Ship propulsion: from paddling to the future

Before the arrival of motorized propulsion systems for ocean going vessels, the primary mode of getting ships to their destinations was by the use of oars (MSN Encarta, 2008). Later developments in powering ships came in the form of sails, harnessing the wind to power the ships (Encarta, 2008). The introduction of the steam engine wasn't much of a factor in ship propulsion systems, as the use of the steam engines on board ships took off as soon as their design could be fitted in the hull of the ship (Encarta, 2008).

The use of steam engines on ships, notably warships, was Swedish born engineer John Ericsson (1803-1889) (Made How, 2008). Dabbling first with the technicalities of propulsion systems, in particular with the design of the steam engine, he first experimented on the use of air as a source of propulsion energy (Made How, 2008). Ericsson, along with John Braithwaite, built a locomotive engine that was entered in the " Rain Hill Trials" in 1829 (Made How, 2008). The competition was established to discover the best new design for locomotives (Made How, 2008).

Eventually, the contest was won by George Stephenson's Rocket (Made How, 2008). After the contest, Ericsson turned his energies to naval design and engineering (Made How, 2008). Ericsson's contribution to the ship engineering field was placing the engine of the ship below the water line of the vessel (Made How, 2008). He also made design alterations on the then current mode of propulsion of ships, the paddle wheel, replacing it with a screw-type propeller (Made How, 2008). The propellers were fully under water, pushing the ship forward as they turned below the surface of the water (Encarta, 2008).

The first ship that used this type of propulsion was the river boat Archimedes in 1840 (Encarta, 2008). As mentioned earlier, one of the earliest modes of ship propulsion was by the use of sails (Encarta, 2008). These cloth or fiber sheets would catch the wind as they were hung from wooden posts on the ship's deck, or masts (Encarta, 2008). This development in ship design would be a catalyst of sorts for ship propulsion into the 19th century (Encarta, 2008). Early civilizations, such as the Egyptians, Phoenicians and Greeks used their ships in trading and in warfare with other competing states (Encarta, 2008).

Soon after, the trade wars between the Greek and Phoenician states developed another means of propelling their ships. They used oars on their ships, or war galleys, oared ships that could move in for attack with little or no wind (Encarta, 2008). A later development in oared ships was the development of the brireme, ships that accommodated two levels of oars, one level, or bank, rowing from within the ship, while the other was on the deck of the ship (Encarta, 2008). With the need for greater dominating power at sea as a concern, another level of oared vessel was developed, the trireme (Encarta, 2008).

This ship was characterized with three levels, or banks, of oarsmen (Encarta, 2008). These vessels were, at the time, the dominant fighting ship (Encarta, 2008). However, these ships were very costly, and the ships were not equipped to carry enough stores and supplies for a long stay at sea (Encarta, 2008). Soon after, these ships of the Greek fleet were replaced by the Roman quadriremes and quintriremes (Encarta, 2008). The rise of the use, efficiency and steam-powered ships quickened the downfall of the sailing ships (Encarta, 2008). Early steamships were crude in design compared to their sleek sailing counterparts.

But as the reliability of steam power and speed of the steam ships grew, the competition between sail and steam was won by the latter (Encarta, 2008). In 1818, an American steamship, the U. S. S. Savannnah, made the first trans-Atlantic crossing (Encarta, 2008). But the ship had to sail for most of the voyage under wind power, as the cargo of coal for the ship's engines outstripped the space available on the ship (Encarta, 2008). As ship builders continued in their bid to improve ships and ship design, they tried to improve the design of the main propulsion unit of the ships, the steam engine (Encarta, 2008).

A later improvement to the design of the steam engine was the development of the double and triple expansion steam engines (Encarta, 2008). These engines would increase the efficiency of the steam engines by allowing the steam released from the piston of the engine to power another piston rather than just releasing the steam (Encarta, 2008). New trends in powering ships The challenge of shipbuilding throughout history was to build a ship around the propulsion system (American Superconductor, 2002).

One idea circulating is the utilization of the electric drive propulsion systems to replace mechanical drive systems (Superconductor, 2008). This shift from traditional fuels in ships engines are achieved by using high- temperature superconductor (HTS) wires in powering the ship engines (Bruce Gamble). The use of HTS technology on ship motors present several advantages (Bruce Gamble). When HTS wires are used in the wires of the motors instead of the commonly used copper wires, the electricity generated by the motors amounts to about 150 times generated by the copper wires, with negative resistance (Bruce Gamble).

These developments can afford the opportunity for ship motor developers to design ship components that deliver electricity at much higher density levels at greater efficiency (Bruce Gamble). This would allow for the design of components that are only one-third of their current size (Bruce Gamble). Recently, Siemens has developed the HTS technology to power their so-called “ All Electric Ships” or AES (Siemens, 2008).

The development of this technology would present to one of the world's fleets, the United States Navy, an answer to address a long-term challenge with a solution that can be accomplished and utilized in the near-term (Superconductor, 2002). Earlier in its application and research stage, the option for building an AES was abandoned by the Navy, as the design for such a vessel was considered as too big and the tonnage was too heavy for use (Leonardo Energy). In essence, the current technology a gearbox in today's battleships would be replaced by a motor and a generator (Bruno de Wachter, 2008).

The efficiency and utility of the motor can be seen when the motor of the ship is not running at full capacity, when diesel or turbine motors are at their lowest efficiency levels (de Wachter, 2008). Recent innovations have been focusing on the old technology of sails on ships (Ronald O' Rourke, 2006). As stated earlier, the sails were first used to power ships by catching the wind in their sails, moving the ship forward (Encarta, 2008). But in the modern context, the sails attached to the ship will only partly power the ship, reducing the fuel consumption of the ship (The Bryant Park Project, 2008).

The adoption of sails in the modern era is a response to the high fuel prices in the global market (The Bryant Park Project, 2008). Another innovation in the research stage is the use of solar panels on ships (Osamu Tsukimori, 2008). As with the introduction and intended results of the “ kites” to power ships across the oceans, the solar panels to be fitted on the vessels will help reduce fuel consumption, bring down emissions, and cut down on carbon dioxide pollution (Tsukimori, 2008). The solar panels are expected to save up to 6. 5 percent of the fuel utilized in powering the diesel engines of the ship (Tsukimori, 2008).

The only use of solar panels on ships was to generate electricity for the cabins of the crew on the ships (Tsukimori, 2008). Conclusion The race to find better ways to power ships and power them efficiently can take more effort and resources. The faster, smaller, more efficient and technologically advanced the machine is, the more it is possible to be adapted. In the light of the increasing and decreasing fuel prices, the challenge is to find the best possible means to power our ships as they carry the economic life lines of the world's various states.