



seasons
energy ltd



CALAYA
ENGINEERING SERVICES LTD.
www.calayaengineering.com



All natural bio-remediation
agent for **treatment** of
hydrocarbon spills on
soil and water.

REMEDIADE your first choice for Hydrocarbon bio-remediation.

- It is a highly-effective and eco-friendly, all natural and organic (non-chemical) solution that rapidly bio-remediates hydrocarbons in soil and water.
- It is a nutrient based product
- It is not toxic. It is safe for people, plants and Animal
- More effective and works faster than other similar product

RemediAde is easily applied to contaminated land and water in the event of spill or leak of crude oil and other Hydrocarbon derivative.

RemediAde Effectiveness

Depending on the weight and the amount of refining, RemediAde cleans up

- Gasoline and Diesel in 5-7days,
- Unprocessed crude and Refined oil in 2-3 weeks.

In most cases, a near breakdown of the oil is seen by day 7

Facts About RemediAde™

- RemediAde™ has been used by the oilfield, chemical and manufacturing industries for over 20 years.
- RemediAde™ is cost effective and has been used in hundreds of hydrocarbon clean-ups of oilfield and chemical plant facilities.
- RemediAde™ is non-toxic, and is a 100% all natural and organic product that is safe for people, plants, and animals.
- RemediAde™ is EPA NCP list approved.
- RemediAde™ is a blend of plant extracts and other organic substances designed to promote rapid bacteria growth for bio-remediation of hydrocarbons.
- RemediAde™ is easy to apply to all environmental incident situations.
- RemediAde™ is a nutrient based solution. It does NOT introduce foreign bacteria or microbes to local environment.

MINISTRY OF PETROLEUM RESOURCES

DEPARTMENT OF PETROLEUM RESOURCES

7, KOFO ABAYOMI STREET, VICTORIA ISLAND, LAGOS

12650

P.M.B. No:.....

01-2790000

Telephone:.....

Website: www.dpr.gov.ng



DPR/HSE.04/005.850/2018/024

Ref. No:.....

Date: 2nd October, 2018

- RemediAde™ is a nutrient based solution. It does NOT introduce foreign bacteria or microbes to local environment.

The Managing Director
Season Energy Limited
4th Floor Lindev Plaza
16th Amodu Ojikutu Street
Victoria Island,
Lagos,

Dear Sir,

APPROVAL FOR THE USE OF REMEDIATE (BIOREMEDIATION AGENT) IN THE NIGERIAN OIL AND GAS INDUSTRY.

Arising from the result of Microbiological Profile of *Remediate* (Bioremediation Agent) which was carried out by an accredited laboratory under Nigerian environmental conditions, it was reported that the product is free of microbes.

2. Consequently, we are pleased to inform you of our acceptance of the product's technical data, including the SDS submitted on the product *Remediate* as well as the results of Microbiological Profile tests; and also convey our approval for the use of *Remediate* in the Nigerian Oil and Gas Industry as a Remediation Agent.

RemediAde™ Effectively Cleans

- Hydrocarbon Odours
- Pipeline breaks and spills
- Storage tank overflows
- Hydrocarbon contaminated sand and soil
- Oil contamination clean-up in marshlands and on beaches
- Oil spills in open water and water ways
- Soil remediation at and around tank farms
- Wellhead clean-ups
- Hydrocarbon dump yard soil remediation
- Refinery clean-ups
- Frac ponds and fluids
- Salt contamination and leaks

RemediAde™ Sample Customer List

(customer since)

- **ConocoPhillips (1990)**
- **Exxon (1999)**
- **ExxonMobil Chemical (1996)**
- **EOG Resources (2006)**
- **Apache Corporation (2002)**
- **Basic Energy Services (2008)**
- **Texas Gulf Sulfur (2000)**
- **Sue Anne Production (1999)**
- **Red Wolf Production (2009)**
- **Spur Production (2009)**

- Petroleum hydrocarbon-degrading bacteria are ubiquitous in nature.
- **RemediAde** contains natural nutrients that causes a population explosion of oil eating bacteria.
- The normal plate count of bacteria in a good soil is about 7,000 colonies (CFU/gram).

With the introduction of RemediAde and under the required conditions plate count could go higher than 6 Billion colonies (CFU/gram).

Conditions include:

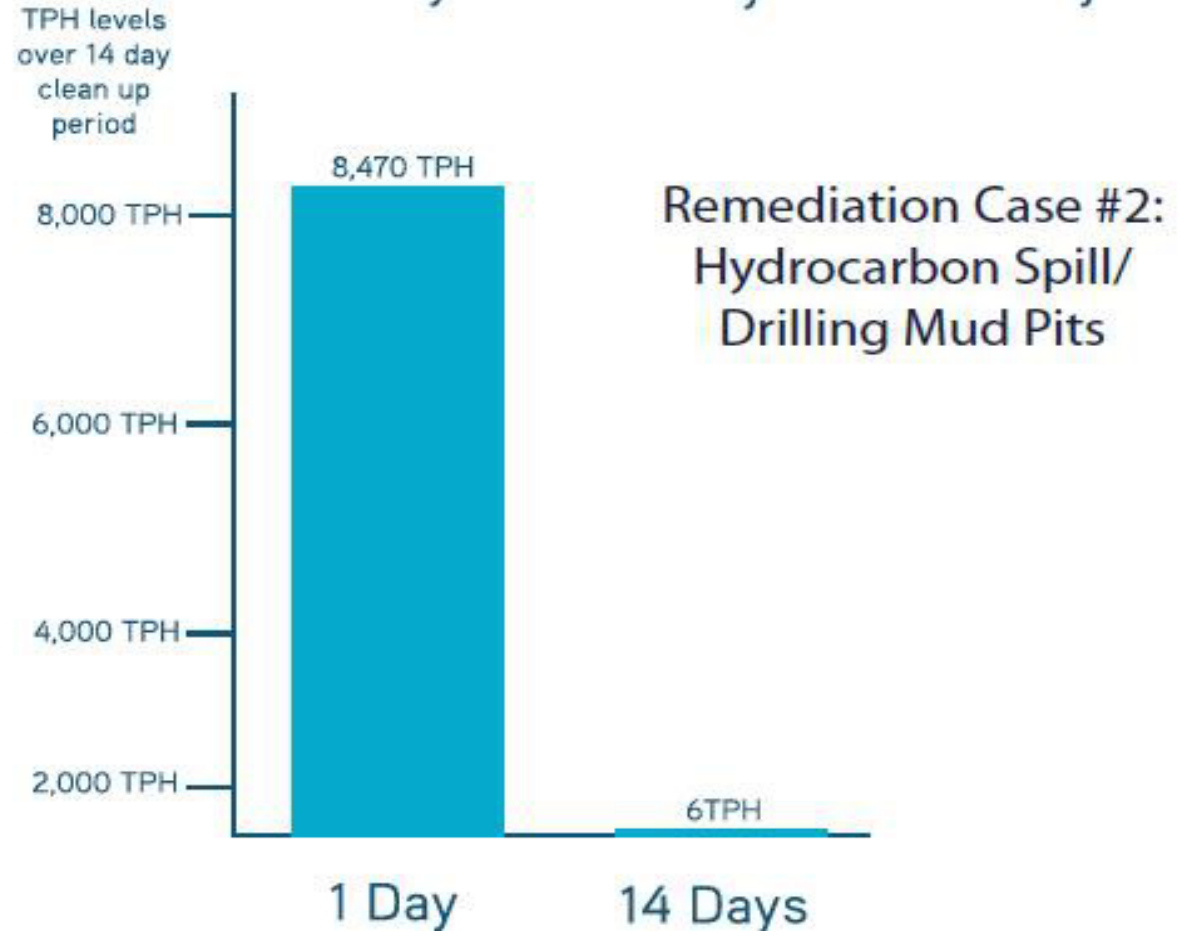
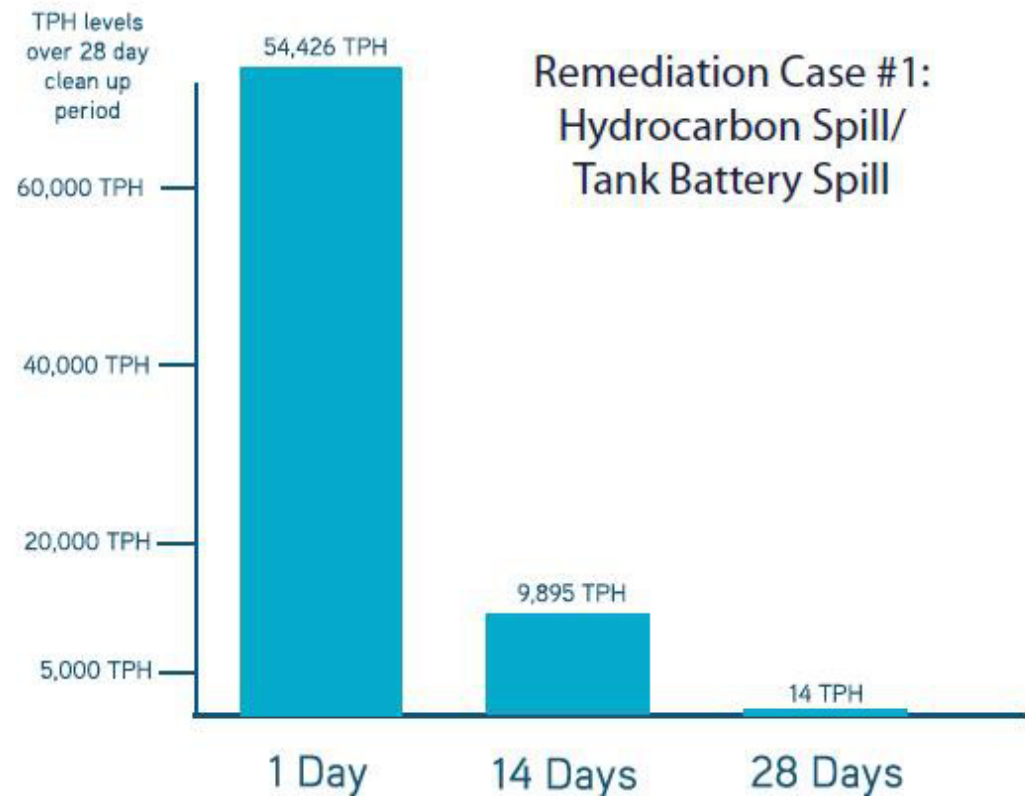
- Favourable soil and water pH (6.5 -8.5) >8.5 add sulphur, <6.5 add lime
- Predetermined concentration of RemediAde in non chlorinated salt or fresh water depending on the TPH and the size of the area being treated
- The oil eating bacteria will utilize the hydrocarbons compounds and release minerals from the hydrocarbon back to the environment which will increase the fertility of the soil.

HOW IT WORKS cont'd

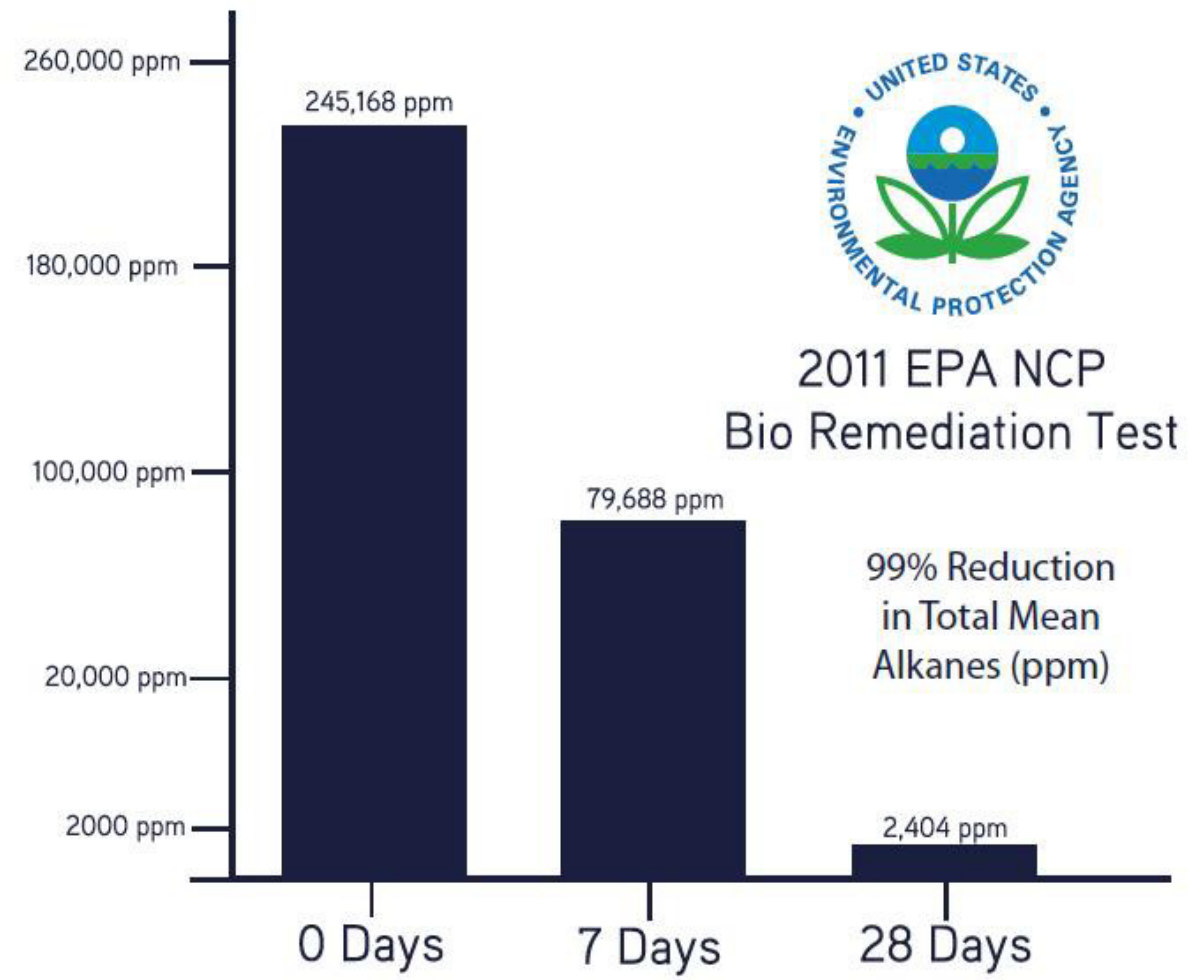
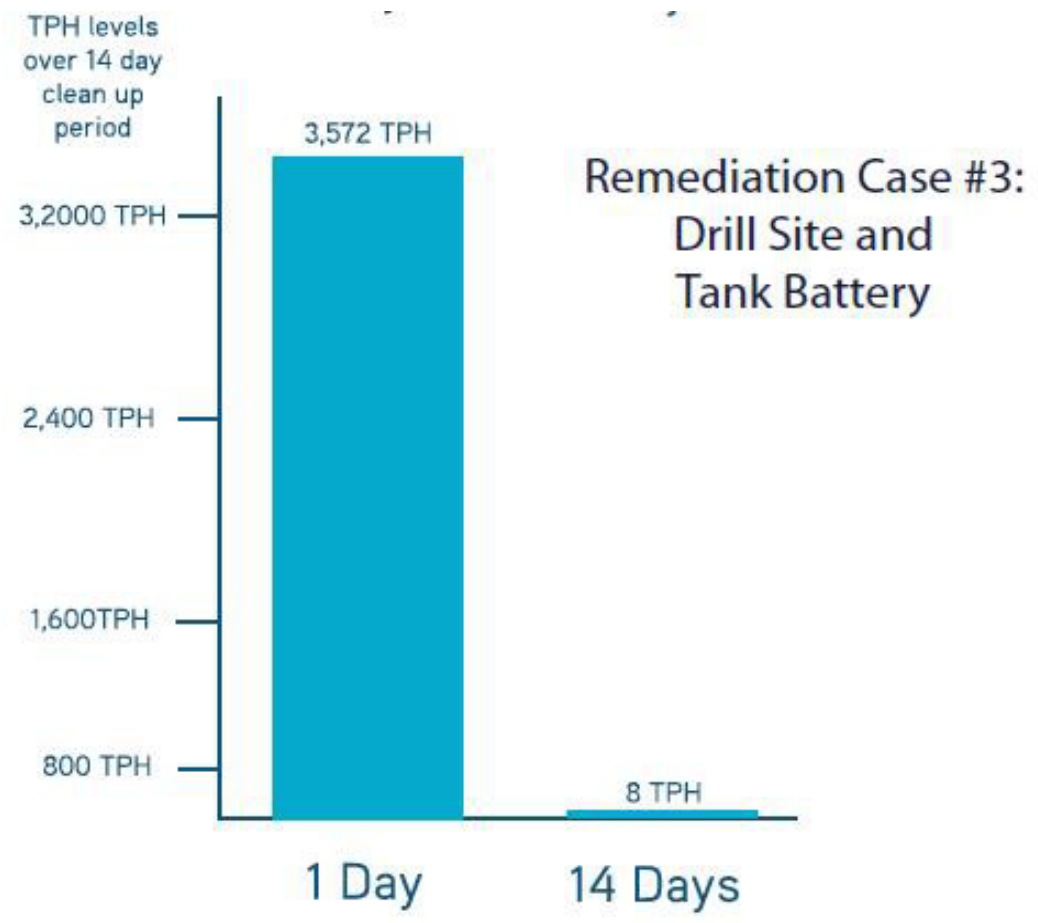
- The bacteria population stimulation is necessary by reapplying RemediAde on day 7 or 14 until remediation is complete. Typically, it takes two treatments, this can vary depending on the level of contamination
 - Most importantly, the product will need to be tilled into the soil to ensure that **RemediAde** is evenly applied (homogeneity).
 - When all the oil (hydrocarbon contamination) is consumed the oil eating bacteria will return to normal levels that commonly occur in nature. The soil will then be able to support crop growth and or natural habitat growth of healthy vegetation. Bacteria do not digest any metals, divalent or trivalent. All minerals and metals will be left in the soil or water.
 - **RemediAde** is able to achieve up to a 99% removal of hydrocarbon contaminations in 28 days (EPA test <https://www.epa.gov/emergency-response/remediadetm>). Considerable contamination reduction is noticed at day 7 of application.
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CLEAN UP CASES

RemediAde™ Clean Up Cases



CLEAN UP CASES



PILOT TRIAL IN PICTURES



**Sample
Collection and
Storage in Presence
of SPDC and DPR
monitoring team**



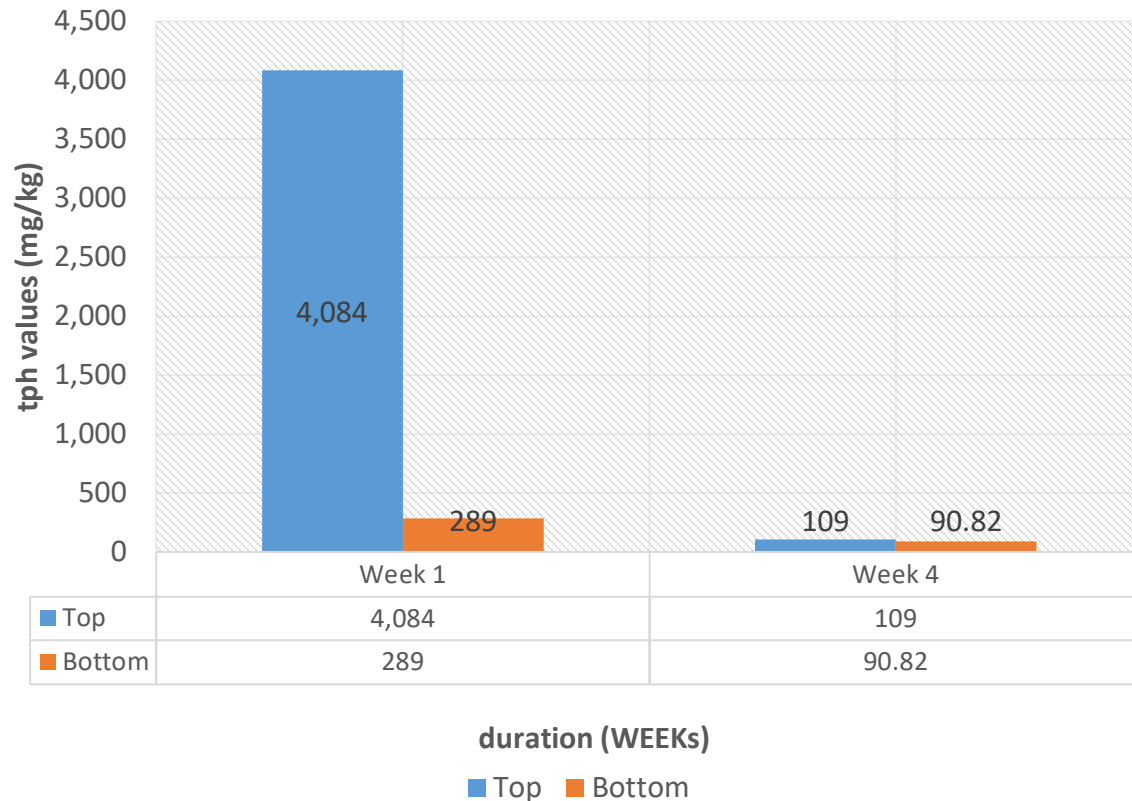
PILOT TRIAL IN PICTURES

Product Preparation and Application

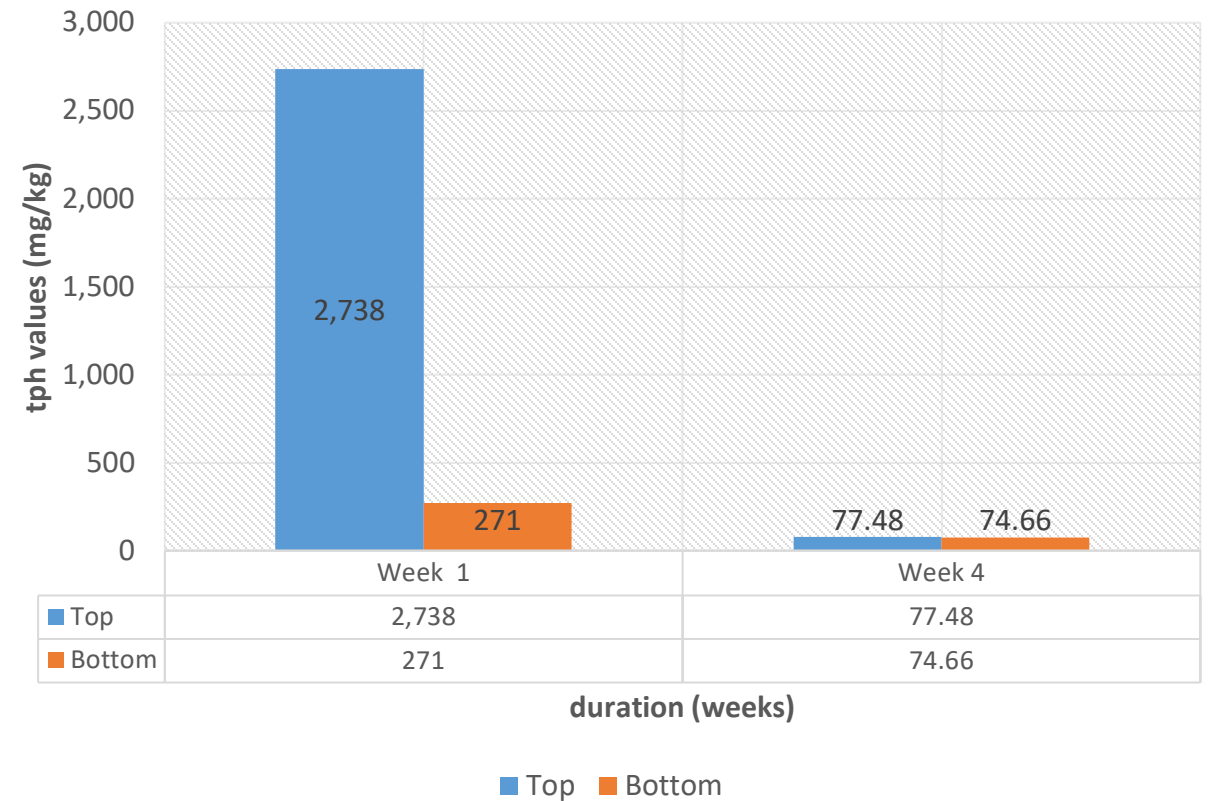


Product Pilot trial on SPDC Facility in Obigbo, Rivers State

TPH VALUES IN SECTION A

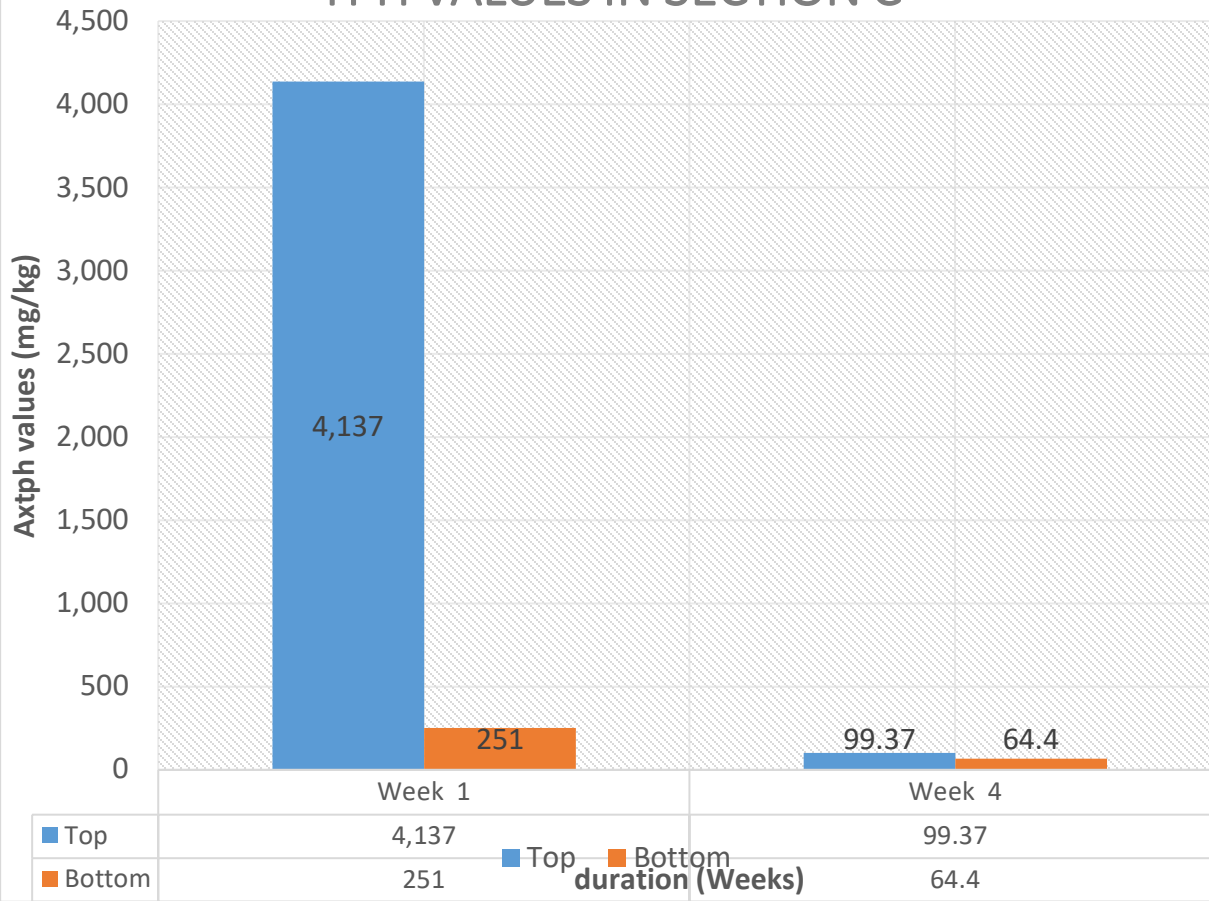


TPH VALUES IN SECTION B

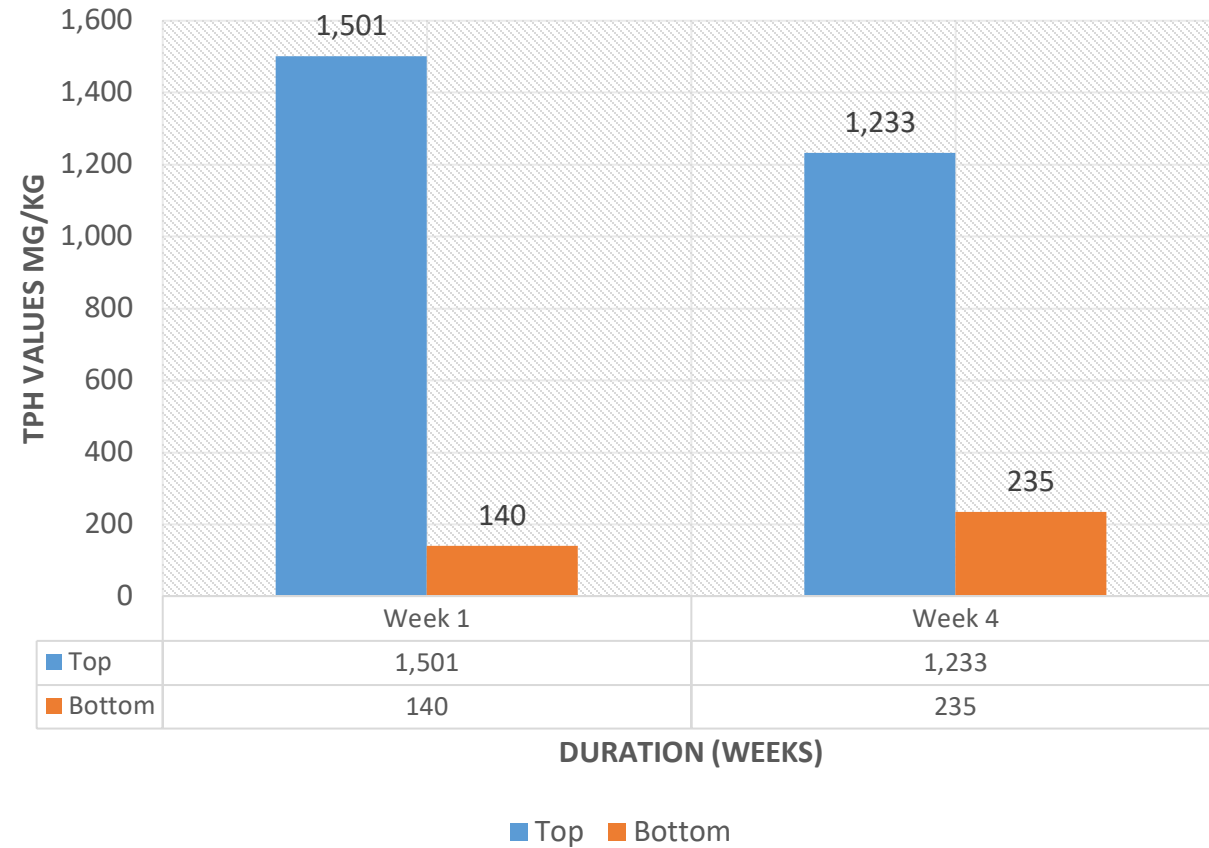


Product Pilot trial on SPDC Facility in Obigbo, Rivers State

TPH VALUES IN SECTION C



TPH VALUES IN CONTROL SECTION



APPLICATION ENGINEERING

Depending on the treatment area, type of spill and level of contamination, we design an application engineering that is best suitable for the treatment while making use of various application equipment which includes the following:

1. Manual/Motorized Knapsack sprayer

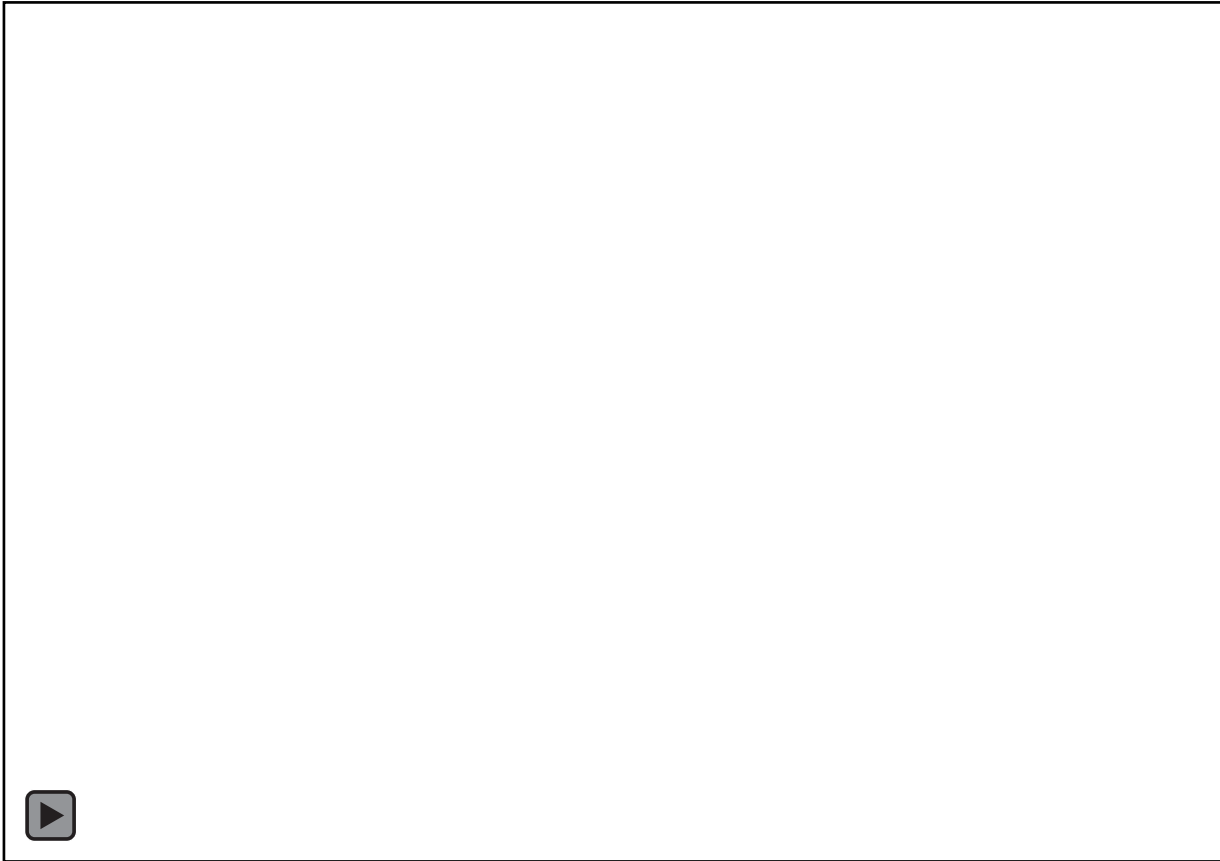


2. Truck Mounted Sprayer



APPLICATION ENGINEERING

3. Tractor Mounted Boom Sprayer



APPLICATION ENGINEERING

4. Boat Mounted Boom Sprayer



CERTIFICATIONS AND APPROVAL

Internationally, RemediAde is NCP listed and approved as a bioremediation agent by the United States Environmental Protection Agency (EPA)

In Nigeria, after a rigorous approval procedures from the Regulatory Agencies, RemediAde has been certified and approved for use in the Nigerian Oil and Gas Industry by:

- i. The defunct Department of Petroleum Resources (DPR) now the Nigerian Upstream Petroleum Regulatory Commission (NUPRC)
- ii. National Oil Spill Detection and Response Agency (NOSDRA)
- iii. Ministry of Environment (FMEnv)



THANK YOU

