Leading the way
Hybrid marine systems for ferries
We build innovative and fully integrated propulsion packages made up of robust and durable components using advanced engineering technologies.
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Thrustmaster leads the way
Innovative products with lifelong support

For more than 35 years, Thrustmaster of Texas, Inc. has been designing and manufacturing high quality marine propulsion equipment for vessels of all types.

We have grown into a leading supplier of thrusters ranging from 75 kW to 8 MW, serving customers all over the world. Our headquarters in Houston, Texas has the largest thruster factory in the world, with complete fabrication, machining, assembly and testing carried out at the facility. Our products are designed in-house by a complete engineering department for mechanical, hydraulic, electrical and electronic design.
Hybrid: Lower costs, better results

Reduce fuel consumption and vessel emissions while automatically drawing power from the most efficient source.
What do we mean by hybrid? Strictly taken, hybrid means a solution somewhere in the middle. In our context, this would suggest that with a hybrid solution a ferry can operate on electric power, diesel engine power, or a combination of both.

In the context of marine propulsion ‘hybrid’ is a collective noun for all sorts of propulsion solutions other than conventional diesel engine driven propellers, whether this is diesel electric or full electric.

In a hybrid solution, a ferry propulsion system operates with two separate sources of power, using either all electric, all diesel engines, or a combination of both.

**MOST EFFICIENT EQUIPMENT AVAILABLE**

**Prime Movers**
- Multiple fuel options

**Generators**
- Variable voltage/frequency/rpm control optimized output rates

**Electric Motors & Generators**
- Permanent Magnet, improved efficiency over operating range

**High Efficiency Inverters and Battery Storage**
- Higher density power sources available

**Ability to control and select multiple power sources seamlessly**

**Energy Harvesting Software**
Smart use of multiple low power engines

Installing three or four Tier 3 engines instead of two higher horsepower Tier 4 engines allows operation with only one or two of these smaller engines running during loitering and periods of reduced power demand. The engines are running at relatively high load, efficiently and clean, rather than slugging way below their design load at low fuel efficiency while expelling carbon deposits and half burnt diesel fuel. The battery bank supplements power for peak loads and allows for the time needed to bring other engines on line.

The reduced running hours and more efficient and cleaner operation of the engines results in reduced maintenance and longer times between overhauls. This translates into much longer engine life and significant reduction in fuel cost and maintenance expense.

The smaller Tier 3 engines save weight and space when compared to the large Tier 4 engines with their SCR’s and urea tanks. And they cost less.
Permanent Magnet Technology ensures higher efficiency

Compact designed e-motors and generators that are more efficient at all motor speeds.

PM technology consumes less fuel. Is lighter weight, lower volume and higher efficiency.
The advantage of variable speed generator sets

Efficient, optimal sized and quiet engines with low maintenance frequency
**BENEFITS OF THRUSTMASTER’S HYBRID SYSTEMS**

- Average fuel savings of up to 30%
- Reduced emissions as fuel is burned more cleanly
- Reduced noise and vibration >6dB
- Decreased engine wear
  Time to overhaul can be doubled
- Optimum engine sizing
  Engines sized according to average load requirement, with peak load requirements supplemented by electrical storage system
Smooth sailing

Optimized and extensively tested Energy Storage Systems (ESS)

Our hybrid control system is equipped with ESS Overload Protection and makes use of smart technology:

- Bi-directional control
- Rapid Charge Ability
- Charge Rates and Battery Life Cycle Prediction

Several measurements are made to be in full control of safety:

- Temperature Monitoring of each Bank
- Energy Harvesting Amplitudes
- Prediction Software developed
- Battery Cell Voltage Managers built-in
- Class Society Approved

ENERGY STORAGE SYSTEM TESTING (LOADED CONDITIONS)

Over 6,833 Full Charge/Discharge Cycles
Bi-Directional Regen on to Power Lines Fully Tested
Hybrid propulsion and the ferry market
A match made in heaven

WHY APPLY HYBRID PROPULSION ON NEW BUILD/UPGRADED FERRIES?

Enhanced performance
Vessel performance can now be significantly enhanced with proven integrated mechanical / electrical systems

Efficiency improvements
Fuel consumption
Emission gases

Improved customer experience
Lower structureborne and airborne noise
Lower structural vibration

We offer a power and propulsion system that continuously chooses the most efficient energy source and delivers it to the required load.
Marine hybrid propulsion system

Supplied as a fully integrated package

Thrustmaster supplies all the components of a marine hybrid propulsion system for the customer as a fully integrated package.

We will integrate the equipment and components and provide a power management system which is seamless to the operator over the total range of power sources.

Our system integration capabilities provide a one-stop-shop for the customer and reduce management oversight costs.
We invest in knowledge and innovation

Utilizing patented and proven technologies to ensure an efficient power control system
The T-Pod\textsuperscript{1} is the latest environmentally friendly thruster from Thrustmaster. The highly efficient Permanent Magnet Motor, with no requirement for an external cooling system, no lubrication pump(s) combined with stored energy supply system results in a highly energy efficient and environmentally friendly thruster.

\textsuperscript{1}Thrustmaster of Texas-Pod
Work together, achieve more

We cooperate with the project naval architects to determine the best system configuration for the application
Distance, speed, turnaround time, payload capacity

Analysis of the required vessel operations is of paramount importance to select the right propulsion system design and configuration.

REQUIRED INFORMATION TO DETERMINE OPTIMUM SYSTEM CONFIGURATION

- Drag resistance of the vessel as a function of vessel speed at various load conditions
- General arrangement and machinery space(s) layouts
- Turnaround time schedule of the ferry at point A and B. (Unload, Reload, Ready-to-Depart)
- Operating profile of thrust and vessel speed requirements as function of total time
- Power cost in kWH from power company at points A and B
- Knowledge of the owner’s emergency planning procedures
Examples – Flexible configurations to your needs

Concept #1

SPECIFICATIONS DIESEL ELECTRIC PROPULSION SYSTEM

- Generator sets/Permanent Magnet Generators 4x
- Battery Energy Storage Systems 1x
- Permanent Magnet Motor T-Pod Thruster 2x
- Rectifiers
- Inverters
- Variable Frequency Drives
- Power Management System
Concept #2

SPECIFICATIONS DIESEL ELECTRIC PROPULSION SYSTEM

Generator Sets/Permanent Magnet Generators 2x
Battery Energy Storage System 2x
Permanent Magnet Motor T-Pod Thruster 2x
Variable Frequency Drives
Power Management System

Concept #3

SPECIFICATIONS ALL- ELECTRIC PROPULSION SYSTEM

Emergency Generator Set
Battery Energy Storage Systems 3x
Permanent Magnet Motor T-Pod Thruster 2x
Rectifiers
Inverters
Variable Frequency Drives
Power Management System
Take control with our advanced power management system
Less bucks, more bang
The advantages of hybrid propulsion summarized

WHY HYBRID PROPULSION?

Technical and design improvements
- Simplified mechanical systems
- Less maintenance
- Remote Performance Monitoring
- Overall OPEX reduction
- Flexibility in locating prime movers

Improved customer experience
- Lower structureborne and airborne noise
- Lower structural vibration

Efficiency improvements
- Lower combustion exhaust gas emissions
- Reduced fuel consumption

WHY THRUSTMASTER?

- One single propulsion system integrator
- In-house expertise in marine hybrid propulsion systems
- Knowledge and expertise in hybrid propulsion (patent holders)
- Proven power management system
- Proven marine thruster & waterjet manufacturing
- Made in the USA
Thrustmaster Hybrid Systems

For a cleaner environment, an enhanced passenger experience, a happier crew, and a better world.

CONTACT US
Thrustmaster of Texas, Inc.
6900 Thrustmaster Drive
Houston, TX 77041
USA

Phone 713-937-6295
Fax 713-937-7962
Email sales@thrustmastertexas.com

www.thrustmaster.net