

## Energy efficiency audits on ships: Hydrodynamic aspects for energy efficiency improvements

The very first step for reducing the fuel bill on a ship, is to carry out an energy efficiency audit; this way the owner can know the details on how the energy is used on board and prepare an action plan. There exist on the market different solutions for improving the energy efficiency of ships and some of them are outlined in this article. Since the propulsion is the main energy consumer of the vessel, the focus is on the hydrodynamic aspects.

### SEA TRANSPORTATION

Sea transport has historically been the most important mean of transporting goods, mainly due to the ability to get to places unreachable by road and the amount of cargo loaded on each trip. Despite the technological developments achieved on road, train and air transport, sea transport has remained unbeatable when it comes to move large amounts of cargo at low cost. If we compare the cost per ton-mile, it can be seen that sea transportation is 80 times more efficient than air transport; this is something pretty clear to everybody, but we still notice that sea transportation can be almost 30 times more efficient than moving goods by truck. Figure 1. National Transportation Statistics , 2009 (Source: US Department of Transportation) It is true that the efficiency, both in terms of energy consumption and operating costs, of aircrafts, trucks and trains is being improved continuously due to the evolution of the technology, but so is doing the shipping and shipbuilding industry, so its leading position is going to last. Furthermore, there is no other mean of transportation offering the flexibility of shipping to suit different boundary conditions such as traffic, speeds, loads, etc. The potential for a vessel to adapt to new environments has no equivalent among the other means of transport. For example, a vessel may be elongated, retrofitted, converted to move a different cargo or duty, and can achieve great improvements in energy efficiency incorporating the latest technologies. All this can be applied to ships even older than forty years. Based on the above considerations, we can be confident that shipping will remain as the main mean of transportation of goods for a long time. The promotion of transport and maritime technology should be a key aspect into the R&D strategic plans and infrastructure development of our governments.