~~VIVUS~~

a rapid response to oil spills

ABOUT

Biomimicry is done in two ways: either from biology to design, or the opposite, challenge to biology. The latter is much more common, as people look at problems in the world and then look to biology to see how they might be able to solve it. But the other way, biology to design, can be equally, if not more, fruitful at times. Examining nature on a deeper level and looking at all of its genius can make you think of problems in the world and how they could be solved by building upon nature's 3.8 billion years of research, and emulating nature's genius to bring those strategies to real world design.

PROBLEM

Deep sea oil operations are accountable for some of the most catastrophic oil spills in history. Being miles from land in open ocean delays response times to the spills and asperates its affect on the environment. While oil companies are required to have reactive measures in place to handle spills, they often will contract out to land-based response teams. This leaves a window of time between the spill and containment that allows the oil to spread unihibited across the ocean surface.

RESEARCH

An oil spill is a form of environmental pollution that releases liquid petroleum hydrocarbon into the environment as a result of human activity. Since the 1960's, over 1.6 billion gallons of oil has been spilled into the ocean all over the world. Marine wildlife are the most visibly affected by oil spills as the crude oil covers their skin, limiting the ability to fly, retain warmth or breath through gills. Given the catastrophic impacts of oil spills, an immediate response system is paramount to limit any lasting affects.

OPPORTUNITY

From our research, we concluded the current oil spill response instrastructure for deep sea oil operations is not entirely effective and requires multiple factors to align to be successful. We saw a place to create a synthesized solution that would be a resilient and sustainable tool to clean up oil spills without harming the marine ecosystem. Collecting this oil for reuse would provide an incentive for oil compaines to manage their oil mishaps.

1.6 billion gallons of oil spilled into ocean waters from 1960-2016

880,000 gallons of oil spilled into US waters a year from drilling operations

267 oil spills in Gulf of Mexico since 1960

82,000 birds and 25,900 marine animals harmed or killed in Deepwater Horizon oil spill

KEY INSIGHTS

Assumption: There is no singular method that can clean up oil spills

Insight: No oil spill is the same and solutions are context specific; there is no magic solution

Assumption: There are immediate responses to oil spills

Insight: There is no rapid, clean up response to oil spills despite the requirement of a procedure to be in place

Assumption: The limited amount of innovation in oil spill clean up is due to "Big Oil" limiting funding

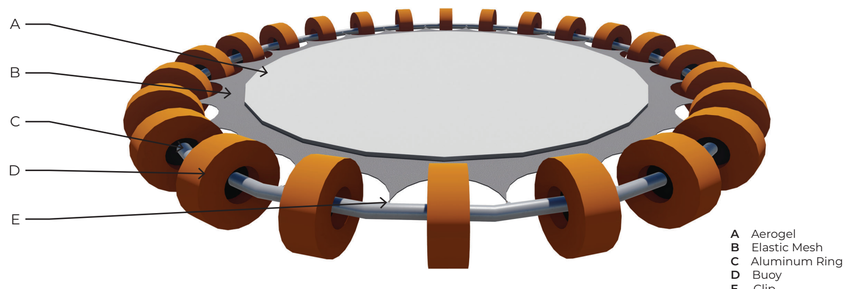
Insight: Oil companies are willing to fund solutions that can help limit their impact of the environment and improve efficiency

Assumption: Mucus net of Scaled Worm Snail was ejected retrieved by a mechansim or muscle

Insight: Mucus net uses natural ocean currents for passive ejection and active retrieval

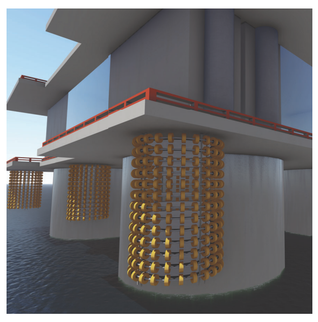
SOLUTION

Vivus aims to clean up oil spills as an immediate emergency response strategy. While it collects spilt oil it mitigates the catastrophic spread of oil, thus preserving natural marine ecosystems. Once the oil is collected it is housed in a containment unit where it can be given back to oil companies, fostering more accountability and producer responsibility. We aim to respect what we harvest from the earth and create mutualistic relationships between oil companies and the marine ecosystem they harvest from.

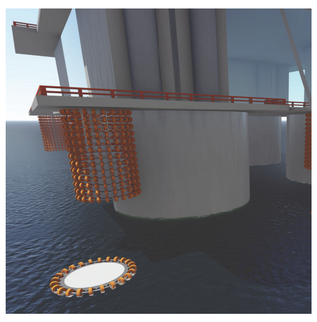


A Aerogel
B Elastic Mesh
C Aluminum Ring
D Buoy
E Clip

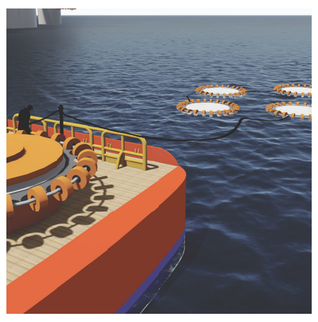
PROCESS



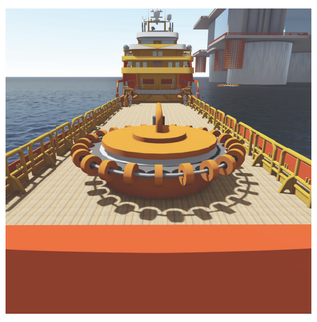
Stored on bottom half of oil rig in racks



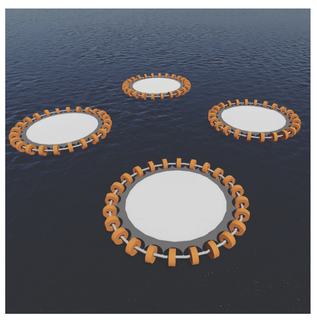
Deployed off rig into water



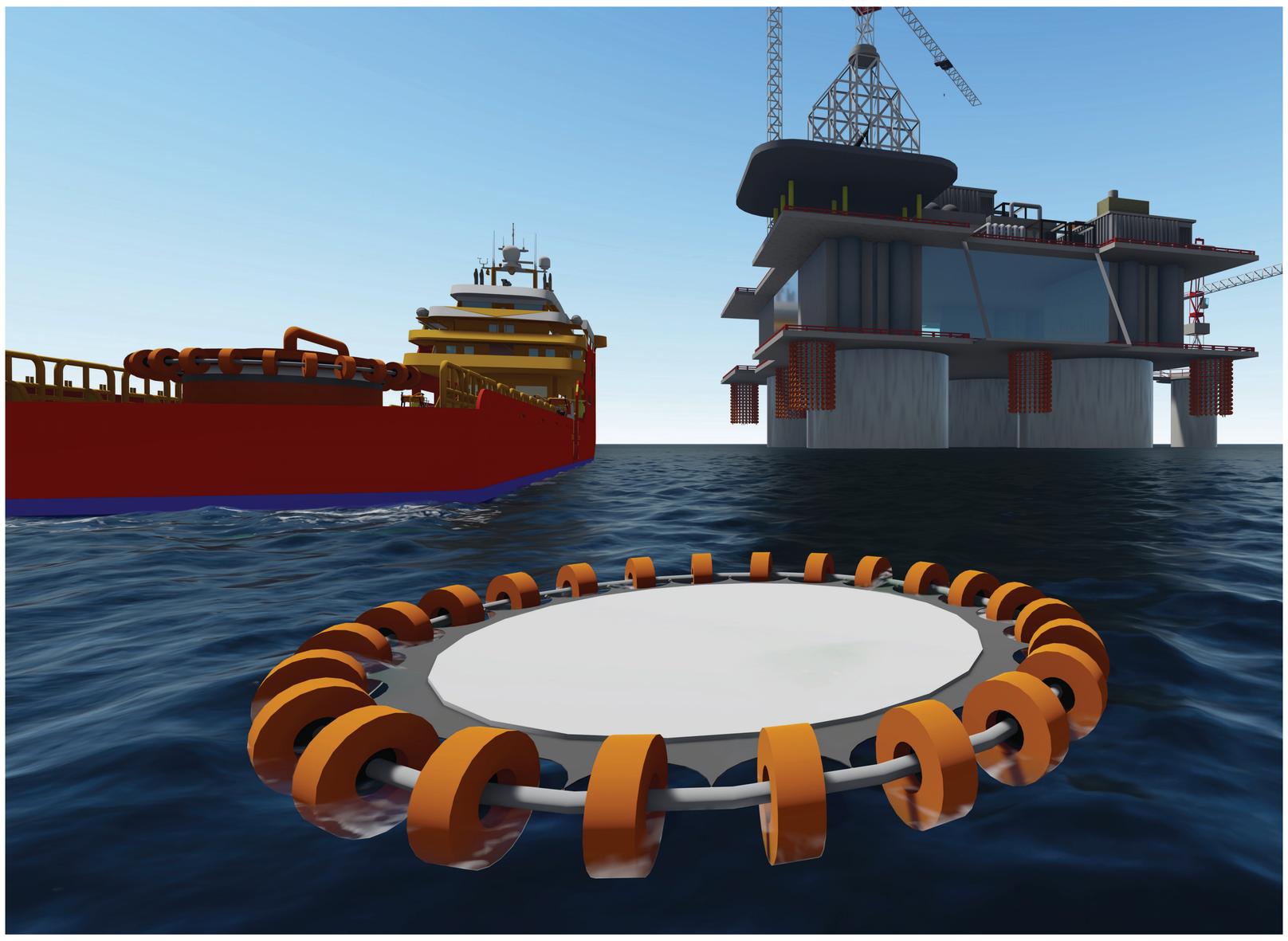
Hauled onto OSRV via pulley system



Press squeezes oil out of pad into collection tank



Put back into ocean



LIFE PRINCIPLES

1 Evolve to Survive

Replicate Strategies that Work
- *use water currents to capture and collect*
- *floating on surface of water*
- *hooks*
- *deployed off rigs*

Integrate the Unexpected
- *ability to flip over and still absorb*
- *contains oil indefinitely*

Reshuffle Information
- *can be moved to where oil spill is*
- *dragged through water*

2 Adapt to Changing Conditions

Embody Resilience through Variation, Redundancy and Decentralization
- *high volume of same product in water*

3 Be Locally Attuned and Responsive

Leverage Cyclic Processes
- *ocean currents*
- *bioremediation*

Cultivate Cooperative Relationships
- *Oil Response teams sell collected oil to "Big Oil"*
- *"Big Oil" has a visible indicator to public they are handling their issues*

4 Be Resource Efficient

Use Low Energy Processes
- *water current for momentum*
- *retrieved manually*
- *basic press to squeeze out oil*

Fit Form to Function
- *circular shape*
- *gaps between buoys allow water and oil through*
- *flush with ocean surface to soak up oil*

5 Use Life Friendly Chemistry

Build Selectively with a Small Subset of Elements
- *minimal materials*

PERFORMANCE CHARACTERISTICS

Buoyant · Sustainable · Responsive · Rapid

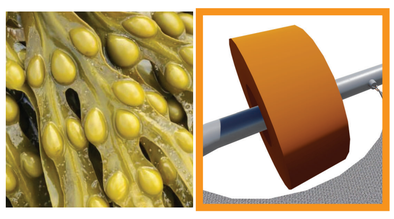
Adaptable · Integrated · Scalable · Acessible

DOI

	LOW				HIGH
Relative Advantage	☐	☐	☐	☐	■
Compatibility	☐	☐	☐	☐	■
Complexity	☐	■	☐	☐	☐
Triability	☐	■	☐	☐	☐
Observability	☐	☐	☐	☐	■

COMPONENTS

Component: Vivus
Function: Ocean currents for capture and collection of oil
Organism: Scaled Worm Snail

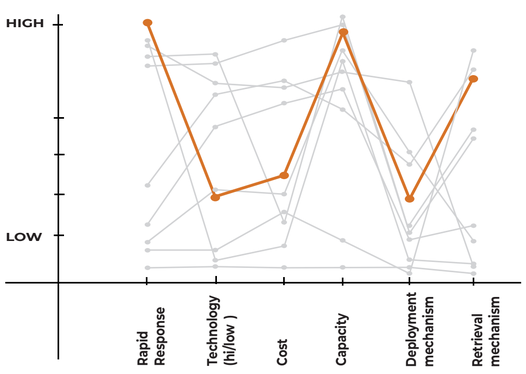


Component: Buoy
Function: Flotation
Organism: Giant Kelp

Component: Hook
Function: Secure pad
Organism: Caddisfly

Component: Pad
Function: Absorption of oil
Organism: Milkweed

STRATEGY CANVAS



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