

Sailing laboratory:  
Hr.Ms. Tromp.  
In the adjoining photo the  
actuators that are part of  
the complete anti-noise  
systems.



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Photos: Tom Basten / TNO

# Navy ship can be quieter, so safer too

The quieter a navy ship sails on the water, the less likely it will be hit by a sea mine, which can, after all, be triggered by noise. TNO has been working for the Ministry of Defence to develop a system that decimates the noise from frigate to water.

Sailing through hostile waters as quietly as possible is vital for frigates: sea mines as well as submarines are becoming increasingly more sophisticated in noise detection. Good reason for the Navy to constantly invest in developing technologies that minimise noise from ships. TNO has been collaborating with the Dutch Defence Material Organisation on a system that can even more substantially reduce the water-bound level of noise.

'The gearbox that is normally fixed to a ship is first positioned on rubber springs,' TNO researcher Dr Arthur Berkhoff explains. 'While that certainly suppresses the ship's higher frequencies, it reinforces the lower frequencies. But to solve this by inserting another structure between the ship and gearbox would be difficult and expensive.' So Berkhoff and his colleague Dr Tom Basten came up with a system that actively suppresses vibrations, and thus noise. By adding a considerable dose of vibrations.

## SHAKERS

That AVC (Active Vibration Control) system comprises six *shakers*: large 50 kg cylinders that drone in pairs against the gearbox. The rhythm and force with which this happens creates vibrations that are phased to contrast with the existing vibrations that are subsequently weakened.

The drone emanates from a copper coil around a magnetic mass inside the cylinder. As soon as current is passed through this coil, a magnetic field is created that sets the magnetic mass in motion. 'Actually the system works in just the same way as a loudspeaker,' Berkhoff points out, 'except that a loudspeaker causes air to move and the *shaker* mass.'

The surges of current are constantly adjusted to the vibrations in the

gearbox by computers and specially developed software.

## COMFORT

To try out the system in practice the Navy made the frigate Hr. Ms. Tromp available. The system was first tested with the frigate anchored at Den Helder and then when sailing at various speeds on the Norwegian-German-Dutch acoustic range near Bergen in Norway. Both the onboard and underwater measurements reveal that the AVC system decimates water-bound noise. The onboard vibrations, too, appeared to be considerably less. 'Such a system could also be used to boost the comfort of the crew,' Berkhoff says. 'They could, for instance, sleep better.'

Whether the system will ultimately be used by the Dutch fleet is not yet clear: the AVC system is still not a ready-made product and more development is necessary. Defence is, nonetheless, enthusiastic about the very promising results.

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