



ENHYDRA ELECTRIC PASSENGER EXCURSION VESSEL

MARINE PRODUCTS

Red and White Fleet sought a hybrid power solution that offered sustainable fuel consumption, lessened impact on marine life, and provided quieter operation than traditional diesel engines.



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
Main Engines:	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



Hybrid excursion vessel powered with Twin Disc gears.

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Situation

Red and White Fleet is the oldest sight-seeing and charter tour company in the San Francisco Bay area. Founded in 1892, the business has been working on providing feasible hybrid power for its fleet in recent years.

This is just another example of how Mill Log Marine and Twin Disc strive to solve our customers' needs in marine and industrial drive train applications.

Bob Shamek
Key Account Executive, Mill Log Marine

It commissioned the *Enhydra*, a lithium-ion battery powered electric passenger excursion vessel, from builder All American Marine, Inc., of Bellingham, Washington.

Implication/Problem

Red and White Fleet sought a hybrid power solution that offered sustainable fuel consumption, lessened impact on marine life, and provided quieter operation than traditional diesel engines.

During the construction of the vessel, All American Marine, Inc., partnered with Mill Log Marine of Kent, Washington, to develop a specialized control system for the vessel that would meet Subchapter K requirements.

One challenge for Mill Log Marine was integrating traditional marine transmissions with the electric motors. Unlike traditional diesel engines, when reverse is engaged on an electric motor, there is no need for a clutch to be engaged. The engine simply slows down to zero RPMs and then begins rotating in other direction without any shift.

Solution

Designed for silent running harbor tours of San Francisco Bay, the 600-passenger *Enhydra* is the largest hybrid-powered passenger vessel to operate under Coast Guard Subchapter K rules in the United States. Its BAE Systems HybriDrive propulsion system includes two generators that are mounted to variable speed Cummins QSL9 410-hp diesel engines.

The system offers parallel hybrid powering of the AC traction motor from its generator, lithium-ion batteries, or both.

To provide its speed and maneuverability, the ship is powered through Twin Disc MG-5114SC reduction gears driven by the electric motors for main propulsion. The control system solution developed by Mill Log Marine also incorporates Twin Disc EC300 electronic controls.

The gears used in the *Enhydra* have an added feature, a remote electric motor driven oil pump. This allows the gear to stay engaged when the motors are operating at low speed and through zero shaft speed when changing rotation from forward to reverse.

The EC300 control system provides drive motor speed and rotational control, along with fault monitoring. The dual CAN bus wiring provides redundant control communications from the pilot stations to the controllers in the engine room.

A Twin Disc monitor at the helm provides a graphical readout for control system fault codes as 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, offering less vibration, noise, and environmental impact.