

GO ELECTRIC



GET IT RIGHT WITH TWIN DISC

HYBRID AND ELECTRIC SYSTEM
SOLUTIONS TO ACHIEVE YOUR GOALS



GO ELECTRIC

MOVE FORWARD WITH TWIN DISC

As leaders in power transmission technology, Twin Disc delivers the solutions that best fit your specific application: diesel power, full electric, or a hybrid system that takes advantage of both.

EVOLVING OPTIONS, GROWING BENEFITS

Hybrid and electric systems give you a better way to:

- Be environmentally friendly
- Meet emissions standards as well as stakeholder expectations
- Save on fuel and maintenance costs
- Reduce noise and vibration
- Increase efficiency

Here's how we define the options:

Full electric system eliminates the main diesel engine and its maintenance costs, and cuts fuel costs and emissions. Configurable power-dense energy storage systems efficiently provide the energy needed to power the application.

Serial hybrid system uses an electric motor to replace the traditional main diesel engine, drawing electric power from an onboard energy storage system, onboard gensets, or both.

Parallel hybrid system pairs the diesel engine with an electric motor. This configuration allows for a diesel-only, electric-only, and boost mode, taking advantage of both.

Note that marine and land-based applications require different systems and configurations; talk with Twin Disc specialists about your specific needs.

LET'S TALK ABOUT YOUR APPLICATION

Twin Disc supports you with complete hybrid systems as well as specific components. Our specialists work with your technical experts to determine the optimal configuration and components. **Talk to us today about moving forward to a better system, and a better bottom line.**



MAID OF THE MIST

CATAMARAN FERRIES

Fleet: Maid of the Mist (passenger catamarans)

Location: Niagara Falls, New York

Shipyard: Burger Boat Company, Manitowoc, Wisconsin

Designer: Propulsion Data Services

Integrator: ABB

Propulsion: Two Veth VL-200 L-drives per vessel

Situation

Two Maid of the Mist ferries give about 1.6 million tourists a year up-close views of Niagara Falls. In replacing aging diesel vessels, the company chose all-electric propulsion to protect the Niagara River. Also important: efficiency, reliability and minimal maintenance.

Solution

Two new Maid of the Mist catamarans each feature two VL-200 L-drives from Veth Propulsion by Twin Disc. These high-efficiency thrusters are powered by lithium-ion batteries that are charged from Niagara Falls' hydroelectric power plant.

Results

The Veth L-drives enable the ferries to move upriver without diesel fumes, view-obstructing exhaust stacks, or noise to compete with the falls. "And everyone is impressed by the lack of vibration—even the Coast Guard," says Christopher M. Glynn, president, Maid of the Mist Corp.

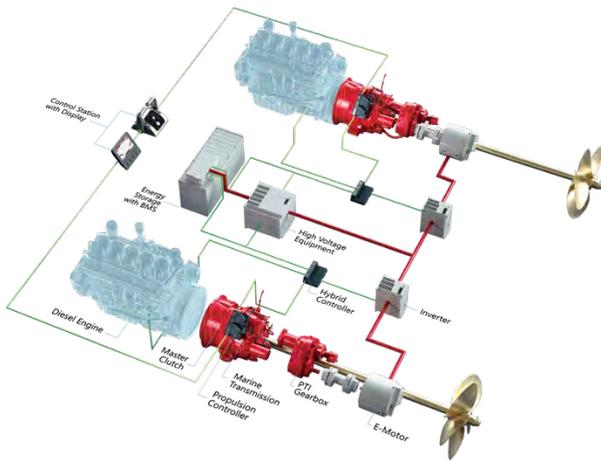
Maneuverability is outstanding. "We can turn in our own length, which is very helpful coming out of Horseshoe Falls," Glynn says. He adds that crew can "walk" the vessels laterally into the dock. "It's more delicate than with a traditional mono-hull—and it saves the paint!"

Glynn praises Twin Disc's responsiveness. "The technology has been around for a period of time, but not bundled together like we're doing," he said. "Veth was super helpful as we went through the approval process for the electrical package. They didn't just say, 'Here's what we have. Good luck.' They were very interested in making this work."

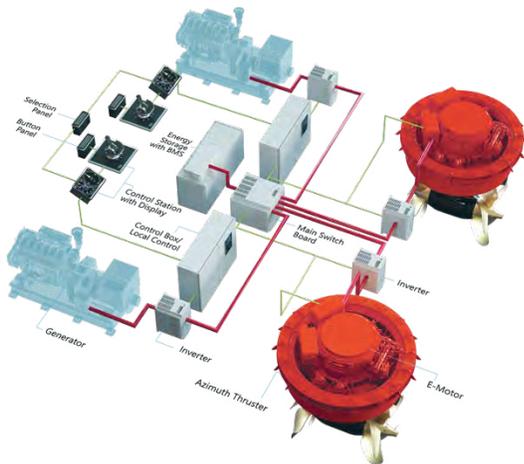
SELECT SYSTEM CONFIGURATIONS

We offer custom configurations to create the optimal system for your application. Here are four common systems for you to explore:

MARINE

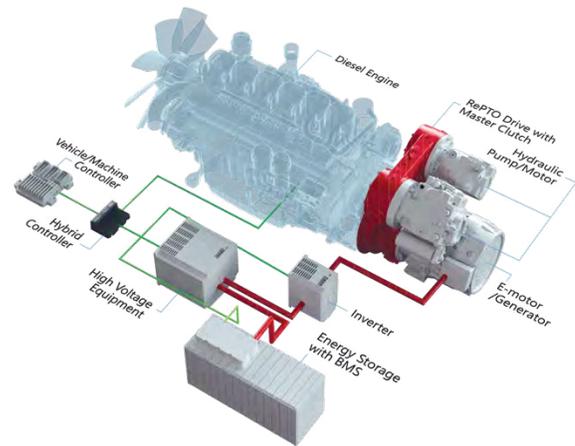


PARALLEL HYBRID

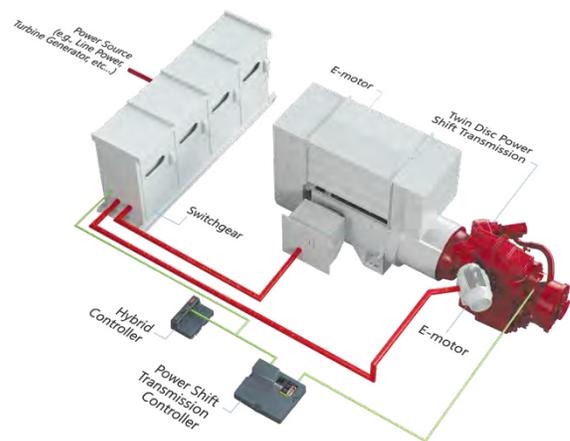


SERIAL HYBRID

LAND-BASED



PARALLEL HYBRID



SERIAL HYBRID

See more systems at twindisc.com/goelectric.



GASE
STUDY

HINCKLEY PICNIC BOAT

SIGNATURE EDITION YACHT

Model: Picnic Boat 40 S

Builder: Hinckley Yachts

Location: Portsmouth, Rhode Island

Propulsion: Hinckley SilentJet™ technology, developed with Twin Disc

Power: 2x 90 kilowatt (kW) electric motors, 2x Cummins 550hp diesel engines

Marine gears: 2x Twin Disc MGX-5075SC with Master Clutch MC-15

Energy storage: 1 x 80 kWh battery that can be charged by shore power or while underway by diesel power

Situation

Hinckley, a renowned American yacht builder and maker of the world's first fully electric luxury yacht in 2017, sought to deliver increased range as well as a truly silent cruising experience—a paradigm shift for pleasure boats.

Solution

The yacht maker partnered with Twin Disc to create its SilentJet™ technology, with a groundbreaking automatic mode that seamlessly manages diesel/electric operation.

Results

The hybrid upgrade enables Hinckley's iconic Picnic Boat to run in near silence. The vessel glides silently away from the dock and can travel farther than with an electric-only platform. With SilentJet engaged, the Picnic Boat 40 S's cruising speed is seven knots. Range is at least an hour (at seven knots, and up to 90 minutes at 5.5 knots), and the Picnic Boat 40 S cruises at 35 knots (depending on load) under diesel power.

When faster speeds are desired or the battery needs charging, the diesel engine comes on automatically, replenishing the battery in just 30-45 minutes. Electrical loads are supported by the battery at anchor, so there's no need for a noisy generator. Hinckley calls it "the quietest ride on the water."

"By collaborating with Hinckley on a complete hybrid solution, we advanced our development with a proven builder who embraces electric and hybrid technology," says Mike Gee, Twin Disc vice president - hybrid engineering. "We focused on Hinckley's needs and tailored our technology and software to provide an automatic mode that seamlessly manages diesel/electric operation. The functionality perfectly complements Hinckley's user-friendly control system."

PARALLEL HYBRID

MARINE

Diesel + Electric Motor with Energy Storage

This parallel hybrid system uses standard Twin Disc propulsion control. It's best suited for vessels with long waits between jobs, high percentage of slow speed operation, and operating in restricted areas and zero emission zones. Twin Disc technology enables implementation into any standard QuickShift® marine transmission.

1. System Overview

- Parallel hybrid using diesel and electric power
- During low-power operation, the e-motor uses excess diesel power to generate electricity
- In high-demand phases, electric power can boost diesel power

2. Marine Transmission

- Based on standard marine transmission, with same footprint and selection criteria and proven worldwide support
- No trailing pump needed; transmission is lubricated as diesel or e-motor drives it
- Efficient design minimizes losses

3. Master Clutch

- Provides power generation through PTO/PTI in forward, neutral and reverse
- Prevents engine back-driving during electric-only operation
- Allows all features of QuickShift® transmission

4. PTI Gearbox

- Allows for standard speed/smaller e-motor through motor speed reduction

- Offset to propeller shaft enables installation of large motors
- Reductions from 1.0:1 to 2.5:1
- Integrated sea water pump cools transmission during electric propulsion
- PTO available for onboard hydraulics (e.g., steering pump)

5. Propulsion Controller

- Twin Disc standard propulsion controller and operator interface

6. Hybrid Controller

- Manages power distribution, interfacing with propulsion controller and high voltage equipment

7. E-Motor/Inverter, High Voltage Equipment

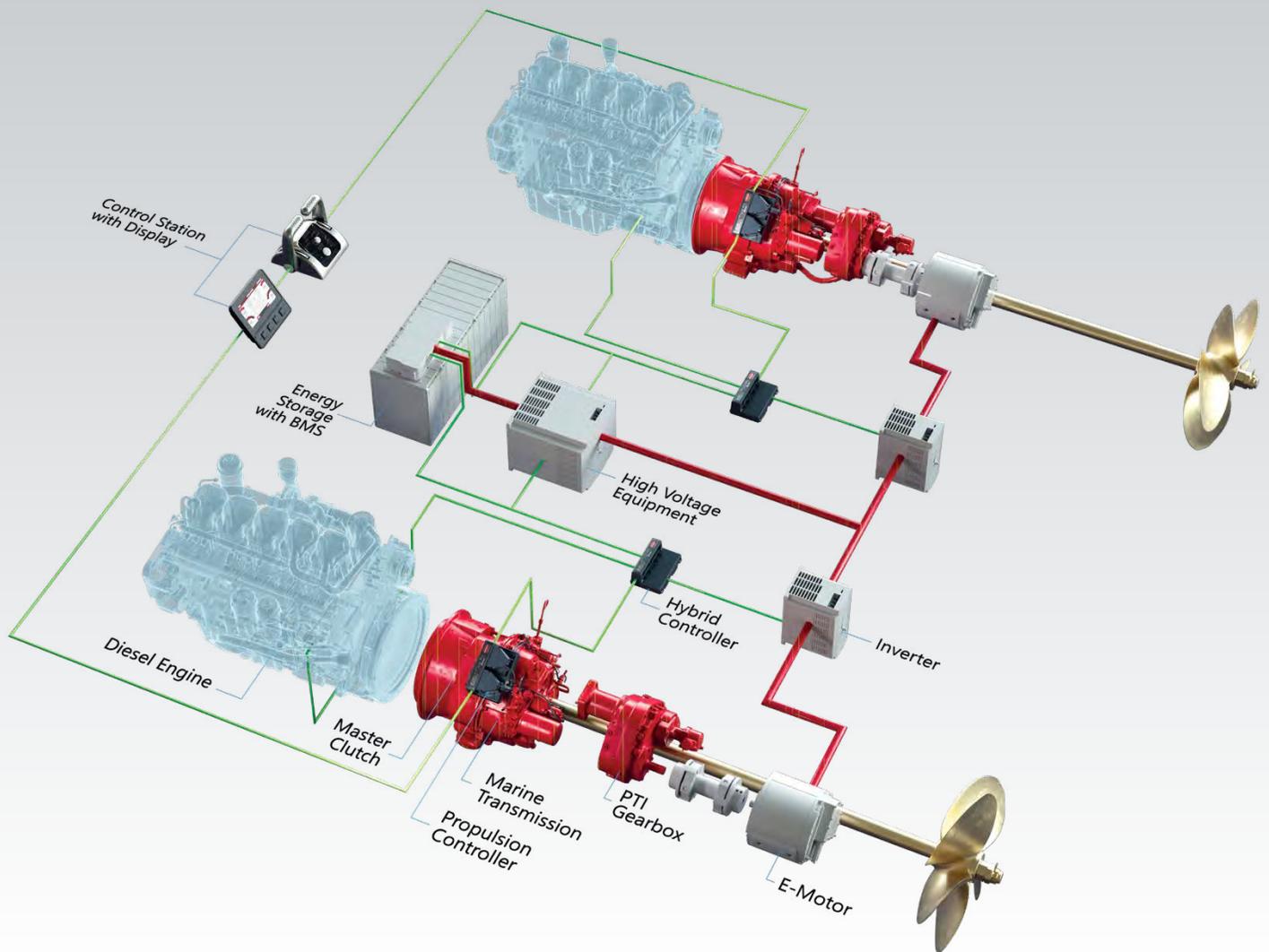
- Selection based on application characteristics
- Controlled and monitored by hybrid controller

8. Energy Storage

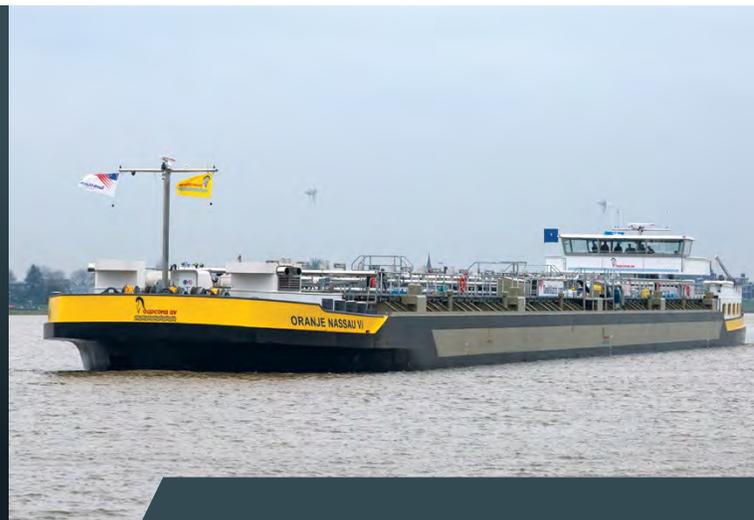
- Selection based on application characteristics
- Controlled and monitored by hybrid controller

ELECTRIC POWER FOR GREENER DREDGER. The Afonso De Albuquerque is a trailing suction hopper dredger built with a state-of-the-art filter system to meet the latest ultra-low emission vessel (ULEV) standards. The vessel features two electric-driven VZ-1250 rudder propellers (1100 kW) and one 2-K-1300 Veth Jet bow thruster. The dredger, one of more than two dozen Veth Propulsion by Twin Disc projects with the Jan De Nul Group, plays an important role in maintaining navigable waterways, enabling offshore energy production and reclaiming land.





SMOOTHER, EMISSION-FREE SAILING. Three Veth VL-700 L-drives (533 kW) provide the primary propulsion for the Oranje Nassau VI, incorporated in a revolutionary hull design that lets the tanker move smoothly through shallow waters. A battery charged by the ship's engines can power the L-drives' electric motors when required, enabling the vessel to sail through harbors emission-free. Veth Propulsion by Twin Disc provided an additional three L-drives for the Oranje Nassau V.



PARALLEL HYBRID

HYBRID LAND

PARALLEL HYBRID

MOBILE & STATIONARY EQUIPMENT

Diesel + Single Electric Motor with Energy Storage

This parallel hybrid system delivers the optimal balance between electric and hydraulic power requirements.

1. System Overview

- Parallel hybrid using diesel and electric power
- In high-demand phases, electric power and diesel power can assist one another
- The e-motor can use excess diesel power to generate electricity
- Power regeneration is possible through braking (inertia or vehicle)

2. RePTO drive

- Installed between diesel engine and e-motor/generator
- Single and dual tower options available for driving hydraulics or other auxiliary loads
- Mechanical interface to direct-mount e-motor/generator to RePTO drive output

- Master Clutch between diesel and RePTO drive for electric-only mode and power regeneration
 - Power generation through PTO/PTI in various operating states
 - Prevents engine back-driving during electric-only operation

3. Hybrid Controller

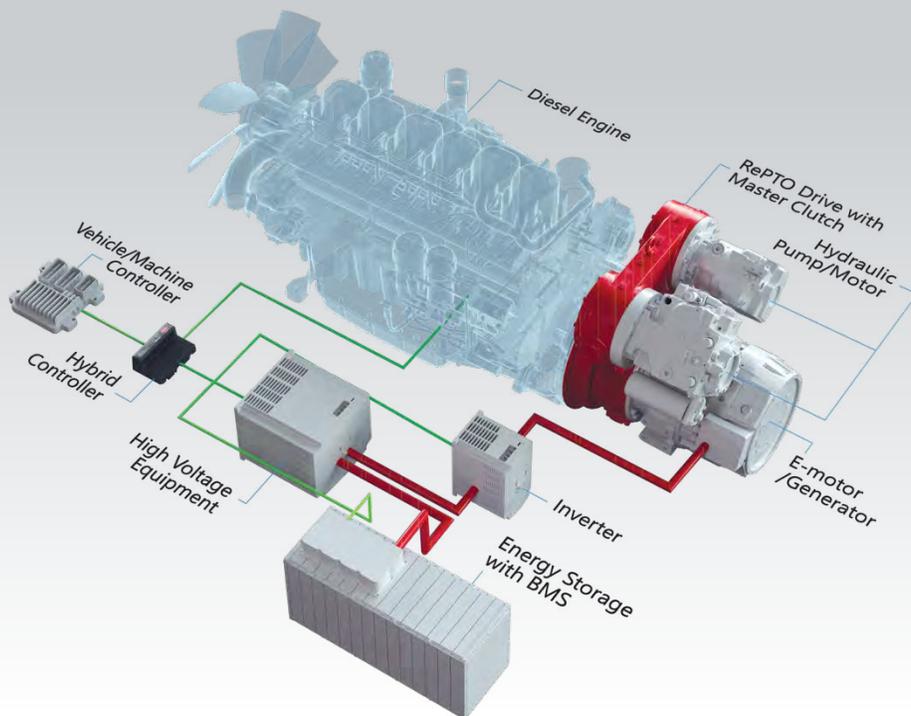
- Manages power distribution, interfacing with customer's vehicle/machine controller and high voltage equipment

4. E-Motor/Generator, Inverter, High Voltage Equipment

- Selection based on application characteristics
- Controlled and monitored by hybrid controller

5. Energy Storage

- Selection based on application characteristics
- Controlled and monitored by hybrid controller





EDILOG

NEXT-GENERATION HYBRID LOG STACKERS

Product: AM 370 Pump Drive

Maximum input power: 700 kW (939 hp) 0.7:1 ratio @ 1200 rpm

Application: Pulp mill log stacker

Manufacturer: EdiLog

Electrical system design: Elforest Technologies

Location: Östrand, Sweden

Situation

Log stackers must run all day, every day to maintain pulp mill production— but continuous diesel engine use drives up carbon dioxide emissions, fuel costs, maintenance needs and noise. EdiLog wanted a more cost-effective, reliable log stacker that would be better for people in and around the machine, and better for the planet.

Solution

EdiLog turned to Elforest Technologies to design a hybrid drive system combining electric and diesel operation. And Elforest chose the Twin Disc AM 370 Pump Drive. Energy is stored in ultracapacitors that deliver better performance than batteries and have a service life equal to that of a diesel engine.

Results

“We’re operating the diesel engine at 1200 RPM, which significantly reduces noise,” says Kjell Arne Engberg, EdiLog CEO. “The AM 370 at an 0.7:1 ratio gives us the hydraulic flow and generator efficiency we need.”

The electric motor is simpler than a conventional gearbox, with fewer parts in the power train—minimizing maintenance and operating costs. Fuel savings are estimated at 28%, and CO₂ emissions are cut by 120 tons annually. Reducing noise and vibration increases operator comfort.

Reliability is also enhanced. “The coupling between diesel and the AM 370 is now working flawlessly,” says Engberg. “We’ve delivered seven hybrid log stackers, and together they have run more than 50,000 hours.”

SERIAL HYBRID

MARINE

Electric Motor with Generator Power & Energy Storage

This serial hybrid system uses an electric motor and can both generate power and store energy. The system optimizes fuel consumption with a generator. It's best suited for vessels operating in restricted areas and zero emission zones.

1. System Overview

- Serial hybrid using electric power
- Optimizes fuel use via gensets operating at the top of their fuel efficiency range. When propellers operate at low power, some gensets can be switched off, and the rest continue in their optimal range
- Machinery compartments can be located to optimize cargo space or meet class requirements

2. Azimuth Thruster with E-Motor

- Ultra-low-profile electric motor integrated into azimuth thruster
- Underwater components identical to standard azimuth thruster for worldwide support
- Same footprint and selection criteria as standard azimuth thruster
- Full range of models available

3. Propulsion Controller

- Veth standard propulsion control and operator interface

4. Control Box/Local Control

- Manages/controls power distribution, interfacing with propulsion controller and high voltage equipment

5. Inverter, High Voltage Equipment

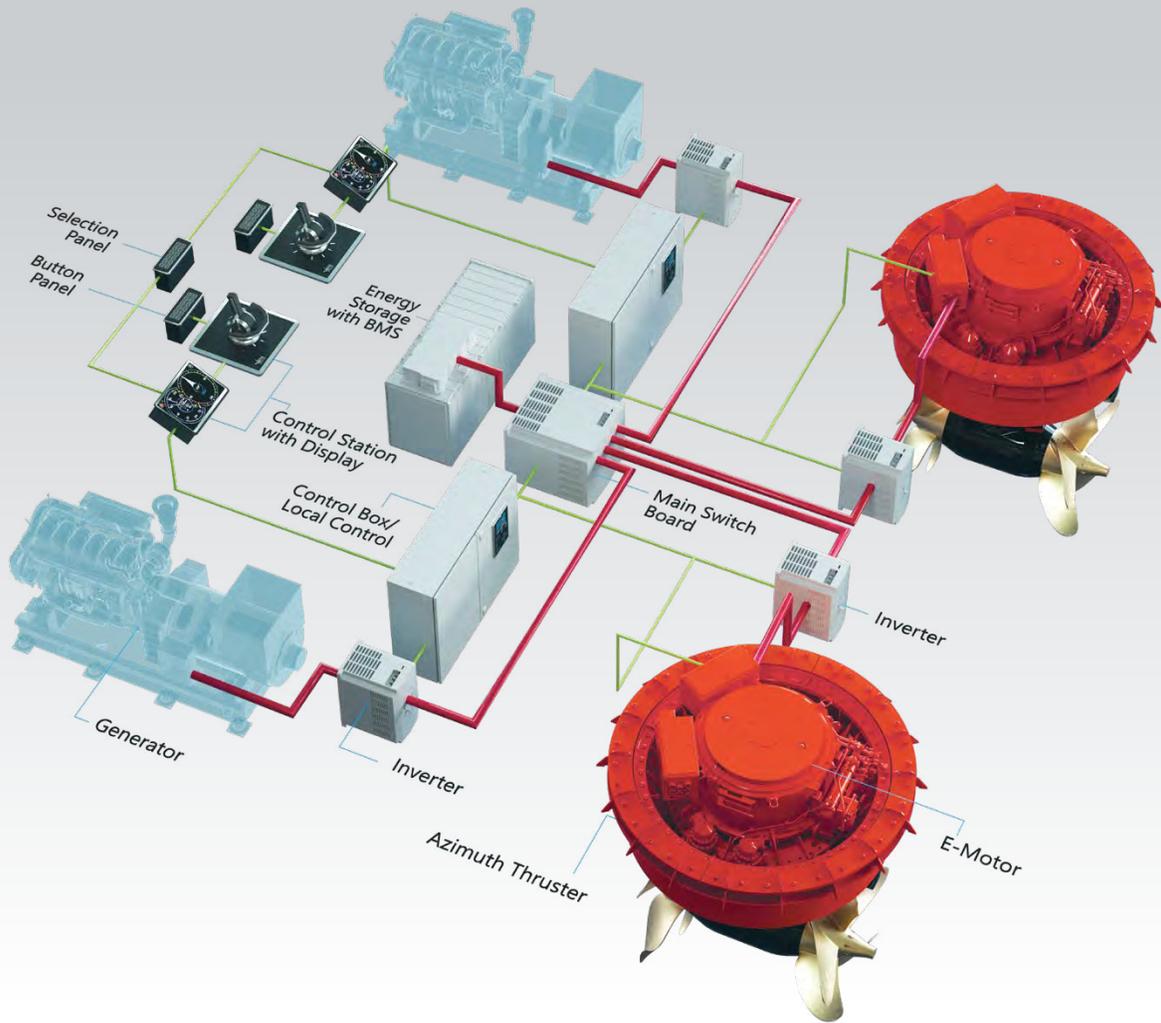
- Controlled and monitored by alarm and monitoring system
- Selection based on application characteristics

6. Energy Storage

- Controlled and monitored by alarm and monitoring system
- Selection based on application characteristics

NEW ENGINES FOR THE WORLD'S FIRST HYBRID CONTAINER BARGE. Technology and emissions regulations have changed since the Semper Fi was commissioned in 2012. Veth Propulsion by Twin Disc, a leading Scania dealer, refit the Semper Fi with Veth's first installation of the new Scania DC16 EU Stage V engines and a new after-treatment system. The low-nitrogen oxides (Nox) EU Stage V engine meets emission regulations, reduces fuel use, and increases agility with impressive torque and response. And the Semper Fi can maintain its Green Award gold-level certification.





REVOLUTIONARY RIVERBOAT SETS

SAIL IN THE U.S. The American Song is equipped with advanced technology including twin ultra-low-sulfur Caterpillar diesel engines that reduce emissions and fuel use. Two Z-drives from Veth Propulsion by Twin Disc (Model VZ-1250A-CR) deliver maximum maneuverability through full 360-degree thrust vectoring. VT-400 Tunnel Thrusters aid navigation without generating distracting noise. The result is superior, reliable, nimble propulsion for faster, more comfortable sailing.



SERIAL HYBRID

MOBILE & STATIONARY EQUIPMENT

Power Shift Transmissions – E-Frac: Electric Motor with Remote Power Source

This serial hybrid system for power shift transmissions uses a single electric motor. Transmission operation is managed by a state-of-the-art micro-processor.

1. System Overview

- Serial hybrid capable of using power from various sources
- Frac pump is driven mechanically with electric soft start
- Electric line test option

2. Transmission and Controller

- Twin Disc power shift transmission
- Mechanical interface to direct mount e-motor to transmission
- State-of-the-art microprocessor control manages transmission operation

3. Hybrid Controller

- Interface with customer-supplied switchgear
- Communicates with transmission controller for range selection

4. E-Motor

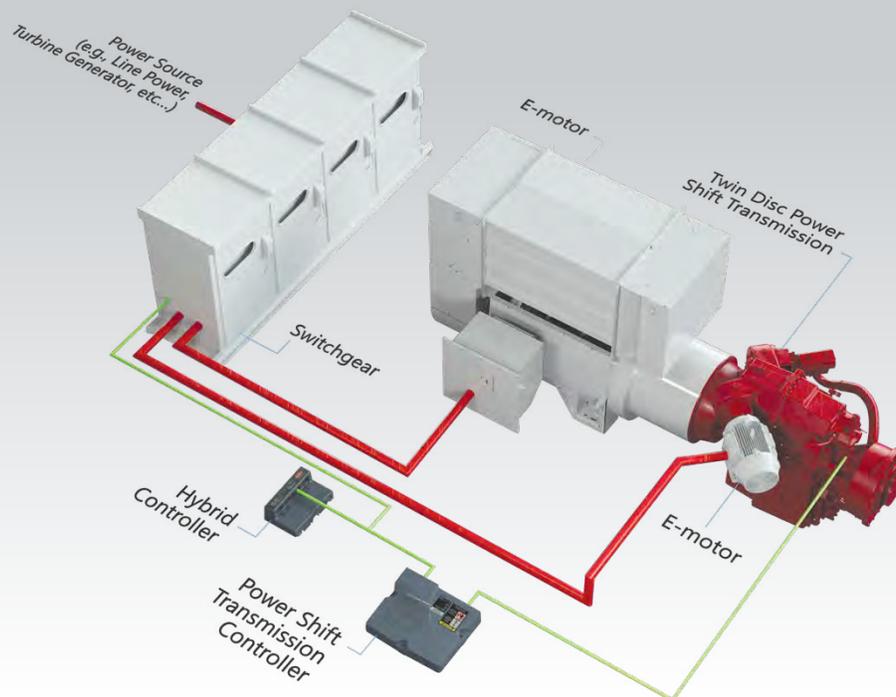
- Customer selects and supplies
- Constant-speed operation

5. High Voltage Equipment

- Customer selects and supplies

6. Soft Start E-Motor

- Line test option
- Speed synchronization





ENHYDRA

ELECTRIC PASSENGER EXCURSION VESSEL

Model: 600-passenger hybrid-powered passenger vessel

Builder: All American Marine, Inc., of Bellingham, Washington

Company: Red and White Fleet

Location: The San Francisco Bay area

Generator sets: Cummins QSL9 410-hp diesel engines

Marine gears: Twin Disc MG-5114SC

Propulsion system: BAE Systems HybriDrive

Electronic controls: Twin Disc EC300 electronic controls

Hybrid power: AC traction motor from its generator, lithium-ion batteries, or both

Situation

Red and White Fleet, the oldest charter tour company in the San Francisco Bay area, sought a hybrid power solution to increase fuel sustainability, reduce impact on marine life, and support quiet operation. The company commissioned the Enhydra, a lithium-ion battery powered electric passenger excursion vessel, from All American Marine, Inc., who partnered with Mill Log Marine to develop a Subchapter K-compliant control system.

Solution

Designed for silent running harbor tours, the 600-passenger Enhydra is the largest hybrid-powered passenger vessel in the U.S. to operate under Coast Guard Sub-chapter K rules. Its BAE Systems HybriDrive propulsion system includes two generators mounted to variable speed Cummins QSL9 410-hp diesel engines.

The system offers powering of the AC traction motor from its generator, lithium-ion batteries, or both. Twin Disc MG-5114SC reduction gears driven by the electric motors provide main propulsion. The gears also have a remote electric motor-driven oil pump that lets the gear stay engaged through zero shaft speed when changing rotation from forward to reverse.

The Twin Disc EC300 control system provides drive motor speed, rotational control and the fault monitoring required under Subchapter K regulations.

Results

The Enhydra's HybriGen system results in lower engine operating hours than conventional drives. It has fewer parts, reducing fuel and maintenance demands. When engaged, the electric motors are quieter than traditional engines, for less vibration, noise, and environmental impact.

TWIN DISC'S FAMILY OF PRODUCTS

We offer an extensive range of products from which you can tailor a power transmission solution that will make your application work better, faster, longer.

MARINE

MARINE TRANSMISSIONS



SURFACE DRIVES

AZIMUTH THRUSTER



MANEUVERING THRUSTER

ELECTRONIC CONTROLS



REAR ENGINE POWER TAKE-OFFS



PROPELLERS



MARINE CONTROL DRIVES



LAND-BASED

POWER-SHIFT TRANSMISSIONS



AWD TRANSMISSIONS



PUMP DRIVES



DRY CLUTCH POWER TAKE-OFFS



ELECTRONIC CONTROLS



INTEGRATED CONTROL SYSTEMS



TORQUE CONVERTERS



REDUCTION GEARS



HYDRAULIC POWER TAKE-OFFS



TRANSMISSION & TORQUE CONVERTER SYSTEMS



PNEUMATICALLY ACTUATED CLUTCHES



GAIN SUSTAINABILITY WITH RELIABILITY

Ask us about hybrid and electric systems to achieve your goals. With more than a hundred years of experience in the design of innovative power transmission products, Twin Disc understands your needs and delivers the solutions that earn your confidence.

LEARN MORE AT [TWINDISC.COM/GOELECTRIC](https://www.twindisc.com/goelectric)

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