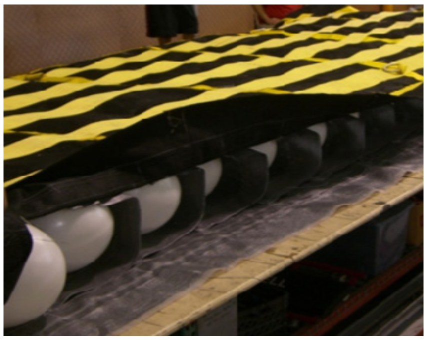
PRODUCT NEWS: Sound Attenuation System™ (SAS)

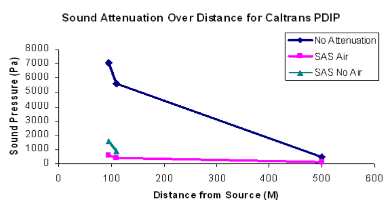
Design Innovation Eliminates Energy Consumption and Simplifies SAS Deployment for Pile Driving, Drilling, and Submerged Sound Sources

GUNDERBOOM
Engineered Aquatic Filter Barrier Systems



Recent developments have advanced sound attenuation technology beyond the need for use of offshore air supply to a system of statically-contained air. The "hard bubble" feature for Gunderboom's Sound Attenuation System™ (SAS) is a breakthrough in the attenuation of underwater sound. This simplifying concept eliminates the need for any energy use to maintain the attenuation function during operations, simplifying the setup and reducing operational costs.

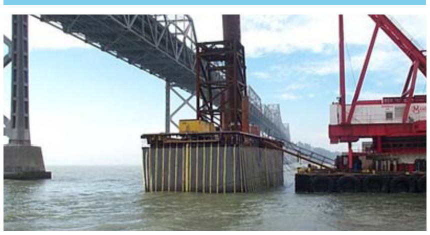
Underwater sound and pressure waves are problematic for marine life. The effects range from adverse behavioral changes to lethal injury.



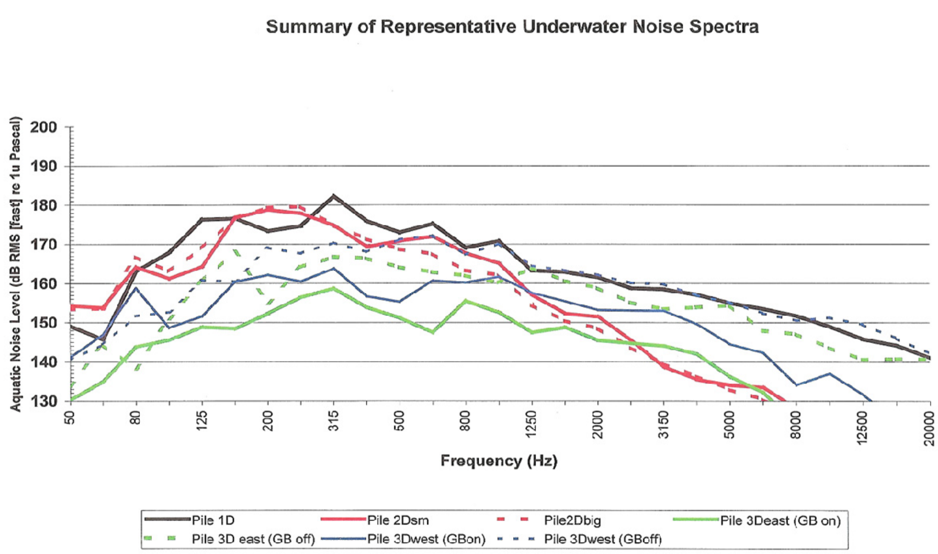
The Gunderboom® SAS allows marine operations to proceed by proven attenuation of underwater noise.

Sound attenuation over the years has had varying degrees of success for different applications. The key to successful attenuation of underwater noise for a broader array of applications resides in the creation and maintenance of an air interface that has a consistent integrity. Gunderboom uses Aquatic Filter Barrier (AFB) technology to accomplish a successful marriage of fabric barrier systems with the air bubble curtain concept and through this has created a confined air barrier system. This has yielded a highly successful and adaptable technology.

Gunderboom has the expertise in marine engineering, design, fabrication, installation and operation of underwater fabric systems to identify the best, most effective and cost-conscious solution for your project.



Gunderboom's "confined" bubble curtain, pilot tested for the Caltrans Oakland Bay Bridge Project, produced reductions of 20-22 dB. By creating a consistent medium for reduction, especially in higher currents, this system achieved results unattainable by an unconfined bubble ring.



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Traditional Approaches to Sound Attenuation and Steps Forward

When sound pressure waves travel underwater, their transmission can be disrupted by introducing an air barrier. This is due to the compressible nature of air as opposed to the incompressible nature of water.

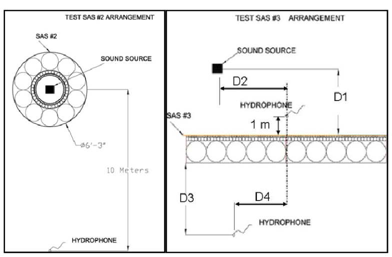
Various types of air barrier systems have been used to address the problem of underwater noise; a common type traditionally used is the unconfined bubble curtain. These are created when compressed air is released through bubble rings or other underwater diffuser structures. Unconfined air bubble systems have been shown to provide some attenuation, but results are inconsistent. The integrity of this type of underwater barrier is difficult to maintain under various site conditions such as in currents or waves, and due to the natural loss of cohesion of the unconfined air bubbles.

The Confined Air Bubble Curtain; Piloting Gunderboom's Sound Attenuation System

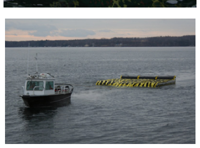
Sound attenuation arose as a possibility for Aquatic Filter Barriers during the early 1980's, when a barrier curtain was deployed to contain debris from the explosion of underwater demolition, and reduced impacts from the sound pressure waves were observed. Gunderboom designed and fabricated a double-wall curtain, used for a confined air bubble curtain, that was pilot tested in full scale for the California Department of Transportation (Caltrans) pile driving work for the Oakland Bay Bridge. The requirements for this system were to reduce the decibel output from driving 8-ft diameter piles; the hammer was a 1.2 million ft-lb Menck MHU 1700. The pilot system produced a reduction of 20-22 dB.

A sound attenuation system that can be deployed with no offshore air supply equipment reduces cost, operational requirements, environmental hazards and energy use.

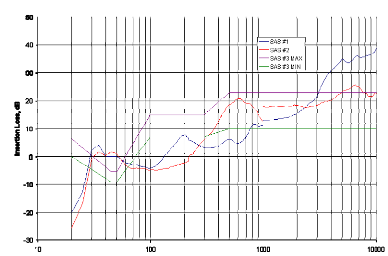
Recent Advancements: Leaping Ahead with the Cost-Effective, Energy-Efficient Hard Bubble Design



A further breakthrough in air interface design is the advent of the "hard bubble" feature for the SAS. This simplifying concept makes it possible to create an underwater air barrier without the use of compressors. In this new approach, air-filled HDPE balls are incorporated into layers of the AFB. Unlike the compressed air bubble curtains, the hard bubble design allows for sound attenuation that is specially targeted for the application. Through sizing and configuration, reductions can be achieved for frequencies that accommodate the specific type of operation, sound source or organisms of concern.



The hard bubble SAS has been tested through a program of research and development with tank testing at the University of New Hampshire's Ocean Engineering Department, numerical modeling (COMSOL Multiphysics finite element) and prototype field tests at the US Naval Underwater Warfare Center (NUWC) acoustic test facility at Seneca Lake, NY.



UNH physical testing demonstrated a 40+ dB reduction at 10kHz (pile driving is commonly in the 8-12 kHz range). Numerical modeling further supports that very high reductions may be achieved for these higher frequencies. Attenuation at low frequencies is much more challenging, but even for the lower ranges, field testing results achieved reductions of 10+ dB for 500+ Hz and 7+ dB for 100+ Hz; numerical modeling results show that reductions of 10+ dB at 60+ Hz and 20+ dB for 250+ Hz may be achieved.

For your underwater application that is in need of sound attenuation, please contact us to go over the requirements of your project and develop a design specific to your operation.

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