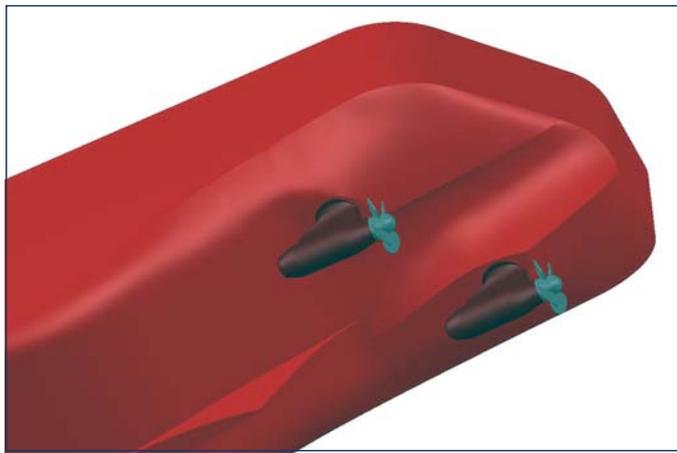
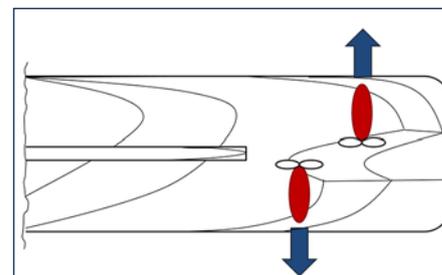


New asymmetrical stern improves ice management



Aker Arctic has developed a new stern design specially intended for ice management vessels. Among many other benefits, the design will improve the flushing effect of the propulsion units compared to a traditional propulsion arrangement. The flushing effect of water flow is typically used in ice management operations to clear ice away to achieve open water areas.



Icebreakers and ice management vessels are required to have efficient icebreaking and ice clearing capabilities. Their normal tasks are to clear ice from piers, clear and enlarge ice channels and clear ice ridges, etc. so that other vessels can move and berth without problems.

In a typical arrangement of azimuthing pulling type thrusters, the propellers are located very close to each other when they are turned inwards for the flushing operation. The amount of water they need in order to create the maximum flushing effect might be limited, which causes them to cavitate, vibrate and create noise. The flushing operation is therefore not very efficient if the thrusters cannot be used with full power or they have large forbidden sectors.

"We have now invented a solution to this," Project Manager Riku Kiili highlights. "By changing the stern design to an asymmetrical form, the thrusters can be installed lengthwise away from each other. There is more space in between the pods and when turning them sideways for ice flushing, they get enough water and can blow the ice away using full power."

Model testing results

An extensive model testing series was carried out, lasting totally about ten days. Two different designs of the stern were manufactured and both of them were tested with the same tests:

- level icebreaking capability in two different thicknesses
- breaking out from an ice channel stern first, both directions
- breaking through an ice ridge
- clearing capability of brash ice

The model used to compare the test results was one of the icebreaking supply and stand-by vessels we have designed.

The results from the tests showed that the level ice breaking capability and the breaking out from an ice channel remained, but brash ice and ridge clearing capability was improved with the new design.

Many benefits for ice management vessels

Regarding the open water characteristics of the new stern design, excellent manoeuvrability will remain and directional stability will not be a problem. Movements in waves will be slightly asymmetrical and slamming still needs to be studied, but the new stern form can be designed also to manage and break waves more efficiently astern.

In addition to ice management advantages and improved flushing capabilities, this design showed improved DP potential in some situations. There are smaller limited sectors for propulsors and full thrust with both propulsors can be directed sideways in the same direction.

The asymmetrical icebreaking process is similar to the icebreaking Trimaran, where ice is broken and bent downwards in phases. The asymmetrical shape can be designed to allow small oblique icebreaking angles for the vessel, similar to the oblique icebreaker *Baltika*.

The asymmetrical stern will have impacts on the ship size compared to a traditional design. At the same deadweight, the ship length increases, meaning more cargo deck. The cargo deck can be designed to be symmetrical or asymmetrical. On the other hand, if the length of the vessel is kept the same, the deadweight decreases. If the size of the propulsion units determines the breadth of the vessel, with this design the vessel can be narrower, with the benefit of smaller ice resistance. All choices, detailed design and shape of the stern depend on the intended use of the vessel.

"The benefits of an asymmetrical stern for icebreaking ice management vessels are obvious," says Kiili. "Especially for harbour icebreakers, supply vessels or even drillships that need to manage independently in ice."

"Because the propulsion units are not positioned side by side, there is also less risk that a piece of ice will get jammed between the propellers."