

Can We Decrease the Amount of Sound in the Ocean? A Review of Alternative Technologies for Oil and Gas Exploration

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The Arctic is poised for an expansion in oil and gas operations, as demonstrated by the number of leases held in the Chukchi and Beaufort Seas and the exploration seismic activities conducted in the last few years. Some stakeholders are happy to see this expansion; others have expressed concern that there is too much sound going into the ocean from airguns.

The airgun is an impulsive sound source that has been the standard for marine oil and gas exploration since the 1970s. Ironically, the airgun was introduced in the 1960s as a more environmentally friendly source for seismic exploration, replacing explosives such as dynamite, C4 and Seis-Gel. However, it has been under scrutiny recently as a sound source for seismic exploration due to the belief that the propagated sound waves may harm marine life during survey operations, despite protective measures taken by operators that are required by government regulators to ensure compliance with the Endangered Species Act and the Marine Mammal Protection Act.

This concern over airgun noise has prompted industry and academia to investigate alternative technologies to replace, or at least supplement, the airgun as a source for marine seismic exploration. This paper will review the current state of alternative technologies, methodologies, and mitigation measures; as well as discuss the steps needed to advance these technologies. The covered technologies will include active seismic (marine vibrators, low-level acoustic combustion source, deep-towed acoustics/geophysics system), passive seismic, and non-seismic (gravity, controlled source electromagnetic) methods.