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- Will GHG regulations be tightened? 7
- How to make CII work 11
- Still no clear answers on future fuels 14

Hull air lubrication with no compressors

Armada Technologies is developing a hull air lubrication system which does not need any compressors, instead using the force of the vessel through the water and low energy pumps and blowers to generate the bubbles *By Andrew Marshall, CEO, Ecochlor*

A second-generation hull air lubrication system (ALS) is on the horizon.

It has no compressors, would require lower power consumption than the first generation, and has a tight control of bubble dynamics regardless of vessel type, speed or weather conditions.

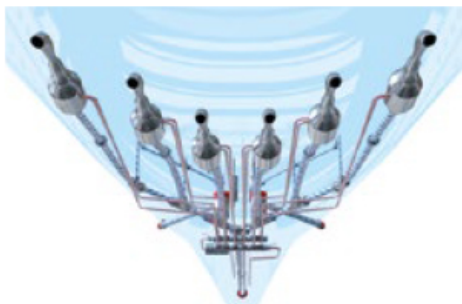
The general principle behind an ALS is the delivery of bubbles under the ship's hull to create a layer of aerated water.

This reduces friction between the hull and seawater, and consequently reduces fuel consumption and emissions.

Most ALS use compressors operated continuously to replenish the air needed.

They have to mechanically force air to the hull bottom, up to 23 meters on a fully laden VLCC.

They normally have no means to optimize performance apart from increasing vessel speed. This might even increase fuel consumption under some conditions.



The Armada system

Armada Technologies is bringing a different process to market, for the production of the bubbles needed for hull air lubrication.

The system uses the vessel's own forward motion to drive water through a series of openings in the bow region of the vessel. These openings direct system water through branch lines to venturis and injectors that then "passively" deliver an optimal air/water mix (rather than simply air) for hull lubrication.

The system utilises a small number of low energy pumps and blowers to deliver optimal system control in certain operational conditions of speed, draft and sea state.

This method of injection allows for tight

control over bubble property, dynamics and air concentration.

"We kept hearing that owners don't like the expense of compressors that operate continuously on their vessels," says Roger Armson, COO of Armada. "This prompted us to look at other options to generate an air/water mix for an air lubrication system."

"Like many optimized enviro-technologies, Armada's ALS takes a lesson from nature to inform its design. We took inspiration from the duck and how trapping a layer of air within their plumage, enables them to glide across water quicker whilst expending less energy. We applied these principles to develop a cost-effective, passive air lubrication system using a venturi system."

"The design allows for greater system control over the water and air, whether in shallow draft, deep draft, high speed or slow speed," adds Alex Routledge, CEO of Armada. "It is my understanding that no other ALS has the potential controllability that the Armada system offers. Without that controllability, those systems could be at the mercy of factors that are out of their control, such as weather conditions and ordered ship speed."

The controllability also makes it easier to operate the system at lower speeds, he says. "This is important [with] the ongoing prevalence of slow steaming across the world merchant fleet. Having an ALS work well in laden condition, but become inoperable at slow speed ballast legs, destroys any return on investment assessment."

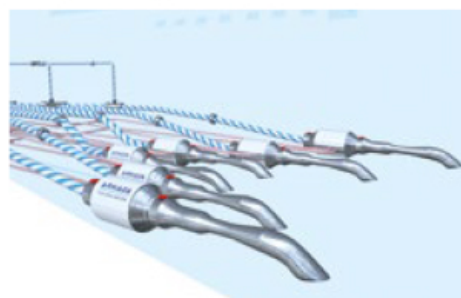
Testing

In September 2022, the system went through HYKAT (Hydrodynamic and cavitation tunnel) testing at the Hamburg Ship Model Basin (HSVA), one of the world's leading pressurized cavitation tunnel testing facilities.

The results proved that passive aeration is viable and offers a credible double-digit on-plate drag reduction.

"We delivered a stable, well engaged and high-quality rigid carpet of aerated water into the boundary layer and significant on-plate reduction was recorded," Mr Routledge says.

"We were able to identify a drag reduction sweet spot, where two identified hydrodynamic phenomena were effectively balanced within



each and every operating condition."

"This points to the importance of an automation system to ensure that the system is performing at its absolute best in varying circumstances at sea."

Less moving parts

The system also has less moving parts, making it more reliable and easier to install, maintain and operate.

"Looking at it from the superintendent's perspective, they're thinking, how much more stress is there going to be for my crew on board the ship to maintain this, how much of a headache is this going to be when I have to fit this alongside 200 other maintenance repair items in the shipyard," Mr Routledge says.

The Armada System has less moving parts because it only needs small capacity blowers not big compressors. Also, it needs less power. 50 per cent of the installation can be done with a riding crew, he says.

CII

As shipowners are investigating a giant pool of potential energy efficient technologies, the improvements make the Armada system an ideal contender to help improve CII scores, Mr Routledge says.

"The [technologies] that will stand out will be the equipment that is simple to operate, are not CAPEX or OPEX heavy and can make a major contribution to the whole ship's carbon reduction package," says Armada's David Swindells.

Armada Technologies is an affiliate of the Ecochlor EcoOne Marine Technology Group