



Electrical Propulsion System

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Diesel-electric transmission or **diesel-electric power train** is used by a number of vehicle and ship types for providing locomotion. A diesel-electric transmission system includes a diesel engine connected to an electrical generator, creating electricity that powers electric traction motors.

Diesel-electric systems are also used in submarines and surface ships and some land vehicles. The first diesel motor ship was also the first diesel-electric ship, the Russian tanker *Vandal* from Branobel, which was launched in 1903. Steam turbine-electric propulsion is in use at least since the 1920s (Tennessee class battleships), the practice of using diesel-electric power plants in surface ships has been a more recent development. The Finnish "coastal defense ship" *Ilmarinen*, laid down in 1929, was among the first surface ships to use diesel-electric transmission. Later the technology was used in diesel powered icebreakers.

Some modern ships, including cruise ships and icebreakers, use electric motors in pods called azimuth thrusters underneath to allow for 360° rotation, making the ships far more manoeuvrable.

Gas turbines are also used for electrical power generation, and some ships use a combination: the *Queen Mary 2* has a set of diesel engines in the bottom of the ship plus two gas turbines mounted near the main funnel; all are used for generating electrical power, including that used to drive the propellers.

The two (2) dominant systems available today are frequency controlled AC motors and SCR controlled DC motors. Frequency controlled AC motor drive systems are generally more cost effective below 500 H.P. and SCR controlled DC motor systems more cost effective at the higher powers. The reason for the latter is the availability of new and rebuilt DC traction motors.

Modern SCR and frequency controlled systems have efficiencies approaching 97% in power conversion. The selection of one over the other is an application issue





Application of Electrical Propulsion Systems:

1. When propulsive or station keeping power requirements are a small or relatively small percentage of the total power requirements. Drill rigs, OSV's with special positioning requirements, research vessels with special maneuvering requirements, and gaming vessels where speed is inconsequential.

2. When space and/or propulsion machinery limitations either exclude the use of direct diesels or adversely affect the construction cost resulting from using direct diesels.
 - a. SWATH vessels with hulls and/or struts too small to accommodate diesel engines, access, ventilation, etc.
 - b. Vessels with potential trim problems, such as stern wheelers, where machinery needs to be located forward to avoid trim problems.
 - c. Vessels that require, due to space limitations, more than one machinery space are subject to increased construction cost due to duplication of or increases in systems such as:
 - i. Engine cooling
 - ii. Space ventilation
 - iii. Control facilities
 - iv. Exhausts, etc.

3. Vessels that require maximum torque at minimum propeller rpm's.

4. Vessels that have a large variation in power consumption.

