMS AND APPLICATIONS, OR TO ASK A SPECIFIC QUESTION,



Contact us by email at marketing@power-packer.com



Visit our website at www.power-packer.com

**PROGRESS IN MOTION** 



The research used in this whitepaper has been commissioned by Power-Packer (CentroMotion), and underwritten by MarketandMarkets Research Pvt. Ltd. the world's largest revenue growth advisory firm.

MarketsandMarkets<sup>™</sup> provides quantified B2B research on 30,000 high growth niche opportunities/threats that will impact the revenues of 70 to 80% of companies worldwide. Almost 75,000 top officers across eight industries worldwide approach MarketsandMarkets<sup>™</sup> with their painpoints around revenue decisions. Our 850 fulltime analysts and SMEs at MarketsandMarkets<sup>™</sup> are tracking global high growth markets following the "Growth Engagement Model – GEM".

MarketsandMarkets's flagship competitive intelligence and market research platform, KnowledgeStore connects over 200,000 markets and entire value chains for a deeper understanding of the unmet insights, along with market sizing and forecasts of niche markets. Power-Packer engineers and manufactures a robust, innovative line of hydraulic position and motion control products that have become the gold standard in excellence for tilting, latching, leveling, lifting and stabilizing systems used in many of today's most demanding markets. We have headquarters in The Netherlands and the U.S., as well as manufacturing plants strategically located around the world. No matter your application, design challenge or geographic location, Power-Packer engineers can work with you to develop the right custom hydraulics solution to help you and your employees work smarter and safer.

Power-packer®

#### CentroMotion Relationship

Power-Packer is part of the CentroMotion organization, a privately held, growing portfolio of highly respected global brands that add value through innovative motion, actuation and control technologies. Our skilled subject matter experts develop solutions that enable our global customers' products to be smarter, safer and more productive, while also creating value for our investors.





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