Hybrid Design Services, Inc. (HDS™) is an ISO 9001:2015 certified company headquartered in Troy, MI, offering a full range of engineering consulting services, including: design, prototyping, manufacturing, and testing services.

HDS focuses on advanced mobility and energy storage.

Phone: +1.248.298.3400  
Fax: +1.248.298.3402  
Web: www.hybriddesignservices.com
A. Battery Pack Design & Engineering
B. Electric / Hybrid Vehicle Design & Engineering
C. Hardware & Power Electronics Development
D. Specialized Services, Products & Technologies
BATTERY PACK DESIGN AND ENGINEERING

Development, Design, and Prototyping

Pack Design and Optimization
- Module Size and configuration optimization
- Pack Electrical, Mechanical and Thermal Interface
- Vehicle Packaging & Environmental Protection
- BMS Development and Integration
- Structural and Thermal/Fluid CAE Analysis

Module Design and Optimization
- Cell Selection
- Module Packaging
- Cell carrier and Interconnect strategy
- Module V/T sense
- Thermal System Integration

Prototype Development
- Module Builds
- Pack Builds
- Incoming and End-of-Line testing
- Supply Chain Management

Thermal and Structural Analyses
- Cell Thermal Model Correlation
- Module model development and correlation
- Module and Pack Thermal strategy development
- Module and Pack Structural System Design

WORLD CLASS ENGINEERING AND PROTOTYPING SOLUTIONS
STATIONARY PACK DESIGN & ENGINEERING

UTILITY SCALE ESS

- Packaging: battery modules, HV/LV wiring, fire suppression, HVAC
- FMEA, Risk Analysis, DVP – UL, Telcordia
- Installation, assembly and service
- CAE (mechanical and thermal analysis)
- Controls and SCADA integration

EXPORTABLE POWER - V2G / V2X
BATTERY PACK DESIGN AND ENGINEERING

HIGH PERFORMANCE VEHICLES
BATTERY PACK DESIGN AND ENGINEERING

ULTRA CAPACITOR

Initial Specifications
Size: 1055mm L x 500mm W x 310mm H
Weight: 49kg (329lb) steel / 102kg (225lb) Al

Configuration A
Voltage & Capacitance: 205 Vdc / 47.2 F
Peak Power: 410 kW (2000A)

Configuration B
Voltage & Capacitance: 216 Vdc / 41.7 F
Peak Power: 410 kW (1900A)

Cooling: Air-to-Liquid Cooling
ELECTRIC/HYBRID VEHICLE DESIGN & ENGINEERING

Prototype Development
- ESS /Controls
- Powertrain/ E-Drives
- Bench-Top Demonstrators
- Full Vehicle Prototypes
- Supplier Management
- Weight Reduction
- Cost Reduction
- Benchmarking / Teardown

Advanced Powertrain Design
- ICE Optimization
- E-Motor Sizing & Selection
- Inverter Selection & Design
- ESS Design, Development and Packaging
- Smart Power Distribution / BDU

Powertrain / Vehicle Simulation
- Performance
- Fuel Economy
- Emissions
- Hybrid / EV Range
- Hybridization Strategies
- Model Correlation

Controls Development
- Hybrid / EV System Controls
- ESS / BMS
- Simulation → Embedded Controls
- Power Distribution

World class engineering and prototyping solutions
ELECTRIC/HYBRID VEHICLE DESIGN & ENGINEERING – CROSS INDUSTRY SUPPORT

Automotive / LEV
- EV/HEV/PHEV System Concept Generation and Engineering
- HV & LV Architecture, Schematics, Prototypes
- ESS Concept, Detailed Design, Prototyping, Testing
- Full System Engineering (DFMEA / FTA / HSIS / Specifications, etc.)
- Fuel Economy Simulations
- Full-vehicle Prototype Development, Integration, and Testing
- Control System Development
- Full DV Testing
- Business Case and Technology Analysis

Utility/Off-Highway/Urban/Commercial
- Fuel Economy Studies and Duty Cycle Simulation
- EV & Hybrid System Development
- Energy Storage System Design & Build
- Power Electronics & Drive System Design & Build

Heavy-Duty & Military
- Class-8 Hybrids  Class-8 ‘EV’
- Architecture Engineering
- Driveline Design
- Battery Pack Development

Marine, Recreational Vehicles, and Alternative Energy
HARDWARE AND SOFTWARE CAPABILITIES
HARDWARE AND SOFTWARE
HDS xEV CONTROLS OVERVIEW

HDS’ Electric Vehicle Controller Software includes basic and advanced functionality. Customers may choose to leverage existing HDS EV Controller Software, or to develop all-new software to meet their individual needs.

An example of main functionality which can be incorporated into the software is shown below:

- Vehicle Safety & Monitoring
  - HV Safety
  - Thermal Safety
  - Operational Safety
  - Service, Maintenance, Diagnostics
- Flexible User Interfaces
  - Programmable displays
  - Tunable Driver controls
    - Throttle Management
    - Shift Management
    - User Interface
- Efficient Traction Drive Interface
  - Torque Control
  - Power Management
  - Regenerative Braking
  - Gearbox Control
- Battery Management
  - Thermal Management
  - Power Management
  - Protection & Safety
- Energy Management
  - DC/DC & 12V/24V Management
  - Smart Power Distribution & Control
    - Main Traction Bus
    - Accessory Bus(es)
    - Charging Bus(es)
- Thermal System Control
  - Fan Control
  - Cooling Pump Control
  - Air Compressor Control
  - Hydraulic Pump Control
  - Heating & a/c Control
  - Auxiliary Systems
  - ….
HARDWARE AND CONTROLS
HDS CONTROL SYSTEM IN PRODUCTION EV CONVERSION

EV Control Systems in Production – Europe & Asia

More than 1,000 vehicles on the road, with over 3 years of service
More than 1,200 vehicles/year production in Europe alone
SPECIALIZED SERVICES
CONCEPT ➔ PROTOTYPE ➔ PRODUCTION

HDS Develops Products From Idea to Prototype in Record Time

Transit Bus Ultra capacitor ESS
From cell to 90-unit DV-tested delivery in 4 months

Heavy-Duty Power System
From concept to working prototype

Heavy-Duty Power System
From idea to running multi-mode xEV vehicle
SPECIALIZED SERVICES

MANUFACTURING & TESTING

MANUFACTURING

• Complete Fabrication & Machining
• Supplier Selection & Supply Chain Management
• Component Tooling & Procurement
• Detailed Electronic Inventory Tracking
• Accurate Prototype Construction
• Torque/Angle Testing & Assembly
• UN Regulation Shipping

TESTING

• Instrumentation
• Data Collection
• Environmental Testing
• IP (Ingress Protection)
• Vibration (SAE, OEM specifications)
• Torque-Angle Testing
• EMC Compatibility (RE, RI, Comp.)
• Thermal Cycling
• ESR/DCR Testing
• EOL Performance/Functionality
• Off-site testing support
SPECIALIZED TECHNOLOGY

GRAPHENE GCF

Advanced Graphene Cooling Systems

- Battery Cooling System

- Graphene Composite Fin (GCF)

- For Cylindrical, Prismatic, and Pouch cells & Electronics
SPDM Power Distribution Modules (SPDM):
• Connect single or distributed energy storage systems safely to the rest of a vehicle or test system
• Offer a single integrated solution to DC bus management.
• SPDM can be used to safely control power on production vehicles, test vehicles, bench test systems, stationary power systems, battery test, and many other applications.
• Integrated controller with bus voltage and current monitors for contactor control.
• HVIL and available Isolation Monitoring allow safe operation up to 800V DC.
• Very low 12V or 24V VDC continuous power consumption.
• Customizable CAN 2.0 speed, frequency and messages.
• EMI/EMC Compatible
• Remote Monitoring & Reporting

Watchdog Systems
• Used as redundant monitoring and emergency shutdown system during HV safety critical testing or vehicle system. Highly customizable and configurable system
• Monitors user defines test bench variables from gas detector and thermocouples to CAN and control signals
• Features an optional on-board flash storage for data logging.
CONTACT HDS

Online
www.HybridDesignServices.com

Visit our Headquarters
2479 Elliott Drive
Troy, Michigan 48083 - USA

Contact Us Directly
+1.866.492.3417
+1.248.298.3400
Fax: +1.248.298.3402

James Pinon
President / CEO
+1.313.673.6917
jpinon@hybriddesignservices.com

Firdevs Arikan
Operations Manager
+1.313.205.2017
farikan@hybriddesignservices.com