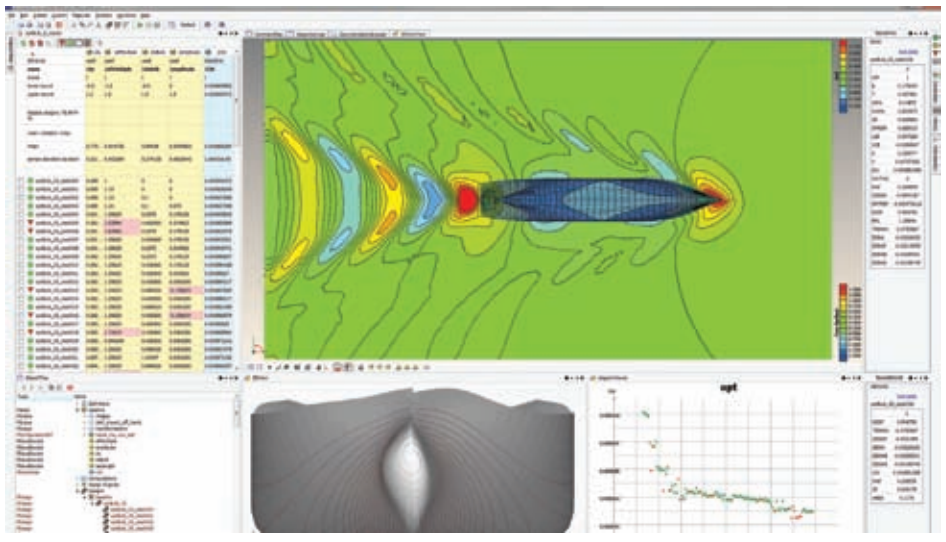
Save around $30m – with a new bow

Germanischer Lloyd's new consultancy division FutureShip is running tens of thousands of computer simulations on different ship designs to produce innovative ideas about how shipowners can save fuel costs – starting with a new bow

Shipyards are good at designing ships. They put together a number of possible designs, test them, and come up with one which works.

But what they don't usually do, says Volker Höppner, managing director of Germanischer Lloyd's new FutureShip consulting division, is test tens of thousands of possible designs using computer simulations, to come up with the best one possible.



An optimised bow design could save 3.5 per cent in fuel consumption – a considerable amount of money over the life of a ship

For one German ship operator, about to purchase a new vessel, FutureShip was able to come up with a bulbous bow design which could reduce overall fuel consumption of the vessel by 3.5 per cent.

This could amount to savings of $30 million over the vessel's lifetime, compared to the design which a top South Korean shipyard was proposing, Mr Höppner says. This is on the basis of an average fuel price of $600 per metric ton.

Taking a tour of vessels in lay-up will reveal that there is no standard or optimum bulbous bow shape for the maritime industry – vessels have a wide range of different designs, from short and fat to thin and narrow.

But changing the bow on an existing vessel is not as expensive as you might think. Germanischer Lloyd estimates that it could cost €200,000 if done in China, or €300,000 if you do it in Europe – an investment worth making if it means savings of $30m.

Fluid dynamics and operations

Many other areas of the vessel's fluid dynamics (how it passes through the water) could also potentially be optimised, according to Mr Höppner. The process used is similar to that applied to cars to optimise for reduced air resistance.

FutureShip can model how the water flows over the propeller and interacts with the rudder – and how small changes to the rudder's shape can improve things. A vessel could also employ different coatings on the hull to help to optimise performance.

Then there is the question of 'appendages' – metal shapes welded to the bottom of the ship by the yard thought to improve propulsion.

"We can show if it is worth doing it or not," said Mr Höppner.

When it comes to operating the vessel, small changes to the trim and draft, and how well the hull and engine are maintained, will also impact fuel costs, Mr Höppner says.

Of course, small changes to vessel operations (different sea temperatures or loadings for example) can additionally alter the optimised set-up.

FutureShip complements its computer simulations by creating software systems which can run onboard the vessel, informing operators if there is an opportunity to reduce fuel consumption.

"The chief engineer knows this – but a chief engineer is not always available. With this system, everyone can act," Mr Höppner said.

Persuading shipyards to change their designs is not something every shipowner is able to do. But ultimately, the market normally wins – which means shipyards insisting on uneconomic designs will be disadvantaged, Mr Höppner says.

FutureShip's software can, of course, be used directly by shipyards, and South Korean shipyard DSME has already begun to take advantage of the technology.

Already this year, FutureShip has persuaded 7 shipping companies to change their designs.

It was also engaged by one Navy, who compared a FutureShip optimised design with the one the shipyard was proposing and found the FutureShip one was better.

Built for lower speed

An even better idea for reducing fuel costs, says Hermann J Klein, member of GL's executive board and current head of the International Assocation of Classification Societies (IACS), is to order vessels which are designed from the start to run at lower speeds - he suggests 14 knots for a container ship, compared to the standard 24-26 knots.

In the past era of low fuel prices, a high speed container ship made economic sense, because of the high value of the average cargo carried in the containers.

Now fuel prices are much higher, the optimum economic solution, taking into account the interests of both cargo owner and shipowner, is to keep speeds at around 14 knots, Mr Klein says.

A container ship built to run at 14 knots will produce savings of 12 per cent in capital costs over a container ship built to run at 26 knots, because so much of the equipment can be smaller – not only the engine, but also the engine cooling systems, propulsion systems and auxiliary power, for example.

In addition to this a large proportion of fuel can be saved by travelling at 14 knots – as fuel consumption is calculated as a cube of the speed, by halving speed you can reduce fuel consumption by as much as 80 per cent.

"Just the same as with your car, if you want to reduce energy consumption the easiest way is to reduce the speed," Mr Klein said.

"This is the major benefit you can generate. The first decision for a shipowner is 'what should be your speed?'. The second decision is 'what is the best hull form for my speed?'."

Shipowners are still placing orders for new container ships optimised to run at 26 knots, but this could place them at a competitive disadvantage in future, as competitors with ships optimised to run at 14 knots would have much lower operations costs.

Other potential operational savings can be generated by working out exactly how much seawater you need to keep the engine cool, taking into consideration the current temperature of both seawater and the engine.

If you minimise the amount of cooling water you can save pumping power. If the ship needs less power, then maybe it does not need such a large auxiliary engine creating electricity.

"The whole system cascades down," said Mr Klein. "You can save so much money on pumps and electric, in the end we are talking about a totally different vessel." DS