

# Optimised friction saves money and environment

**The hull of an ice-going vessel needs a protective layer for two reasons. Firstly to prevent corrosion and secondly to make the hull smooth, so that friction is minimised. We have recently tested new options for hull protection.**

About 20-30% of vessels resistance in ice comes from friction between hull and the ice. The smoother the hull is, the less friction is evident, which saves both money and is ecologically important as fuel consumption is highly related to friction. A corroded vessel has the most friction in ice. In difficult conditions, the difference between high- and low-friction coatings can be the difference between making progress and getting stuck.

## Different options

For the past twenty years, epoxy-based paints have been widely used for hull protection as they offer low friction and good durability for ice navigation. Usually some touch-up painting is done when ships come into dry-dock every five years.

Another option is attaching a compound layer of stainless steel to the ice-belt region of the hull.

"Technically this is a good alternative, but unfortunately it is also expensive. However, in all newer Finnish icebreakers this protective layer has been chosen and experiences have been good," tells Structural Engineer Ville Valtonen.

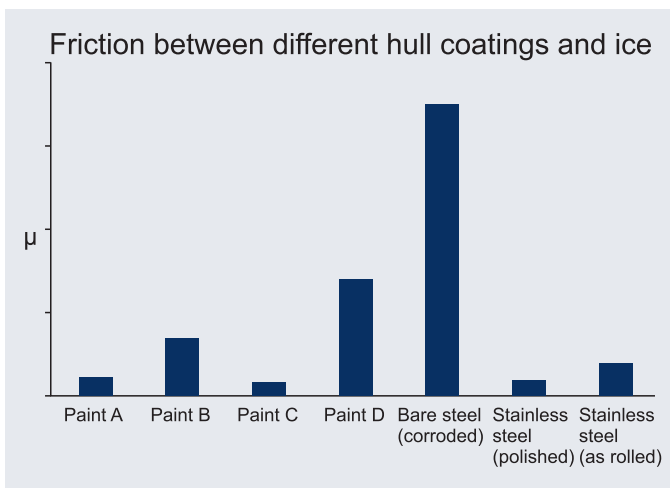
On a theoretical level, concepts of making ship hulls of stainless steel or aluminium have been discussed, but none of these have been tested, as stainless steel is expensive and the strength of an aluminium hull in ice navigation has not been thoroughly researched.

Recently, new paints for icebreaking hulls have entered the market. Some of these new paints differ from the traditional epoxies and have a good strength. However, it is essential to test the friction before starting to use these new paints.

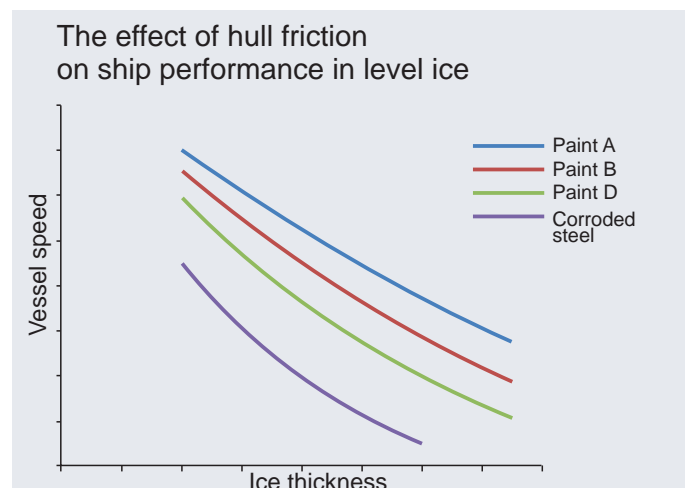
## Friction testing for ice vessels

"We have now tested some new paints with our friction-testing machine, which we use to test the friction between ice and hull coatings in wet contact, which is the most relevant condition for icebreaker paints. The testing machine has been developed specially for the job and ice friction has been tested with it already for decades. Comparisons of results with full-scale measurements have shown that the lab results are reliable," Mr Valtonen assures.

"Results from our recent tests are confidential but it is important to note that there are substantial differences between paints and therefore it is essential to carry out tests before starting to use something new. Otherwise, unpleasant surprises in ice resistance and consequently in fuel consumption may arise."



*This picture clearly shows the impact on friction between different hull coatings.*



*Hull friction affects a ship's performance in ice. The more friction, the more fuel is needed, which is both expensive and ecologically harmful.*