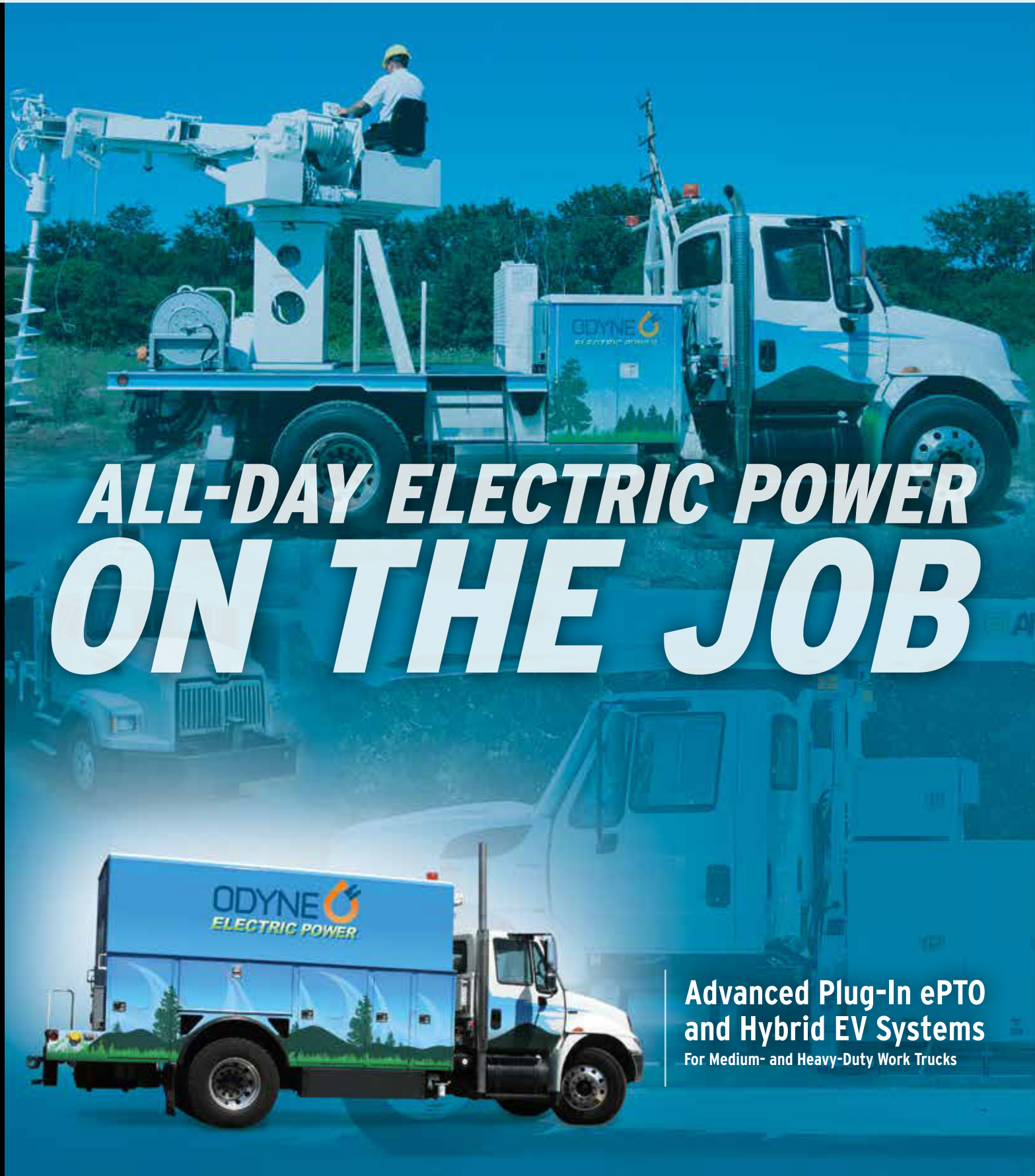
Allison Transmission | ODYNE Electrification Systems

PROUDLY SERVING THE TRUCK ELECTRIFICATION INDUSTRY SINCE 2009



ALL-DAY ELECTRIC POWER ON THE JOB

Advanced Plug-In ePTO and Hybrid EV Systems

For Medium- and Heavy-Duty Work Trucks

WORKING HARDER, SMARTER, SAFER AND LONGER

ODYNE ELECTRIFICATION SYSTEMS PAIRED WITH AN ALLISON TRANSMISSION PROVIDE AN INNOVATIVE PLUG-IN ELECTRIC POWER TAKE-OFF (E-PTO) AND PHEV SYSTEM SOLUTIONS FOR MEDIUM- AND HEAVY-DUTY WORK TRUCKS REQUIRING EXTENDED WORKSITE STATIONARY POWER.

The Odyne Electrification System provides zero-emissions stationary operation for medium- and heavy-duty vehicles requiring engine-off power for electrical loads, hydraulic equipment and compressors. Odyne patented technology delivers lower emissions, improved fuel efficiency, quiet operation and reduced vehicle maintenance by eliminating idling and the need for generators. Odyne's optional plug-in hybrid EV function improves driving power and efficiency. The Odyne electrification system is an excellent match for trucks utilizing truck mounted equipment, such as utility bucket trucks, digger derricks, cranes, and other applications requiring all-day stationary power at worksites. It seamlessly interfaces with an Allison fully automatic transmission utilizing Allison's patented Continuous Power Technology™ to deliver unmatched startability and smooth, full-power shifts for superior acceleration and drivability – all to get your crews to the worksite faster and more efficiently. While driving, the Odyne electric motor optionally provides launch assist and regenerative braking for improved fuel economy and reduced carbon emissions. The Odyne electrification system is designed for optimal performance with transmissions from Allison while fully retaining the manufacturer's transmission warranty. Allison has globally endorsed the use of 1000, 2000, 3000 and 4000 Series™ transmissions with the Odyne electrification system as the exclusively approved PTO-based electrification system.

ALLISON GETS YOU THERE – FASTER, EASIER AND MORE FUEL EFFICIENTLY

Allison Automatics have a reputation for both performance and reliability. Here's why they are the preferred choice for rugged-duty applications:

STARTABILITY

Startability is a vehicle's capability to launch and pull a load. Manual and automated manual transmissions have to launch at very low engine rpm in order to prevent damage to the clutch. This means less torque, which is why they have very deep 1st gear ratios to help them overcome their clutch limitations. An Allison Automatic uses the full torque from the engine and multiplies it with the torque converter. This produces more power to the wheels, allowing your vehicle to get rolling faster and smoother.

MAINTENANCE MADE EASY

Routine fluid and filter changes are the only regular preventive maintenance required with an Allison Automatic. Easily accessible filters reduce labor costs and costly downtime. TES 295® transmission fluid greatly extends fluid change intervals for most applications.

RELIABILITY

Allison transmissions are designed to deliver unrivaled reliability and durability while helping to protect the vehicle driveline. By engineering and manufacturing reliable, fully automatic transmissions and propulsion systems, our customers experience reduced downtime and get more work done.

ALLISON | ODYNE PLUG-IN ELECTRIFICATION SYSTEM

THE SYSTEM PROVIDES STATIONARY ELECTRIC POWER FOR AUXILIARY EQUIPMENT ON TRUCKS OVER 14,000 LBS/6350.3 KG, INCLUDING WALK-IN VANS, BUCKET TRUCKS, COMPRESSORS, CRANES, UTILITY TRUCKS, DIGGER DERRICKS AND OTHER HEAVY DUTY WORKSITE DEVICES.

ON-SITE POWER LIKE NEVER BEFORE

The system has the capacity and endurance to supply all-day power for even extremely demanding auxiliary equipment – up to 36 kW export power at 120V or 240V to replace truck-mounted generators. The system easily recharges overnight via standard plug-in level 1 or 2 EV charging cable. The system stores energy during the day through regenerative braking while driving or seamlessly at the worksite from the motor generator, as needed.

A QUIET, REDUCED EMISSION ENVIRONMENT

Operators appreciate the quiet operating environment, which means a better, safer communications and training worksite with expanded hours in neighborhoods. With significantly reduced emissions, operators also report a reduction in exhaust induced headache and fatigue.

FUEL SAVINGS UP TO 50%

The Odyne Electrification System helps reduce fleet operating and maintenance costs, and, depending on duty cycle, enables large trucks to obtain fuel economy improvements of up to 50% or more, compared to traditional diesel/gas engines. This efficiency may result in fuel savings of up to 1,750 gallons per year*.

PERFECT FIT

The electrification system's minimally intrusive design preserves the OEM transmission warranty and provides greater reliability. It interfaces with many new OEM chassis and Allison fully automatic transmissions, for a seamless, trouble-free solution that can also be retrofit.

WISE INVESTMENT

In fuel savings, increased productivity and reduced maintenance, an Odyne Hybrid System more than pays for itself over the life cycle of the vehicle.

To order visit www.Odyne.com

Odyne Electrification Systems are available direct from Odyne, through truck equipment dealers and from select Allison Transmission distributors globally.

For more information, contact your Odyne representative today or connect with us at odyne.com.

Allison Transmission

ODYNE Electrification Systems

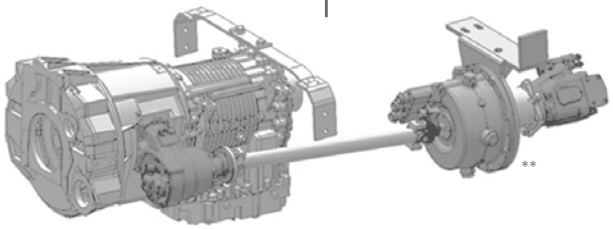
PROUDLY SERVING THE TRUCK ELECTRIFICATION INDUSTRY SINCE 2009

KEY FEATURES AND BENEFITS

Reduced Fuel Costs	Up to 1750 gallons of diesel fuel per year*
Reduced Emissions	Depending on the application, estimated up to 19.25 tons of GHG (CO_2) saved per year* and full day NOx emissions reductions up to 96%
Reduced Noise Level At WorkSite	Operator can talk to others during all electric operation compared to a typical engine-powered truck, improving operator safety
Extended Job Site Time	Optimized with lower cost, overnight off-grid charging with electricity, whereas conventional trucks burn more expensive fossil fuel to operate equipment and provide generator power.
More Power	Up to 50 extra horsepower while driving for improved acceleration when climbing hills, accelerating and cornering and more power for operating equipment at the job site
Lower Maintenance Cost	Reduced chassis and engine maintenance over vehicle life due to lower engine hours
Lower System Weight	Utilizes lithium-ion battery technology
Safety	Designed to SAE-J1772, preventing inadvertent drive-off while charging. High Voltage Interlock Loop (HVIL) detects issues and safely shuts down the system
Operator Friendly	Operation is similar to conventional vehicles and minimal training is required
Performance Monitoring	System changes can be made remotely, as an option

SPECIFICATIONS Odyne Hybrid System

ELECTRICAL	OVERALL	OPTIONS
System Voltage: 350V	Weight: up to 1200 lbs./544 kg (single battery pack) up to 1800 lbs./816 kg (dual battery pack)	Electric air conditioning in cab while engine is off at worksite
Motor: up to 120 HP (90 kW) continuous, 182 HP (136 kW) peak	Chassis Compatibility: Chassis over 14,000-lbs/ 6350.3 kg GVW	Hydronic heater in cab while engine is off at worksite
Batteries: High voltage maintenance-free lithium-ion battery pack(s) over 10 kWh and up to 100 kWh+	Drive Train Interface: Industry standard with Allison fully automatic transmissions	Exportable power up to 36,000 Watts at 120V or 240V AC
Approximate Battery Weight: 350 lbs/181.4 kg per battery pack	Ground Clearance: Standard chassis ground clearance	Advanced telematic system with data acquisition and system upgrade capabilities
10 kWh Charge Time: 2 hours with 220V/30A supply, over 10 hours with 110V/20A supply	Components: Designed for rugged environments	
Charge Rate: 6+ kW		
Charge Station & Charging Cord: SAE J1772 compliant charging cord		
Cord Receptacle: Mounted on the street side, curb side or on the back of the body		
Component IP Rating: IP65 or IP67		



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*Estimate based on International IHC DT engine chassis with Odyne PHEV system greater than 25 kWh in use 250 days per year for 10 years with 2 hours of driving and 4.5 hours of electric mode operation and approximate fuel cost of $5 per gallon diesel and approximately 22.2 pounds of CO_2 per gallon of diesel fuel burned. ** Patented

COMPARATIVE INSIGHTS

ODYNE HYBRID SYSTEM VS. AN ANTI-IDLE OR EPTO WORKSITE ONLY SYSTEM FROM OTHER MANUFACTURERS

Electrification System **Safety, Performace and Application Criteria**	Odyne Plug-in Hybrid System[1]	Other company ePTO work site system[2]
Plug-in Hybrid		
Plug-in Hybrid as defined by U.S. government[3]	Yes	No
Eligible for EPAct credits[4]	Yes	No
Safety		
SAE J1772 compliant: plug-in charging safety[5]	Yes	Optional
High Voltage Inerlock Loop	Yes	No
Warranty		
Acknowledged to fully retain Allison Transmission warranty by transmission manufacturer. Approved and endorsed by Allison Transmission for use with 1000, 2000, 3000 and 4000 Series™ transmissions.	Yes	No
Performance		
Increases fuel efficiency while driving	Yes	No
Increases fuel efficiency at the worksite	Yes	Yes
Increases vehicle acceleration	Yes	No
Standard 120 V and 220 V charging	Yes	No
Maximum battery capacity greater than 20 kWh	Yes	No
Maximum electric motor power greater than 70 kW	Yes	No
Work Truck Applications (available on)		
Aerial bucket truck: Altec, Terex, Versalift	Yes	No
Walk-in Van export power	Yes	No
Cable puller	Yes	No
Digger derrick (fully electric): Altec, Terex, Versalift	Yes	No
Refuse truck	Yes	No
Articulated cranes (knuckle boom & wallboard)	Yes	No
Capable of supporting high exportable power 6-36 kW (replaces generator)	Yes	No
Large air compressors: Boss, Vanair	Yes	No
Tank truck: Amthor International and others	Yes	No
Walk-in van with underground air handling: Utilimaster, Morgan Olson	Yes	No

1 Plug-in Hybrid systems by Odyne allow medium and heavy duty vehicles to operate using stored electrical energy for optional stationary vehicle operations with the engine off and a combination of engine and electrical power during driving, reducing fuel consumption during all modes of operation. Odyne plug-in hybrid systems use the existing standard truck powertrain with an Allison transmission and enhance vehicle performance whilenot impacting the transmission warranty. Odyne plug-in hybrid systems are designed to operate with or without grid recharging and can use the engine to recharge the battery system if required.

2 Solution A Work Site Energy System is an electrified power take-off used to power hydraulic equipment when a vehicle is stationary. Sometimes referred to as a work site energy management system or an anti-idle system, the ePTO system saves fuel during stationary vehicle operations.

3 Plug-in hybrid vehicle as defined by U.S. Federal Government per part 535.4, Medium- and Heavy-Duty Vehicle Fuel Efficiency Program pursuant to 49 U.S.C. 32902(k). Retrieved from: http://www.gpo.gov/fdsys/pkg/FR-2011-09-15/pdf/2011-20740.pdf

4 Certain U.S. fleets are required to comply with the U.S. Department of Energy's (DOE) Alternative Fuel Transportation Program specified in the Energy Policy Act (EPAct). PHEV medium- and heavy-duty trucks are eligible for credits. The DOE will allocate 1 AFV credit (i.e., 1 per vehicle) for the acquisition of such a vehicle. Retrieved from: http://www.gpo.gov/fdsys/pkg/FR-2011-09-15/pdf/2011-20740.pdf, part 535 and http://www1.eere.energy.gov/vehiclesandfuels/epact/faqs.html#B2 for details. Trucks equipped with only an ePTO do not earn AFV credit. Retrieved from: http://www1.eere.energy.gov/vehiclesandfuels/epact/faqs.html#B21

5 First standard in the world reached by industry consensus that provides critical guidelines for safety, charging control and connectors used to charge plug-in vehicles.Retrieved from: http://training.sae.org/webrecordings/pd331046on/

6 Limited warranty, see warranty document for details. Battery has 10-year design life.

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Information or specifications subject to change without notice or obligation.

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