

Patents

Azure's internationally patented energy management system optimizes the operation of the hybrid electric vehicle. This technology allows for the optimization of components resulting in a smaller battery pack and smaller engine. The optimized components plus efficient energy management has achieved outstanding reductions in both fuel consumption (ranging up to 58%) and emissions.

Vehicle Systems Engineering

Seven Patents Issued and Five Pending

- Energy Management (batteries and capacitors)
- Emissions Management
- Vehicle Control (engine, transmission and auxiliary)
- Diagnostics Software
- Energy Management (regenerative braking)
- Energy Management (engine/generator operating point optimization)



Components

Seven Patents Issued and Two Pending

- Hardware Designs (inverters, controllers and motors)
- Control Software (motor control and switching devices)

US Patent Filings*	
TITLE	STATUS
Control System for a Hybrid Vehicle	Patent Awarded
Method and Apparatus for Adaptive Hybrid Control	Patent Awarded
Battery Management	Patent Awarded
Multi Input/Output System Optimization	Patent Awarded
Regenerative Braking Optimization	Patent Awarded
Rear Drive Electric Vehicle	Patent Awarded
Suppression of Multiple Noise-Related Signals in Pulse Width Modulated Signals	Patent Awarded
Vehicle Drive Control System	Patent Awarded
Switching System	Patent Awarded
Contractor Feedback and Pre-charge/Discharge Circuit	Patent Awarded
Transmission Control for Parallel Hybrid	Patent Pending
Emissions Control for Diesel and Gasoline Hybrid	Patent Pending
Export Power Management 1	Patent Awarded
Energy Management - Series Hybrid	Patent Pending
Energy Management - Parallel Hybrid	Patent Pending
Export Power Management 2	Patent Awarded
Compact Filter Package 1	Patent Awarded
Compact Filter Package 2	Patent Pending
Motor Sensing	Patent Awarded
Three Phase Current Sensing	Patent Pending

Patent First Filed as PCT*	
TITLE	COUNTRY
Reduction of Starting Torque	Patent Pending
Patents Issued Outside the US*	
TITLE	COUNTRY
Control System for a Hybrid Vehicle	Canada
Method and Apparatus for Adaptive Hybrid Control	Canada, Great Britain, France, Italy, Germany & Spain
Battery Management	Mexico & Singapore
Multi Input/Output System Optimization	Great Britain, France, Germany, Spain, Mexico, Singapore & Hong Kong
Regenerative Braking Optimization	Great Britain, France, Italy, Germany, Spain, Belgium, Mexico, China, Singapore & Hong Kong

* Titles are indicative of the general fields and may be abbreviated. Certain filings are being examined in other countries under the Patent Cooperation Treaty process.

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