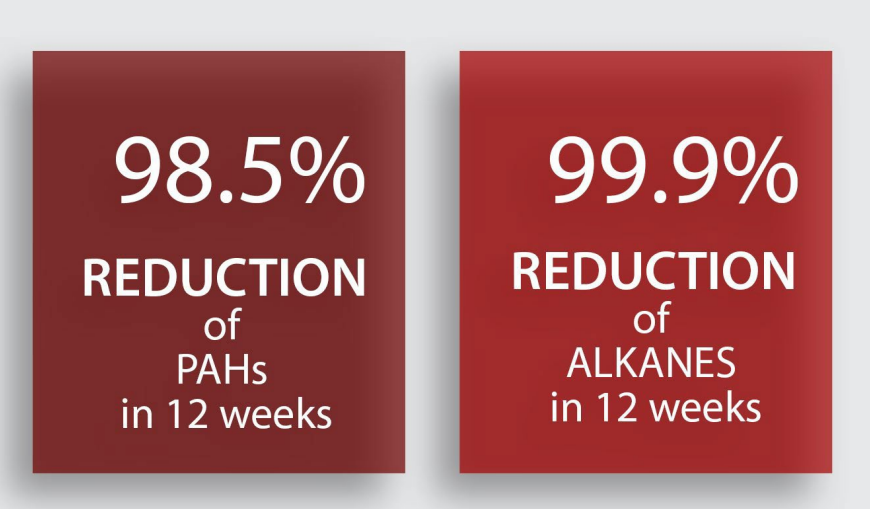
Deepwater Horizon, BP Oil Spill Response
Product Screening Final Report 2011
The Oppenheimer Formula I



Laboratory Screening of Commercial Bioremediation Agents

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Product D: (**Product D is The Oppenheimer Formula I)**
Product D is classified as viable, adapted petroleum hydrocarbon microbes and nutrient amendment. The product was provided as a dry powder of "biomass" and a proprietary nutrient blend. Both components were reconstituted in site water prior to addition to flasks containing site water and weathered oil.

After 28 days
A 95.3% reduction in alkanes and a 68.9% reduction in PAHs were seen.

After 12 weeks
The end of the test study saw nearly complete reduction of alkanes as 99.9% of the alkane constituents were degraded and 98.5% of the PAHs were degraded. In total, approximately 99.8% of the weathered crude oil, both alkane and PAH constituents, were degraded by Product D by the end of 12 weeks.

Background:

- 4.9 million barrel (780x103 m3) or 205.8 million gallons of oil were spilled
- 120,000 suggestions were submitted to BP BioChem Strike Team.
- 43,000 suggestions were ways to clean up the spill.
- 200 different microbial based solutions were submitted
    - Those were divided into 2 categories
        - Naturally occurring: Letting nature take care of the spill
        - Bioaugmentation: Found in gulf water, grown in a bio-facility, and then applied to the spill.
- 1 top product = The Oppenheimer Formula I (Product D – blind testing)
    - 99.9% of alkanes degraded in 12 weeks
    - 98.5 of PAHs degraded in 12 weeks

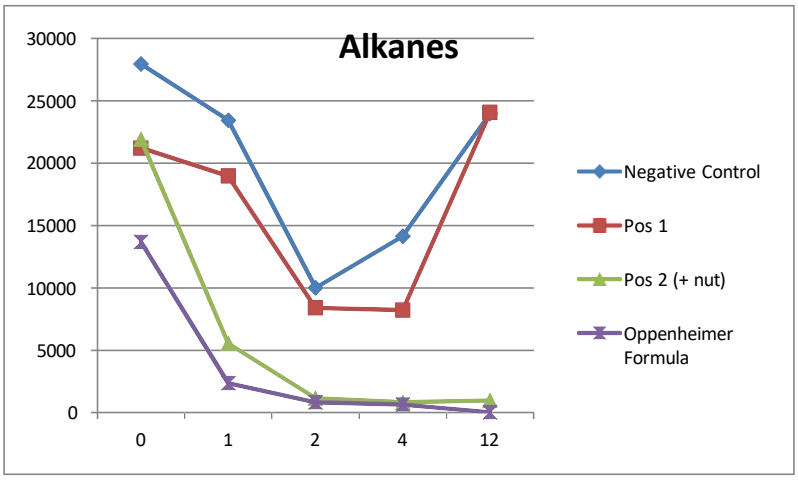
The Oppenheimer Formula on crude oil
All testing conducted by LSU for Deep Horizon - BP Oil Spill

Extraction of PAHs and alkanes in water amended with oil follows methods outlined in EPA Method 8270 series. The entire 250 ml flask was sacrificed for oil extraction including approximately 80 ml of water and the all of the weathered oil remaining in the flask. The flasks were rinsed with dichloromethane (DCM) to ensure the complete solubilization of all oil into the final, extractable liquid fraction.

Four separate controls were prepared in triplicate for each of the five sampling events, resulting in 60 total control flasks.
• Negative Control treatments consisted of 100 ml of sterile Gulf water and 0.5 g of weathered crude oil per test flask. As in all other test flasks, 0.5 g of oil was dissolved in 10 ml of DCM, creating a coating of weathered oil in the bottom of each flask. 100 ml of autoclaved Gulf water was then added to each flask. No nutrients were added.
• Positive Control 1 treatments consisted of 100 ml of Gulf water and 0.5 g of weathered crude oil per test flask; no nutrients were added. As in all other test flasks, 0.5 g of oil were dissolved in 10 ml of DCM, creating a coating of weathered oil in the bottom of each flask.
• Positive Control 2 treatments consisted of 100 ml of Gulf water, 0.5 g of weathered crude oil and a nutrient blend per test flask. The nutrients consisted of 0.25 g KH_2PO_4 and 0.5 g NH_4NO_3 per flask. As in all other test flasks, 0.5 g of oil were dissolved in 10 ml of DCM, creating a coating of weathered oil in the bottom of each flask

Alkanes

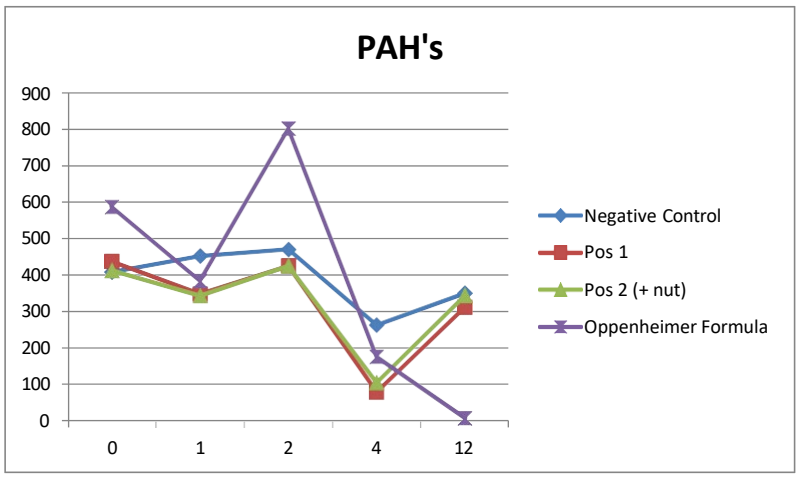
Time/weeks:	0	1	2	4	12	
Negative Control	27933	23433	10003	14133	23967	
Pos 1	21200	18963	8373	8210	24067	
Pos 2 (+ nut)	21900	5520	1150	818	959	
Oppenheimer Formula	13667	2350	805	637	16	Product D



99.9% Alkanes Reduction

PAH's

Time/weeks:	0	1	2	4	12	
Negative Control	408	452	470	263	350	
Pos 1	437	348	425	80	312	
Pos 2 (+ nut)	412	343	425	106	344	
Oppenheimer Formula	586	384	800	176	9	Product D



98.5% PAHs Reduction