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Kongsberg Discovery

28/06/2024



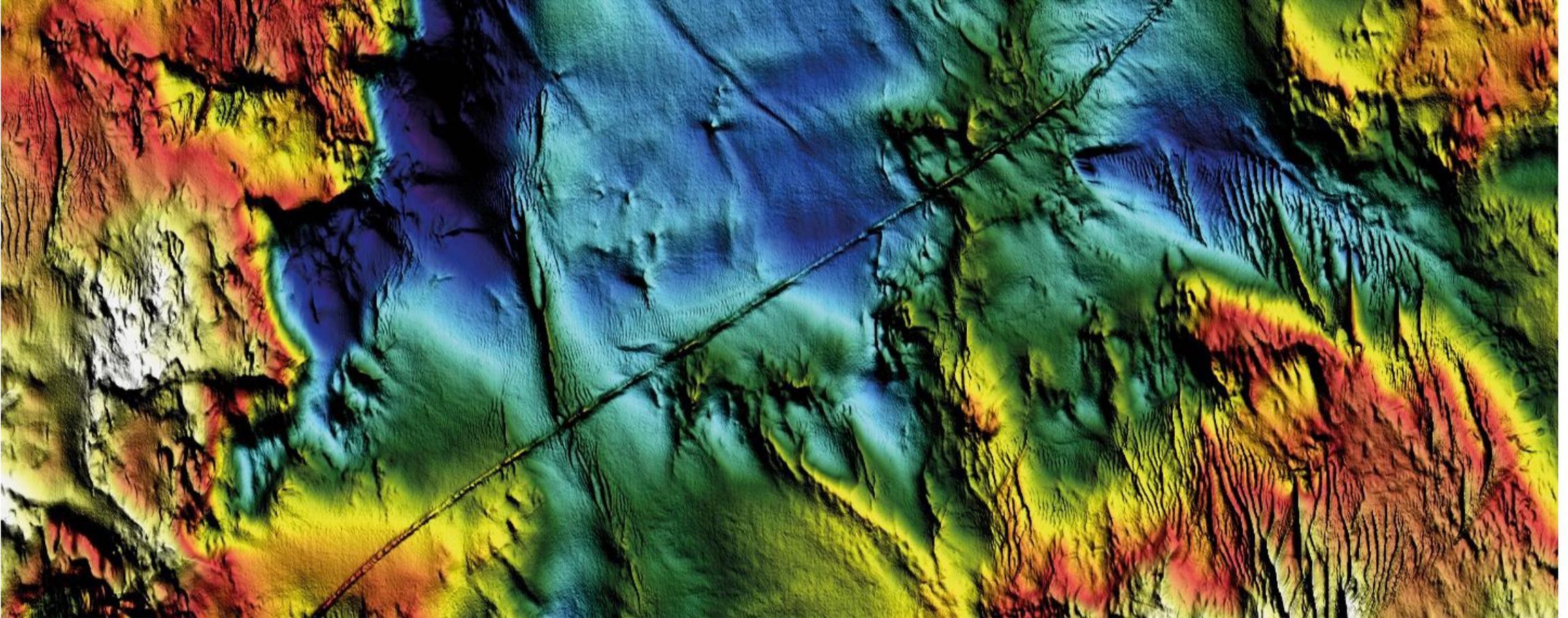
26TH ERVO ANNUAL MEETING



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Best practices for installing acoustic equipment to minimize noise on RV's Installations

Senior Mechanical Designer Leif Kanschat





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Different noise sources on a Vessel that may have an impact on the installed Equipment

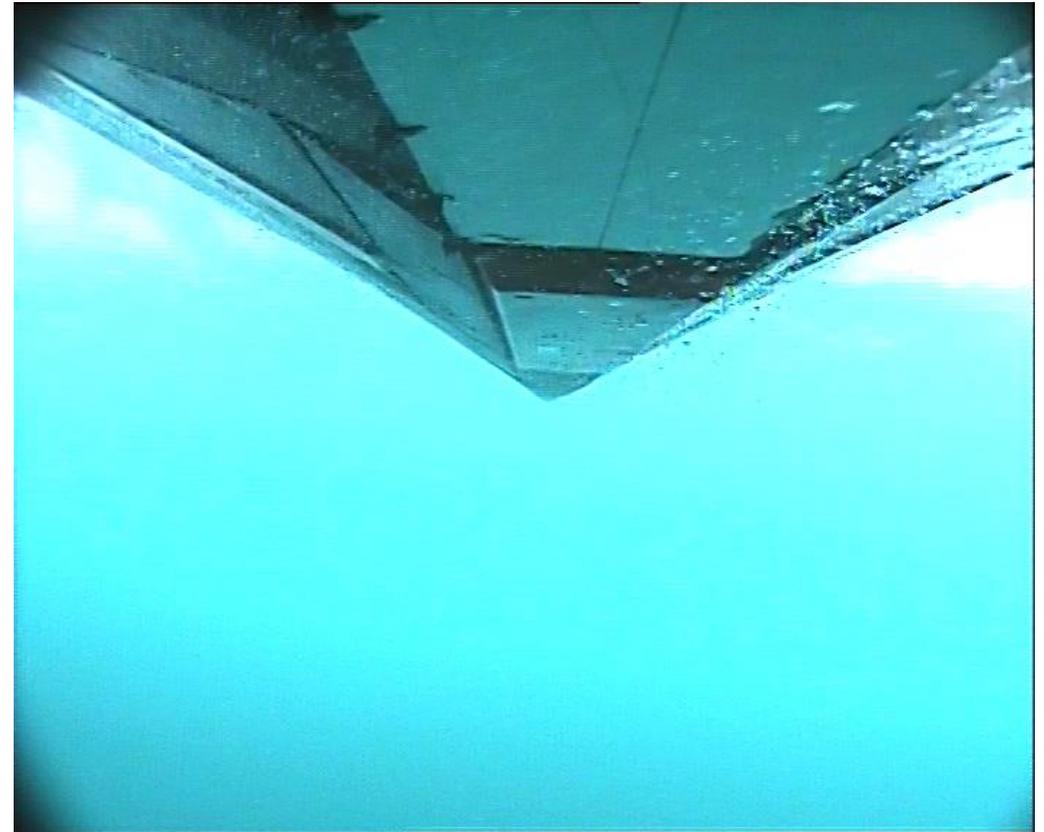
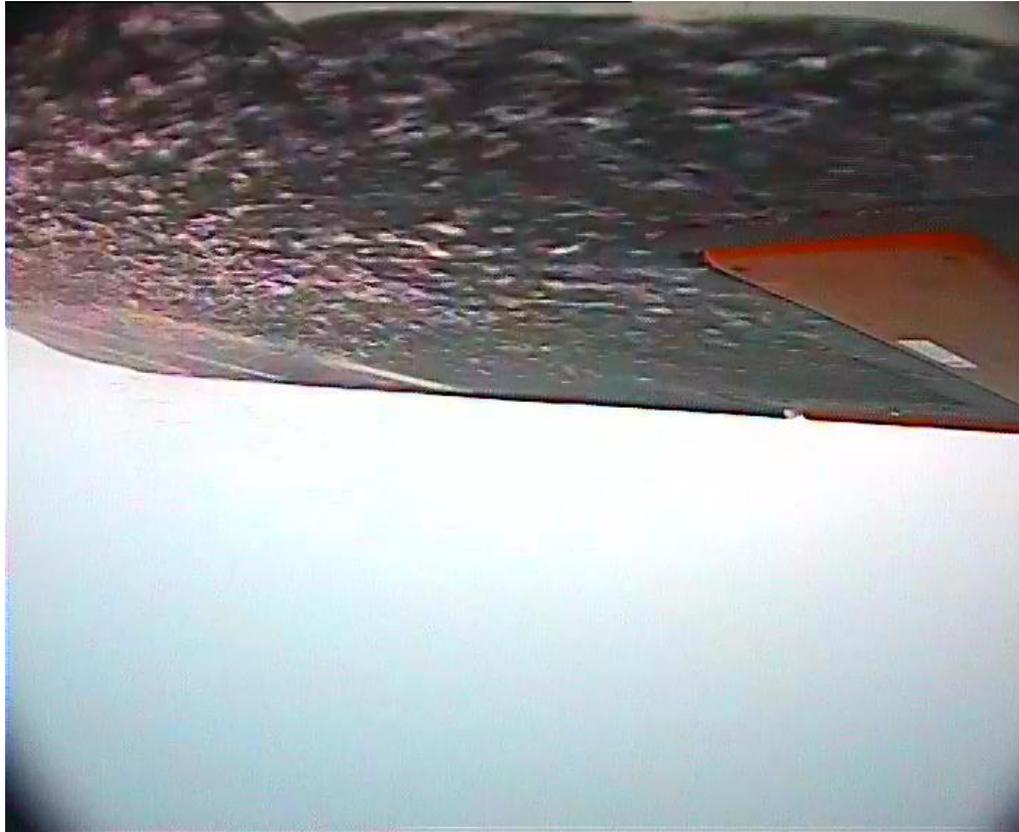
- **Hydrodynamic noise**
 - *Hydrodynamic noise*
 - *Breaking, Turbulent Boundary Layer TBL, vortex shedding, slamming, **Bubble sweep down effects**, propeller-rudder interaction*
 - *Machinery noise*
 - *Main and auxiliary engines, driving systems, bow and stern thrusters*
 - *Propeller noise*
 - *Cavitation etc*
- **Structureborn noise**
- **Airborn noise**
- **Electromagnetic interferences**



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Noisy installations

Example 1



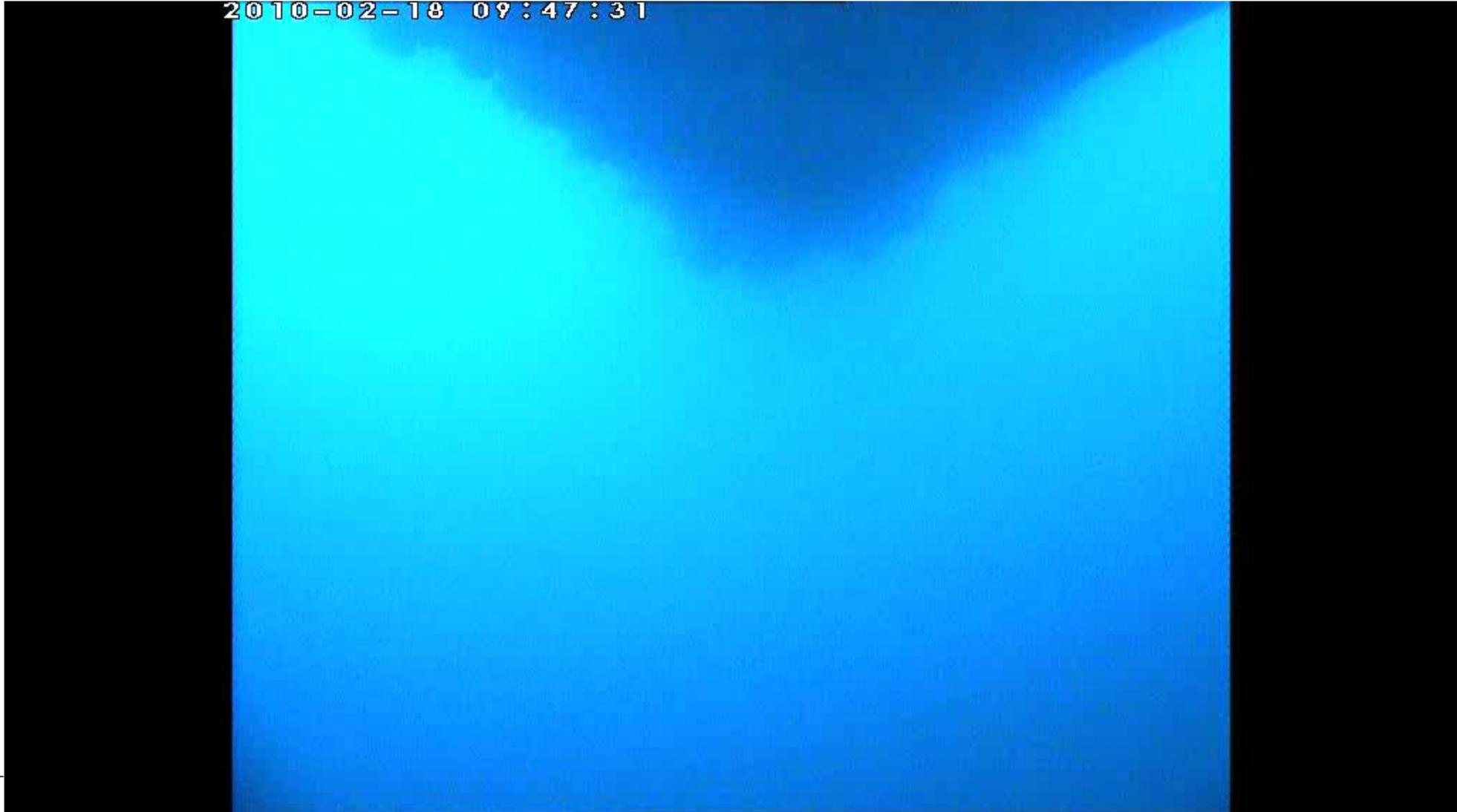


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Noisy installations

Example 2

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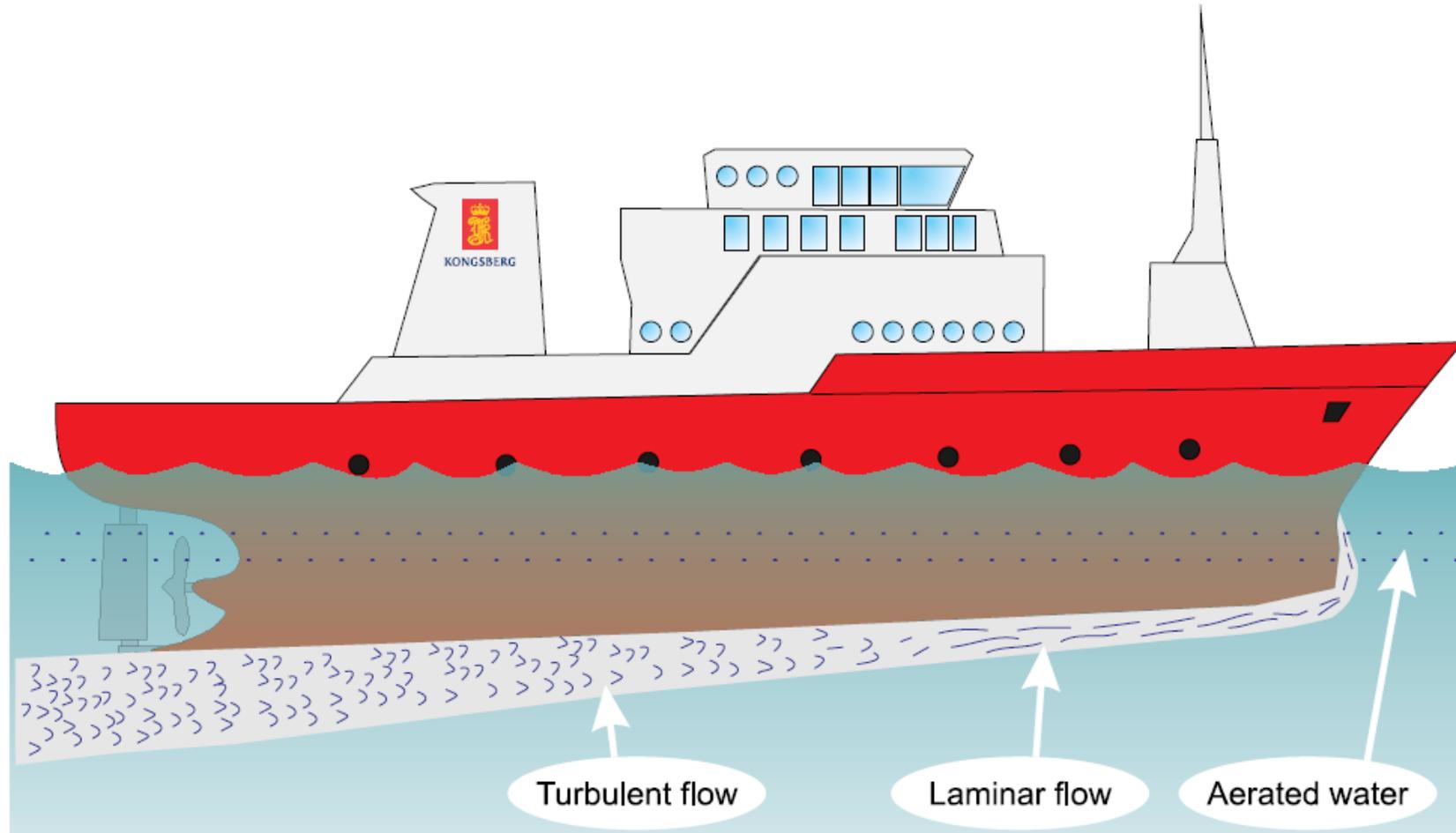
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Sketch of boundary Layer underneath a Vessel

Calm / smooth sea

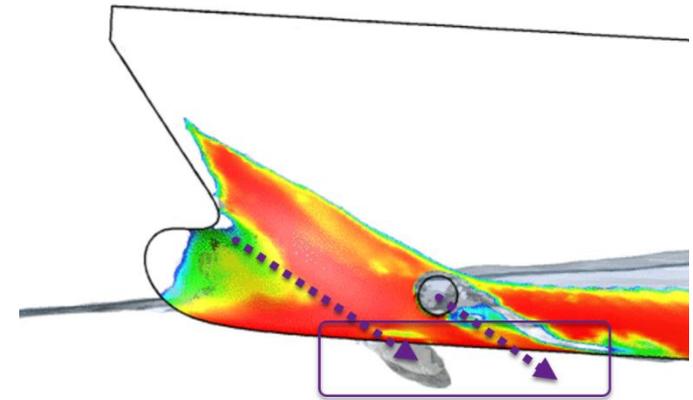
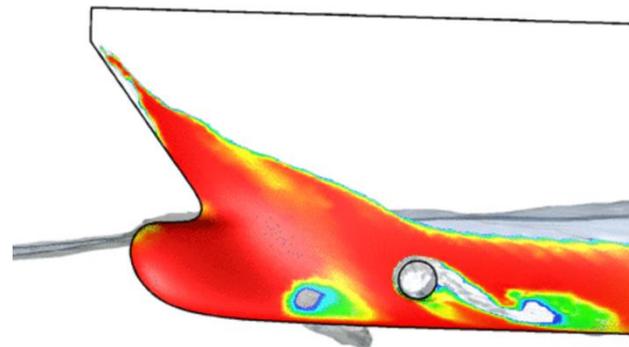
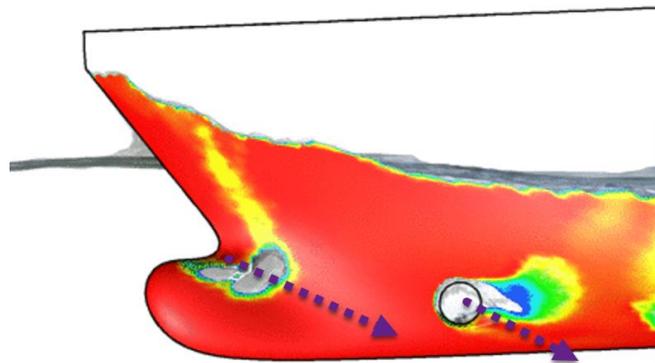
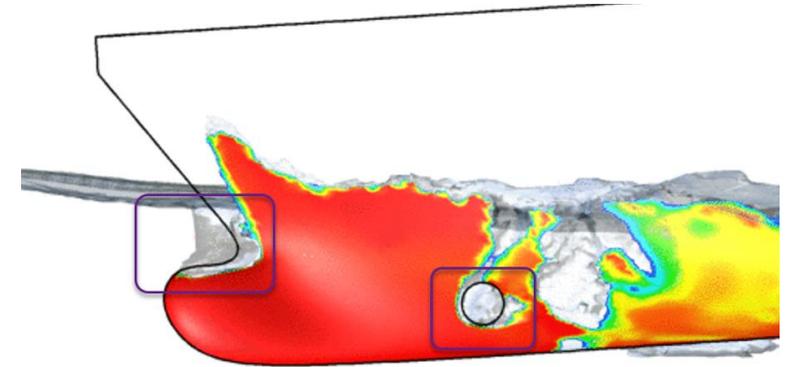
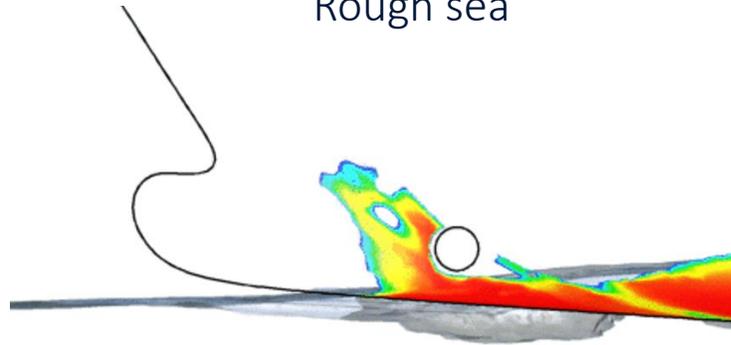


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Bubble Sweep down effects

Rough sea





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What to focus on for noise reduction when planning a scientific vessel?

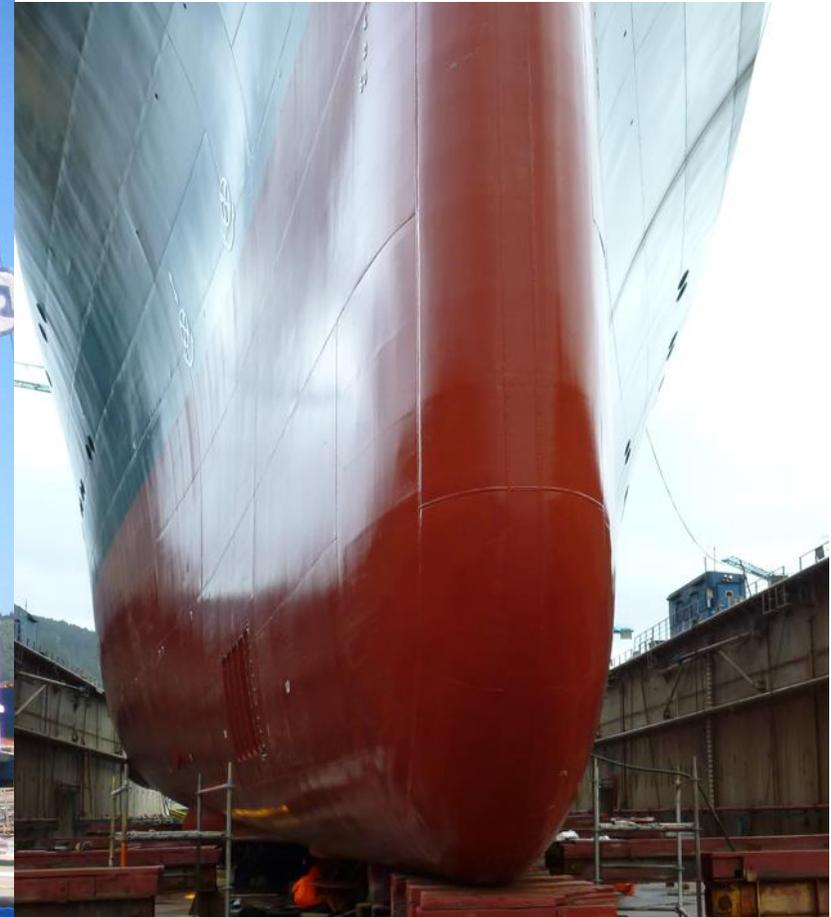
- The shape of the bow design of the vessel, to avoid bubble sweep down
- Use closeable tunnel thruster's
- Use retractable azimuth thruster`s with a bottom plate flush with the ship's hull to avoid aeration from tunnel thrusters.
- Make a Gondola to house all large transducers (not valid for ice breakers).
- Use drop keels for scientific echo sounders and other sensitive acoustic systems.
- Install hydrophones for trawl instrumentation, hydrophones for noise measurement and cameras in the drop keels.
- Design the vessel according to DNV Silent R or similar.
- Avoid any sharp edges or protruding obstacles on the hull, forward of the transducer installations
- High quality steel work is important for the transducer installation.
- Dimensional survey of the transducers, MRU's and the antennas is very important
- Keep focus on EMC
- Install the transceivers as close to the transducers as possible.
- Install the computers in a separate room, not in the operation central. This is to avoid noise and heat in operation room.
- Use a KVM matrix system to limit number of monitors and ease the operation of the systems installed



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Different Hull Shapes

The good, the bad and the ugly



WORLD CLASS – Through people, technology and dedication

KONGSBERG PROPRIETARY - See Statement of Proprietary information



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Different Hull Shapes

State-of-the-art platform for hydroacoustic systems, if no need for ice breaking capability

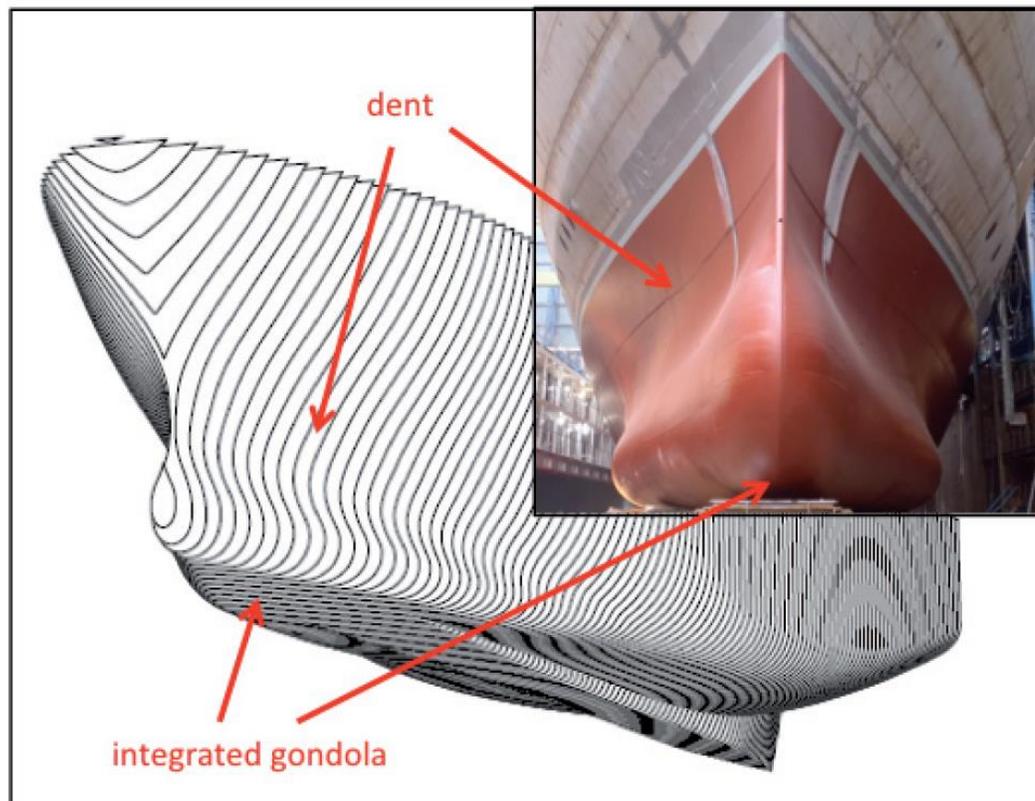




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Different Hull Shapes

- Integrated gondola, RV TFS Sonne, Sun Yat, Mbari





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Different Hull Shapes

- An icebreaker is NOT an optimal platform for hydroacoustic systems!

Main challenges:

- The bow shape is far from optimal to avoid bubble sweep down
- Heavy machinery might create vibrations adversely influencing the acoustic systems
- Blister or Gondola cannot be used
- Boxkeel or flat bottom



The Beauty & the Beast





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Different Hull Shapes

- An icebreaker is NOT an optimal platform for hydroacoustic systems!



- The knife will push aerated water to the sides of the box keel
- The box keel gives additional draft to the vessel. Deeper is better!
- The box keel houses a number of acoustic systems that can be used while sailing in ice conditions.

The Beauty & The Beast

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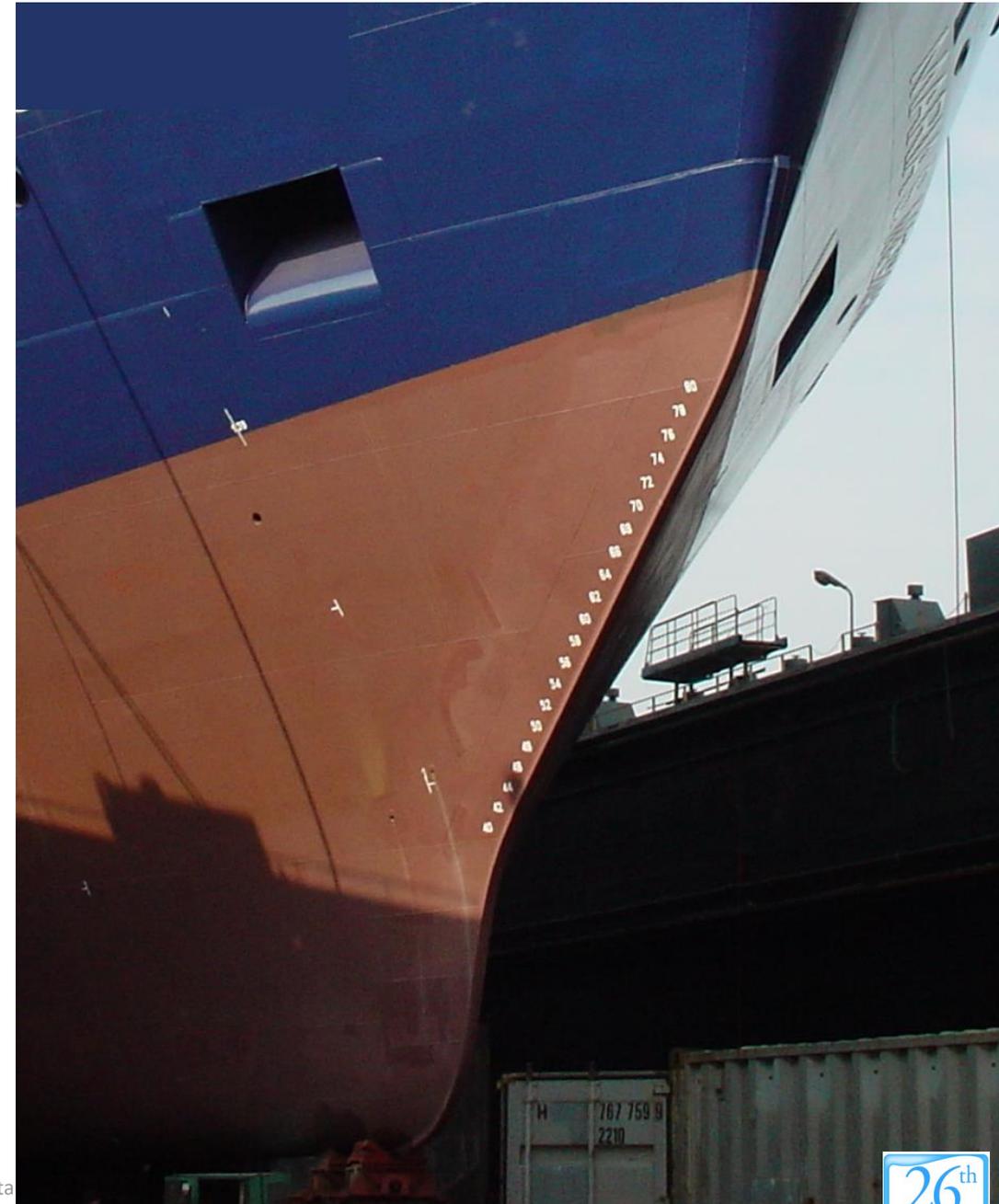
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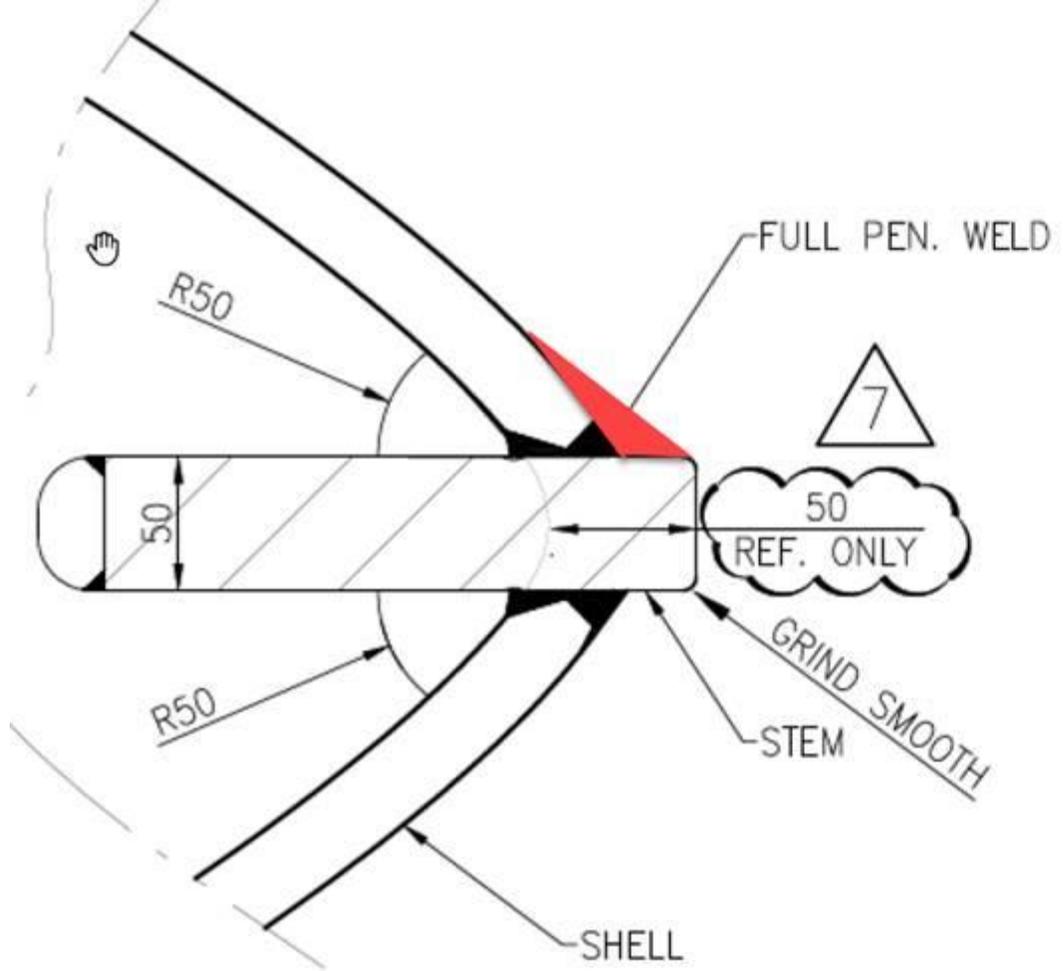
Stem bar design

Sharp edges

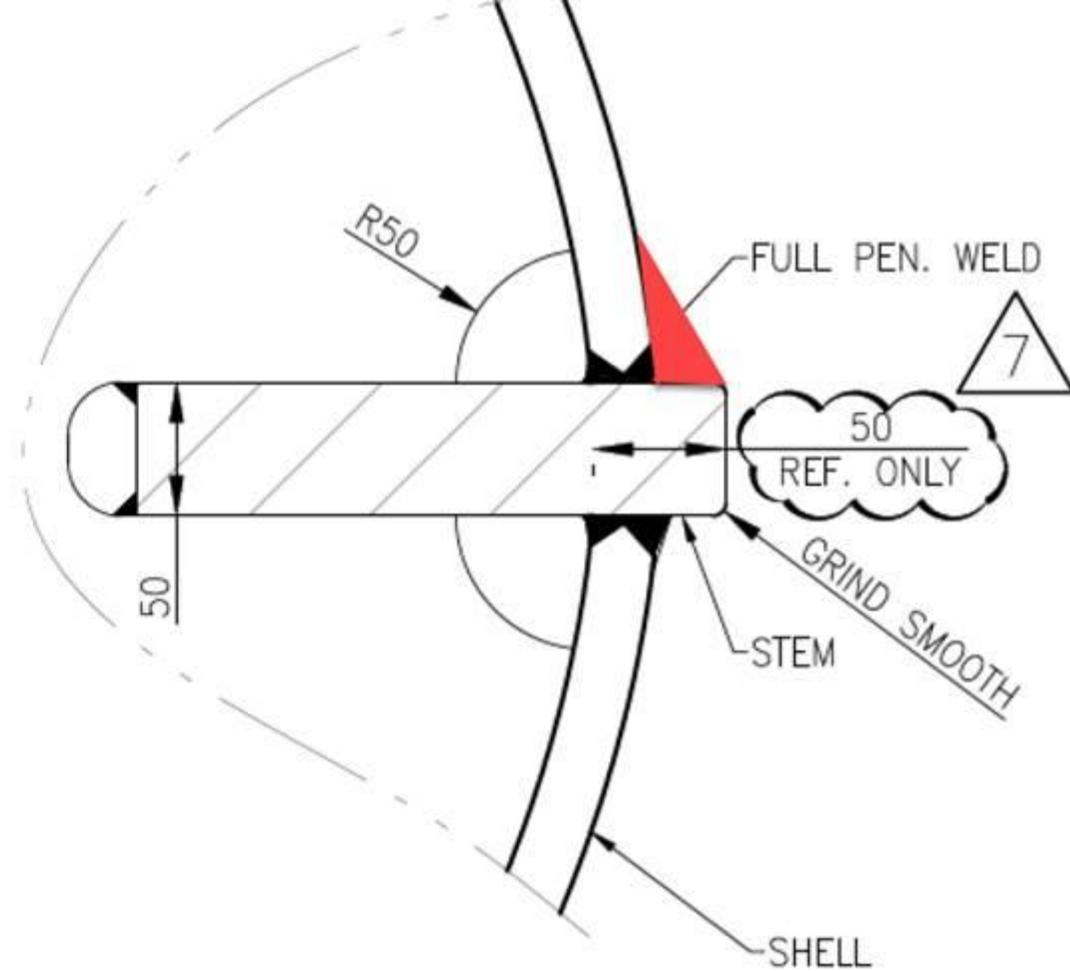


See Statement of Proprieta





STEM AT 2400 ABL
 TYPICAL DETAIL, (SEE NOTE #10) 



STEM AT 7300 ABL
 TYPICAL DETAIL. (SEE NOTE #10) 

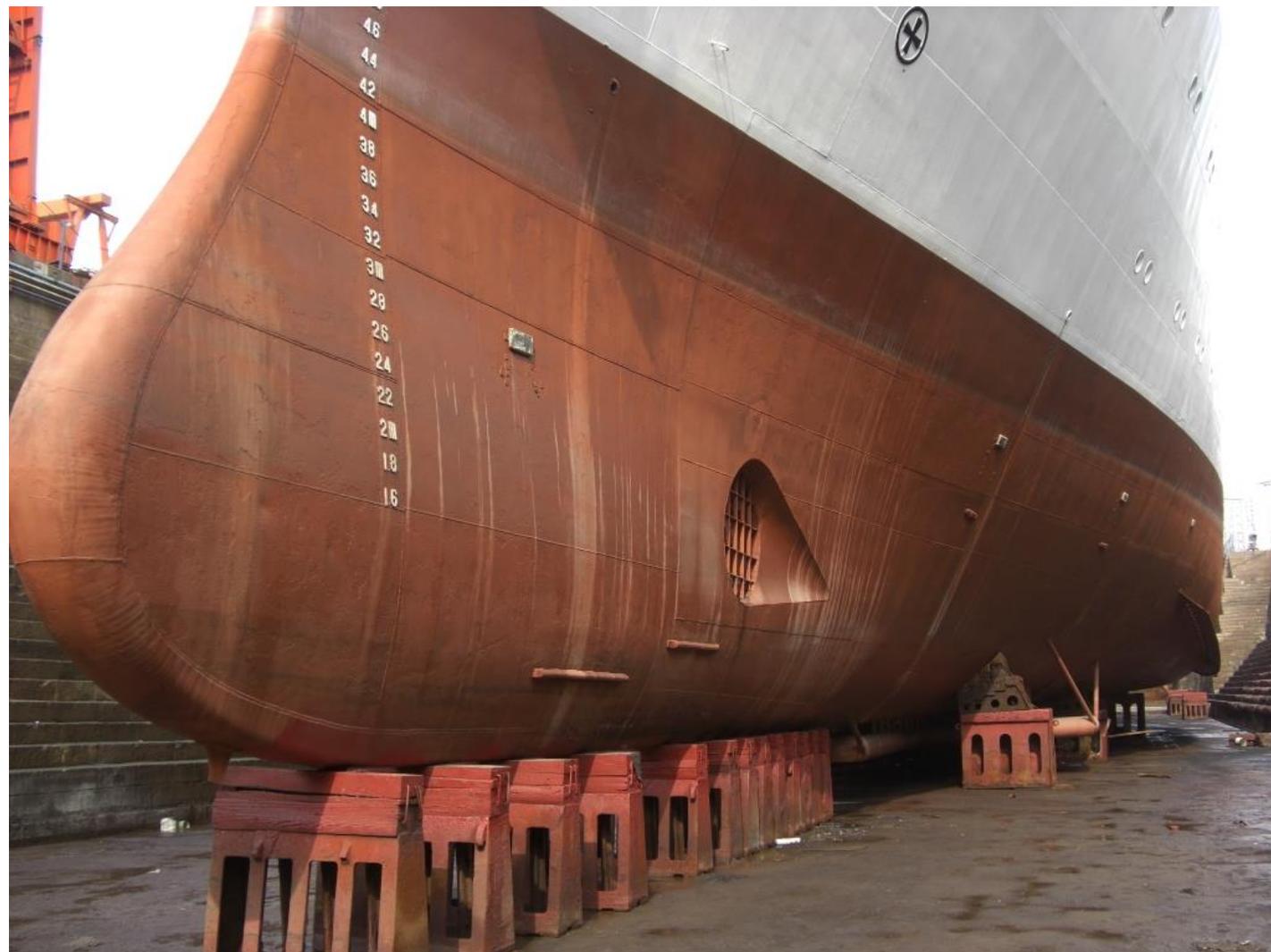
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Tunnel Thrusters

- Open thrusters





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Tunnel Thrusters

- Shutter





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Tunnel Thrusters

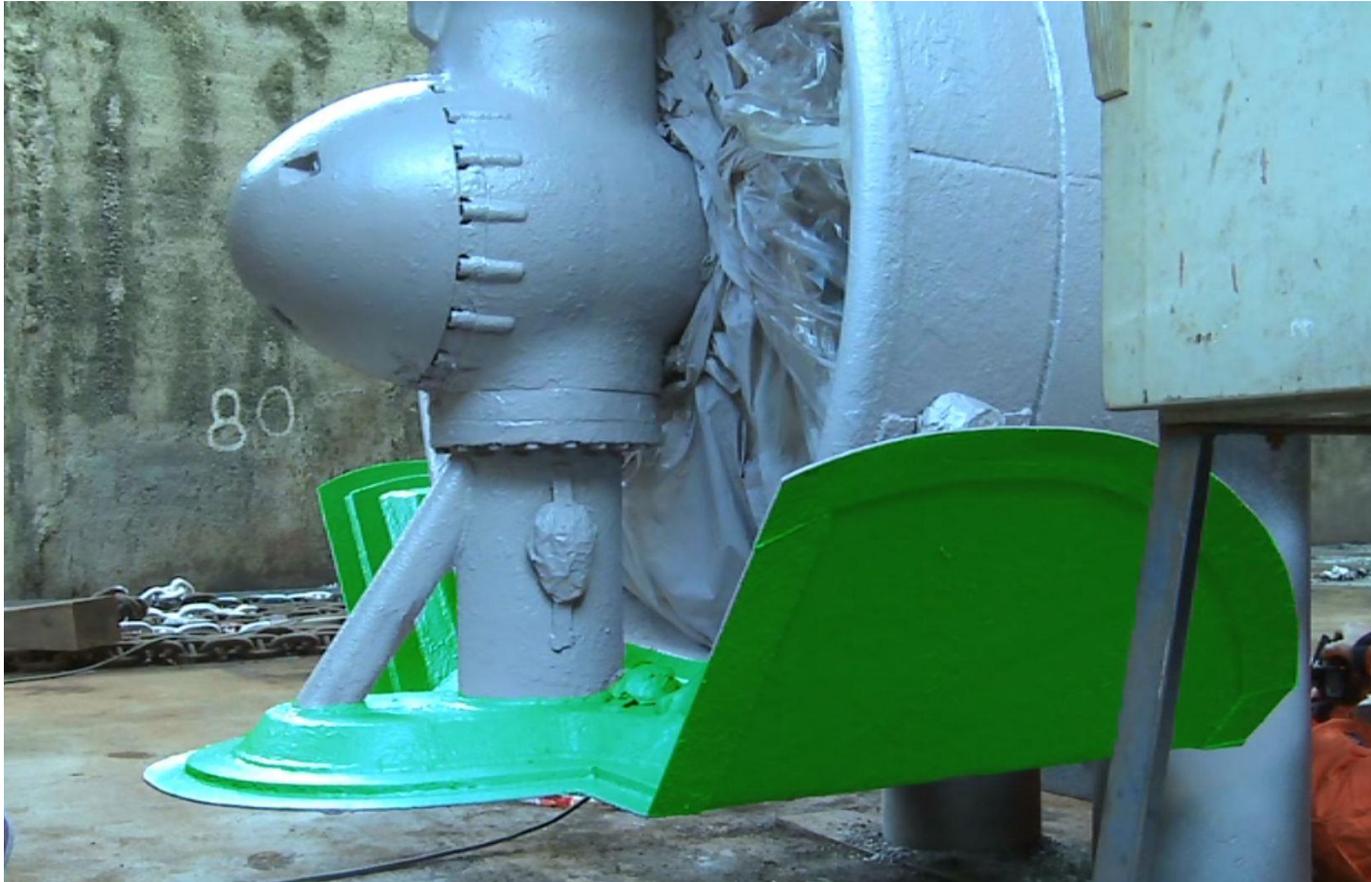
- Shutter





Thuster

- Retractable Azimuth

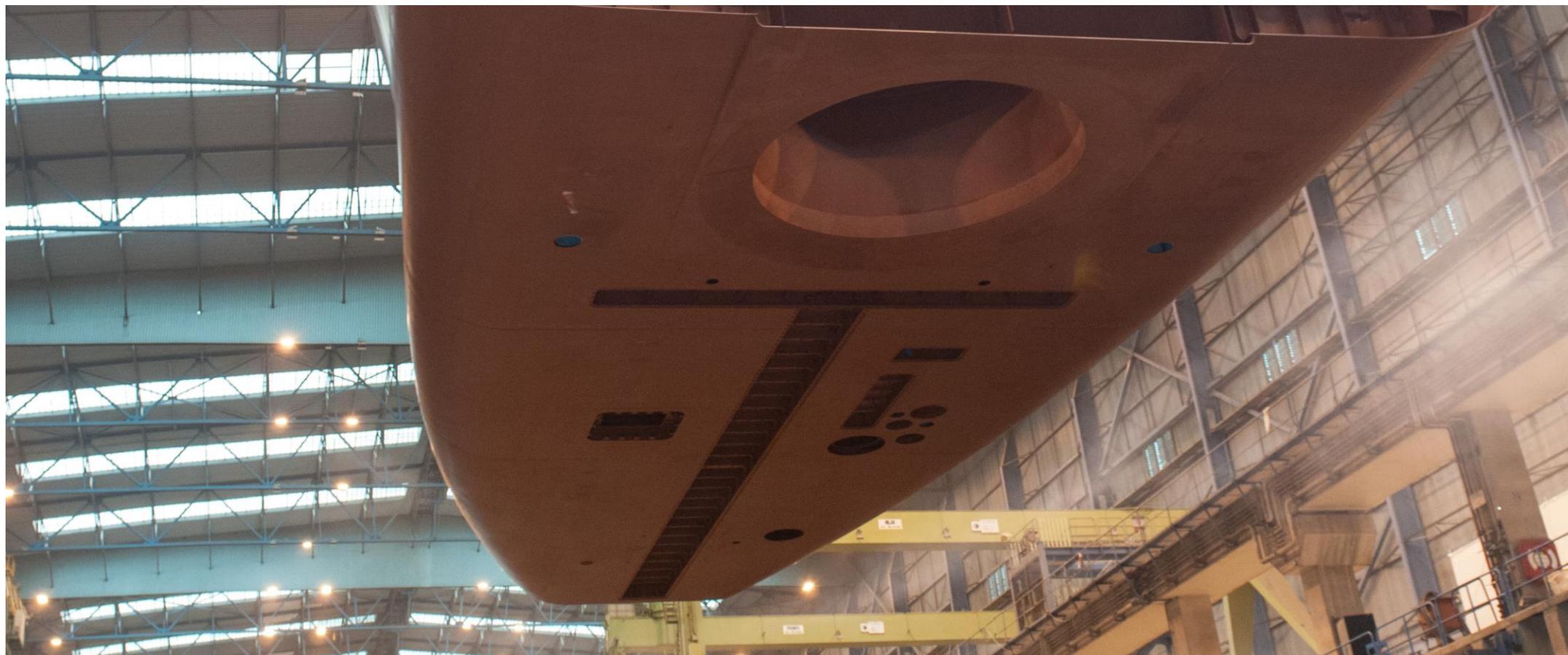




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Acoustic Installation

- Flush mounted





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Acoustic Installation

- Gondola, the preferred installation method





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Acoustic Installation

- Dropkeel

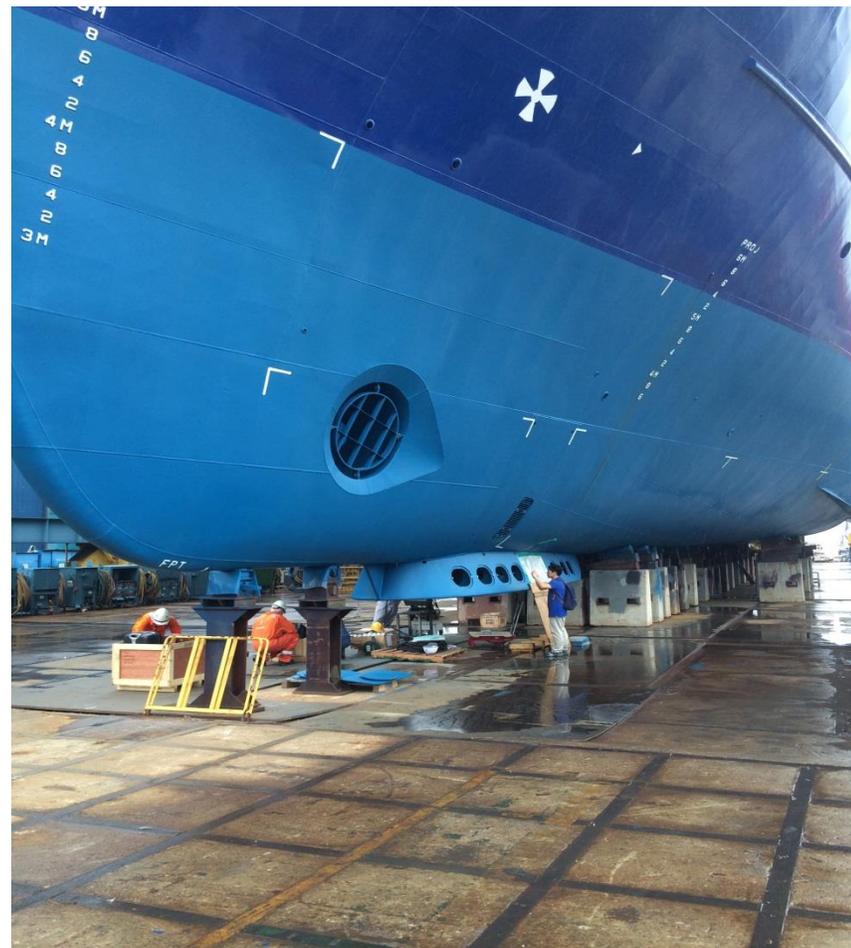
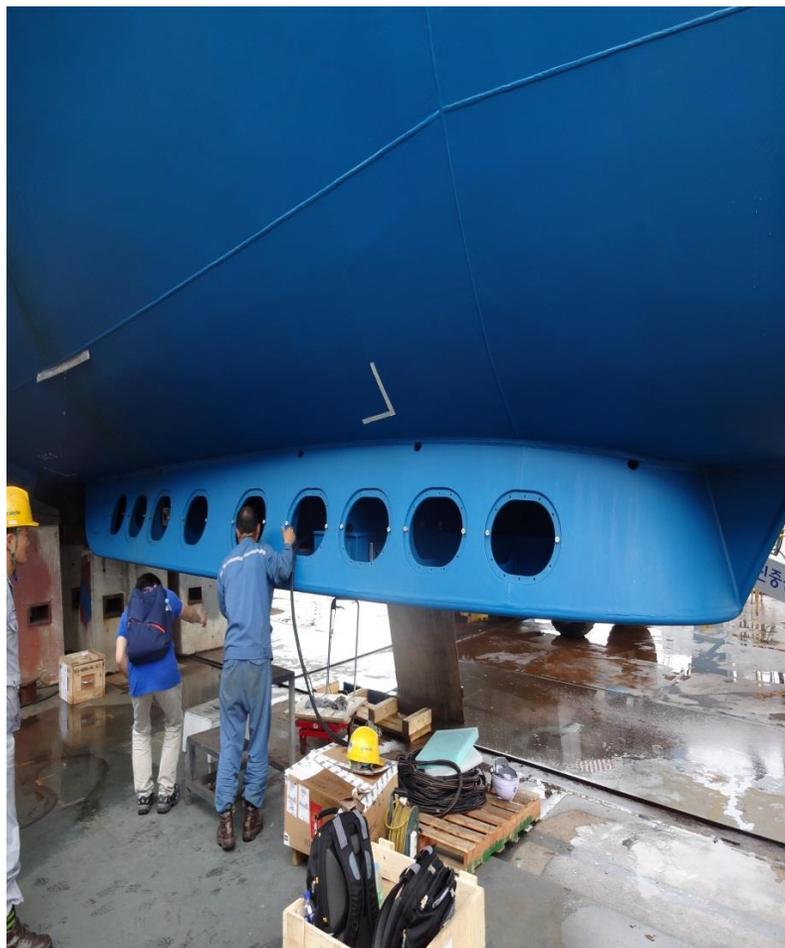




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Acoustic Installation

- Blister





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Acoustic Installation

- Bad shaped Blister, Beautiful Surface work





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Acoustic Installation

- Terrible Surface Work





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**Thank you for your
attention**

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