Seafloor Petroleum Processing Noise Assessment
Project Overview
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Offshore oil and gas exploration and extraction has a long and sad correlation with environmental damage. Most of the known damage has been associated with spills due to shipping accidents, or extraction spills due to well-head blowouts or rupturing of oil and process liquids pipes.

More recently acoustic damage from offshore exploration has been associated with seismic airgun surveys – where impulses are generated by airguns trawled behind a survey ship and the return signal is picked up by hydrophone steamers trawled behind the same ship (see Fig 1).

Fig. 1 Towed Airgun Array

While the airgun array is a technological (and environmental) improvement over the earlier practice of "tossing a stick of dynamite over the transom," it nonetheless does compromise marine habitat. Airgun surveys generate explosions every 10 – 15 seconds will run for up to 20 hours a day, days at a stretch and weeks on end that are loud enough to be heard thousands of miles away.

Airguns are considered an environmental improvement over the earlier dynamite surveys because the slower rise-time of the airgun signals do not cause the instant mortalities in marine life characteristic of dynamite surveys. Unfortunately there are longer-term compromises from the airgun surveys represented in compromised fisheries catch rates following the surveys. There is very little data on the synergistic effects of chronic noise on marine life, so the contribution of airgun noise to the overall poor health of the ocean is difficult to assess.

The petroleum extraction industries are always improving their economic and environmental performance. In order to decrease the risks of surface extraction spills the industry is developing a suite of seafloor processing technologies. These technologies keep various processes close to the well-head, decreasing the amount of pipe runs to and from the surface, and localize pressure gradients of the petroleum and process liquids closer to where they are needed. They also allow for a broader distribution of wells served by a single above-water platform (see figure 2).

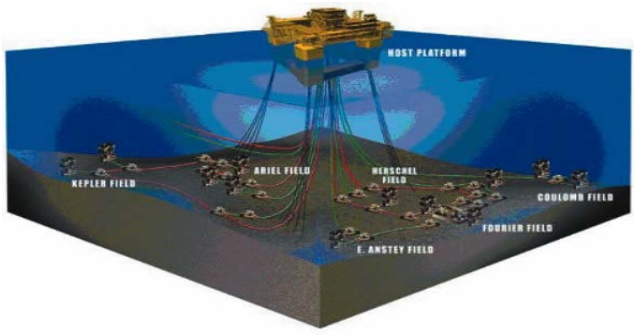

Fig. 2 Multiple oil fields served by a single platform

This equipment includes pressurizers and injectors used to pressurize and inject seawater into the well to force petroleum out; separators and de-sanders which separate mud, drilling muds, water, and sand from the petroleum; and booster pumps which help distribute product over longer distances and bring it up to the surface (see fig. 3 and 4).

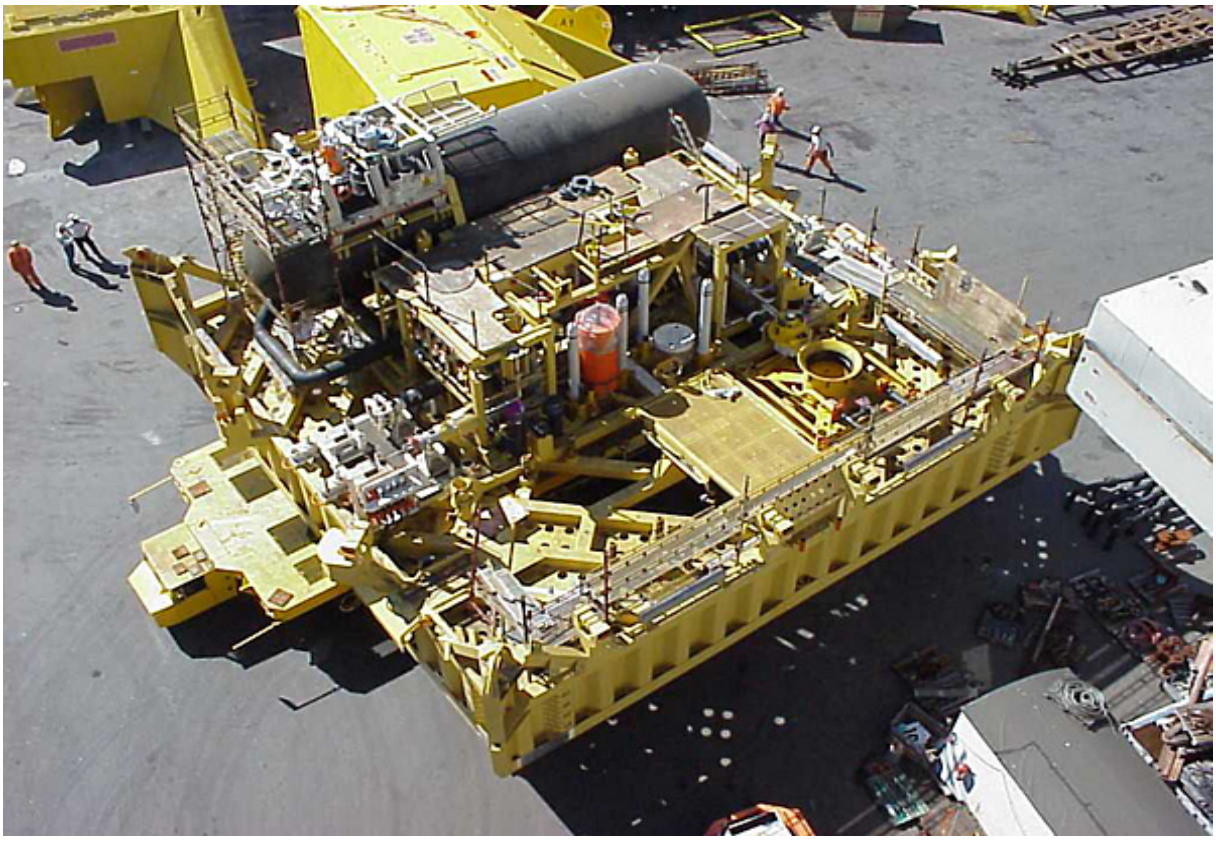

Fig. 3. Seafloor separator on the docks. Note humans above left and right for size

All of this equipment operates under extreme pressures (as much as 100 atmospheres or 1400 psi at the sea floor). Many also generate huge pressure – up to 5000 psi. These physical conditions will naturally generate large amounts of noise. While noise measurements of this equipment have not been published, one industry worker commented that “they are real screamers.” Currently there is no assessment of the biological impacts of this new noise on marine habitats.

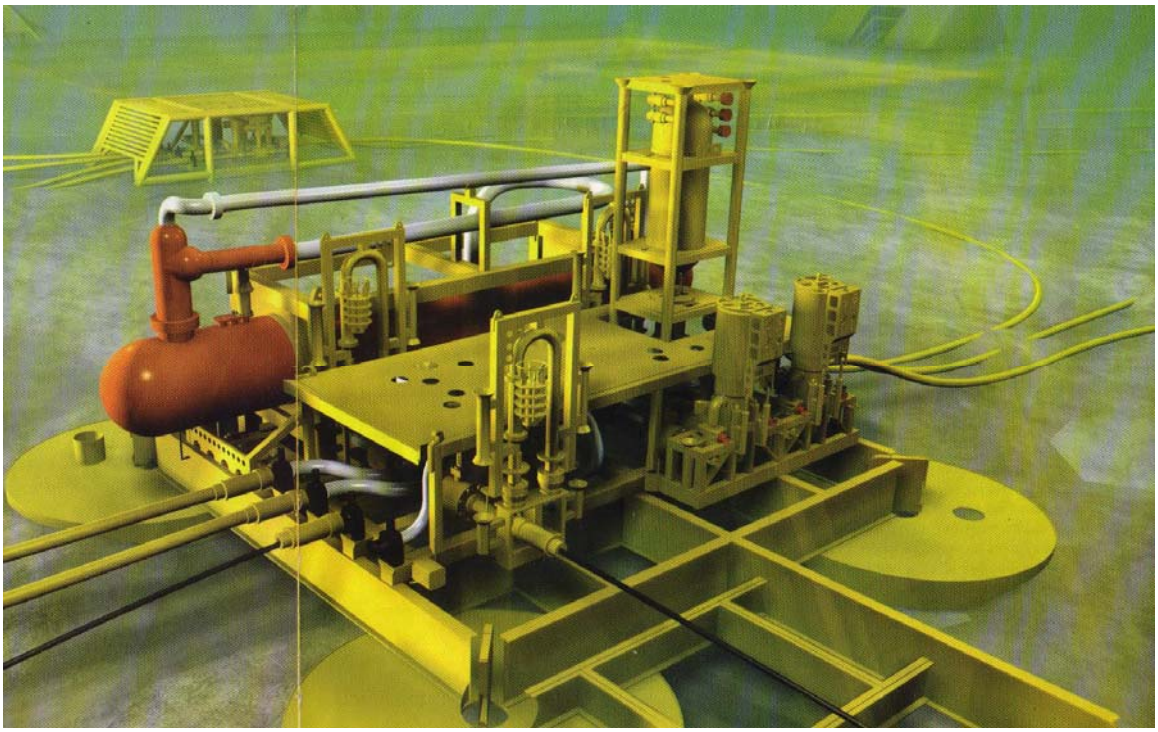

Fig 4. Illustration of a separator in a field

Ocean Conservation Research is developing a program to measure and publish the noise profiles of this equipment. Data from this work will prove exceedingly useful in informing policies and practices around the expansion of ocean-based oil fields. This information is particularly critical at this time because of the recent lapsing of the U.S. moratorium on offshore oil extraction.

While many proposed sites may be at risk of noise-caused habitat displacement, of particular concern are the areas in Alaska such as Bristol Bay, the Beaufort and Chukchi Seas, which are currently some of the most productive fishing grounds in the world. Some 25% of all fish consumed in America are fished in Alaska. Understanding the acoustical impacts of the proposed oil fields may have a profound impact on the Alaskan fishing industry as well as our own food supply.

OCR principal Michael Stocker will be doing this work in collaboration with Mark MacDonald from Whale Acoustics (www.whaleacoustics.com) and under the fiscal sponsorship of the Ocean Foundation (www.oceanfdn.org). We have been communicating with the Oil and Gas Producers “Joint Industry Program” to make sure that our work conforms to their measurement standards.

The project will involve deploying data-logging hydrophones on the seafloor a calibrated distance from the subject equipment. Suspending hydrophones from floats would compromise the low frequency data due to the influence of the surface movement on the devices, and “thrumming” from deployment cables. After recording the operating equipment over a set period of time, the data-loggers will be released and brought up to the surface for evaluation.

End.