Engtek Manoeuvra Systems Pte Ltd

Marine Propulsion Technology

Electric-Podded Rotatable Main Drive Propulsion Systems

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“The only thruster in the world with this design concept.”
Engtek Manoeuvra Systems

Variable Speed “Electric-Podded” Azimuthing Main Drive Propulsors

Introducing a new series of Marine Azimuthing Propulsion Systems designed to provide any vessel Maximum Maneuverability with Silent and Reliable Operation.

“A Propulsion System that Whispers”
Engtek Manoeuvra Systems Pte Ltd offer a “Unique” Series of Electric Propulsors, using Electric-Pod Technology by incorporating a permanent magnet synchronous electric motor as an integral part of the thruster hub, introduces “SILENT PROPULSION SYSTEMS” that are, efficient, compact and light weight. The drives utilize variable speed motor controllers. The thruster pod ratios are idealized for maximum flow conditions. The propeller is a NAB, four bladed propellers with/without kort type nozzles.

Thruster and Propulsion units are compact, lightweight, efficient, silent and ruggedly designed for the marine industry of today and tomorrow.

The “Wet” Electric Propulsion E-Pod System

The Azimuthing Thruster System “Wet” E-Pod concept breaks new ground in thrust; weight and reliability. The thruster system is designed to prevent leakage. Typical thruster systems are prone to water entering or oil leaking through the propeller shaft seals. The E-Pod Wet thruster design eliminates this problem by the introduction of an internal sealed diaphragm located between the rotor and stator, creating two separate isolated and sealed compartments. Water cannot reach the stator through the shaft seal. Using grease packed and sealed bearings the rotor can even run in sea water. Electric-Pod Marine Thruster Systems are available as....
We are working with new and emerging technologies to improve our Thruster and Propulsion product offering. It is the mission of the *Engtek Manoeuavra Systems Pte Ltd* to continually improve the quality, reliability and cost effectiveness of our Thruster Systems, while achieving higher levels of performance.

The **Electric-Pod** thruster and propulsion system combines the expertise in propulsion, hydrodynamics and azimuthing thrusters with the experience for electric propulsion drives. In addition to the flexibility in machinery and vessel arrangement offered by electric propulsion drives, the Electric-Pod System gives improved efficiency and excellent maneuverability.

The Electric-Pod is 360 degrees Rotatable for maneuvering purposes, or +/- 60 degrees hardover/hardover in transit, by the means of either electric or hydraulically operating steering gear. The main component in the underwater unit is the electric motor; in this case a Permanent magnet synchronous type with brushless excitation and the stator assembly shrink fit in the pod housing.

The propeller is of the fixed pitch type, characterized by low noise and vibration, and can be either delivered with separately bolted blades or cast as a complete monobloc. A feature with separately bolted blades is that these can be changed more easily in case of damage.
Owner/Operator benefits:

- Propeller speed is independent of engine speed leading to better maneuverability.
- Built-in features such as power management and protection result in a compact design that eliminates the need for a main switchboard.
- Use of rugged components and optimized operation leads to reduced wear and, thus, extended maintenance intervals. Equipment is rugged and virtually maintenance free with life expectancies of 20,000 – 40,000 hrs.
- The Electric Pod solution provides design and arrangement flexibility for naval architects and installation flexibility for shipyards, while offering space savings or increases in payload.
- Increased cargo capacity or reduced vessel size
- Increased propulsion system efficiency
- Increased propulsion system redundancy and power availability
- Reduced total installed power generation
- Reduced total fuel consumption & exhaust emissions
- Reduced noise & vibration levels
- Reduced vessel turning circle

Shipyard & Construction benefits:

- Flexible machinery arrangement
- Modularized design
- Simpler vessel machinery installation
- Simpler hull form and structure

Thruster outputs for the Electric-Pod Series electric driven / variable speed Marine Drives range from 200 to 3500 Kw (270 – 4025 Hp) and deliver up to 112,600 pounds of thrust (511,820 kg-f).

Electric-Pods are rated for continuous duty, seawater cooled, Class H insulation with Class F temperature rise, and 40 º C max Coolant temperature.
System Comparisons:

- All Rotating groups are dynamically balanced ... eliminating vibrations with reduced noise levels.
- Full Proportional Thruster – 360 degrees with Fixed Propeller System
- No noisy drive gear sets
- The Electric-Pod Package System is less weight than typical azimuthing electric drives and requires less space
- Does not need air ventilation cooling systems
- No alignment required with elimination of couplings and intermediate shafts
- Can continue to operate even if the main shaft seal leaks
- No oil system required with elimination of potential oil leaks
- No loss of efficiency due to elimination of reduction gears etc.

Applications

- Oil Tankers
- Dredgers
- Heavy Lift Vessels
- Luxury Super Yachts
- Container Ships
- Fishing Vessels
- Research Vessels
- River Cruise Boats
- Naval Patrol Vessels
- Swath Vessels
- Ferries
- Chemical Carriers
- Catamarans
- Cargo Ships
- Submarines
Quality = Long Life

All our Propulsion Systems are designed for continuous duty operation. We build them for rugged service by designing units that require very little maintenance using standard bearing sets designed for long periods of operation without replacements.

High Efficiency

*Engtek Manoeuvra Systems Pte Ltd* use fixed pitch, four bladed propellers, together with our efficient built-in Electric-Pod motor assembly, means low parasitic power losses from input to output - and the highest thrust in relation to tunnel diameter.

**Electric-Pod Motor/Controller Drives:**

Thruster Systems use a VFD (Variable Frequency Type Controller). The VFD is a compact AC thruster drive for heavy marine use in marine thruster systems.

The robust design incorporates effective protection against supply network disturbances. Trip-free operation is also guaranteed due to sophisticated motor control principles and motor/drive protection features, component selection and effective cooling.

Enclosure classes of IP21 and IP54 and integrated high-level EMC filters make the NXS suitable for all environments.

The modular design of the VFD brings several advantages: the control terminals are safely separated from power terminals, upgrading the control inputs and outputs is easy and convenient, replacing the cooling fan (the only regularly replaceable component) is fast, the display panel can be utilized for parameter copying, etc.

**Features**

- Steady state speed error < 1%
- Low torque ripple
- High immunity to resonance vibrations
- Starting torque > 200%, depending on motor and drive sizing
- Suitable for multi-motor applications
- High-speed applications (up to 7200 Hz) possible
- Extremely low-noise motors (fSW 10 kHz without derating)
Design

The mechanical design is extremely compact. The IP54 units in particular are the smallest AC drives on the market. All units are suitable for both wall and enclosure mounting with all necessary components: integrated EMC filters, AC chokes, cable protection, dust and water protection. The effective super-cooling principle allows high ambient temperatures and high switching frequencies without de-rating.

NXS control unit

There are no fixed inputs or outputs in the VFD. There are five slots (A, B, C, D and E) for I/O boards, and a suitable board can be selected for each slot.

The VFD units are delivered with OPT-A1 and OPT-A2 boards if the I/O is not specified. In many countries, boards OPT-A1 and OPT-A3 are used as standard I/O as the galvaneically (double) isolated thermistor input is often required.

Removable terminals snap-in card installation, automatic card identification and instructions on the drive help making quick connections. If necessary, the inputs, outputs and field bus boards can be added in the field. The NXS is simply the most flexible frequency converter series on the market.

Software modularity

The All-in-One application package has seven applications (=default settings and functionality of control inputs and outputs, which can be selected with one parameter. The application will also be requested by the Start-up Wizard at the first power-up. With this single setting, the controls can be programmed e.g. for two external control places or a pressure control with the integrated PID controller. In most cases, the default basic application is suitable and only the min/max frequencies as well as motor nominal values must be set.

Main Propulsion Drives... we use Liquid Cooled Power Drives where required. The liquid-cooled Drive is our most space-saving AC drive, well suited for locations where air-cooling would be difficult or expensive, or where the installation space is at a premium.

As no air channels are required, the drives are extremely compact and suitable for ship board installations. As almost all of the heat generated is removed by the coolant, a high degree of protection is easily achieved at all power ratings. The space savings compared to just the power module of a similar rated air-cooled drive can be up to 70%.

All components requiring cooling are mounted on one or more common aluminum cooling elements. The entire liquid-cooled power range has only six different chassis sizes.
The liquid cooling liquid, which can be pure drinking water, removes about 95% of the heat generated. There are no special dielectric requirements on the liquid (de-ionization), as it never comes into contact with the high potential in the drives.

The required liquid/liquid heat exchangers and auxiliary devices can also be supplied by **EMS-Thrusters**.

All systems are available with a high degree of protection (IP54) and can be installed almost anywhere in the vessel. This also reduces the load on the air-conditioning system in the electrical control room. As the liquid-cooled drives lack the large cooling fans, they are also quiet!

The liquid-cooled drives are built around the hardware and software modularity concept used throughout the VFD range. The liquid-cooled drives have a power section designed from the start for liquid cooling, contrasting with the more usual way of just replacing an air-cooled cooling element by a liquid-cooled one. This design has allowed a great reduction in size.

**A robust modular design makes the VFD Drive a platform for all marine applications.**

The core of the VFD is a fast micro controller providing high dynamic performance for applications where good motor handling and reliability is required.

The VFD supports fast drive-to-drive communication. It also offers integrated data logger functionality for analysis of dynamic events without the need of additional hardware. Fast monitoring of several drives simultaneously can be done by using the NCdrive tool and CAN communication.

**Features**

- Speed error < 0.01%, depending on the encoder
- Incremental or absolute encoder support
- Encoder voltages of 5 V (RS422), 15 V or 24 V, depending on the option card
- **Full torque control at all speeds, including zero**
- Torque accuracy < 2%; < 5% down to zero speed
- Starting torque > 200%, depending on motor and drive sizing
- Full capability for master/slave configurations
- Integrated data logger for system analysis
- Fast multiple drive monitoring with PC
- High-speed bus

The motor controller is remotely operated by the bridge-mounted variable-speed Joy Stick Controller. **Remote control stations are available.**

**“A Complete Family of Electric-Pod Drives that is completely reliable”**
The **Engtek Manoeuvra Systems Pte Ltd Electric-Pod Series** of high performance Drives deliver rugged efficiency to match the compact, efficient and rugged designed thruster system. The drive units offer a broad current range of up to 3500 Kw at 380/460/690 VAC.

**A Legend of Performance that Lasts**

We didn’t just design the Electric-Pod Drives to work; we designed them to work hard, in the toughest conditions.

You get advanced, self-contained, space-saving workhorses known the world over for dependability. You can depend on them for simple operation too, with easy-to-read LED diagnostic indicators and simple one-turn visual adjustments.

**Control Consoles (Bridge Mounted)**

The Electric Thruster Systems come complete with a fully operational bridge mounted control console. This system provides power “On/Off”, Main or Remote Switch, alarms and a **Fully Operational Joystick Controller for variable speed** with “Full 360 degree control plus rpm Controls’.

The Complete system is designed for easy installation, hookup and service. The major components to be installed are the thruster, motor controller, bridge console and remotes if required. All electrical interfaces are well marked and ready to be hooked-up.

For Main Propulsion Electric-Pod Azimuthing Systems:

One or several panels with selector switches can be located at remote stations (wing or fly-bridge) to operate the propulsion systems.

The Standard Main Control Console is fitted with the following:

**A Steering hand lever for combined controls**
- 360 degree steering control and throttle control of the e-motor controller.
- E-motor control and alarms
"Stay on course with Engtek Manoeuvra Systems Pte Ltd Marine Propulsion Drives"

A Steering hand lever for combined controls
- 360 degree steering control and throttle control of the e-motor controller.
- E-motor control and alarms
- Emergency direct steering control (hand lever) –non follow-up
- An independent steering propeller or nozzle position indicator
- RPM indicator
- Current Indicator
- An electric cabinet to be connected to the motor controller-cabinet.

A full range of thrusters and propulsion systems are available to meet the design and material requirements of the major classification societies.
Forward fit or retrofit, we can accommodate it all. Our thruster systems will give you that additional steering capability in narrow waterways, rivers, coves and small harbors, while our propulsion systems will get you on your way and keep you going. When you combine top engineering designs with high class materials and the latest manufacturing techniques, you will guarantee yourself of exactly that which we offer…**capable maneuvering assistance when you want it!**