

EXPERIMENTATION WITH NEPH PRODUCTS IN TREATING MUD POLLUTED WITH HYDROCARBONS AND MINERAL OILS

The sample treated with NEPH products was completely made of mud polluted with hydrocarbons and mineral oils.

The sample had a black shiny look, with evident presence of halos due to organic components (hydrocarbons).

The treatment consisted of dosing the product prepared according to its usage instructions, in a closed 1.5 l reactor.

Two tests were made: one in absence of oxygen, with shaking the mud with the product (test A), and one carried out aerobically, insufflating air (test B).

Hereafter is the preparation protocol of the sample, the product and the analytical findings.

NEPH PRODUCT PREPARATION

In a 500ml were added 12.5 g of ingredient no. 1 and 18,75 g of ingredient no. 2.

Water was added to 500 ml; the mixture was gradually heated up to 40 °C while stirring.

The preparation was let to rest for approximately 1 hour; thereafter the mixture was poured in a 5 l container, adding 1.375 l of water and 32 ml of ingredient no. 3 (biological activator).

TEST A SETUP – IN ABSENCE OF OXYGEN

Given the sample consistence, it was diluted in water in order to avoid dehydration during treatment. In fact the first test, performed adding 10% in weight of the product to the mud, produced after 24 h of mere stirring, the dehydration of the sample and a color change from dark black to gray.

During the second test the operations were carried out in the following way:

- ◆ 200 g of mud + 200 ml of water + 20 ml of product
- ◆ stirring at room temperature (circa 20 °C) for 96 hours

TEST B SETUP – IN AEROBIOSIS

Test B was performed in the following way:

- ◆ 200 g of mud + 200 ml of water + 20 ml of product
- ◆ stirring and aeration at room temperature (circa 20 °C) for 48 hours

ANALYTHICAL DETERMINATIONS

The analysis chosen to characterize the treatment were the total extractable parts, before and after the treatment, that is to say the heavier fraction represented by mineral oil.

The method utilized was the official one US-EPA 3550B – 3620B, i.e. the gravimetric determination of mineral oils after extraction via ultrasounds with ether and purification with a Florisil® column.

The dry part was determined at 105 °C (MLSS) and the part of organic substance by incineration at 600 °C (MLVSS), according to the official method IRSA-CNR “analytical methods for mud”.

In test B were analyzed all the metal species, after digestion in oxidizing acid environment (nitric acid _ hydrogen peroxide), with a Perkin Elmer ICP.

ANALYTICAL RESULTS

Measurements were carried out on the sample as it was before treatment, diluted with water, an on the sample after treatment for 96 hours.

In both tests the mud color passed from deep dark initially to gray, indicating a change in the composition of the original mixture.

TEST A

SAMPLE	MINELRAL OIL mg/l	MLSS %	MLVSS %
Original	1.469	8,72	67,74
Initial dilutions	336		
After a 24 hrs treatment	900 *		
Final after a 96 hrs treatment	151		

* determination done with a dehydrated sample after a 24 hrs treatment starting with the original mud.

The percentage of oil reduction was then 55 %, with reference to the original sample at initial dilution and at final measurement (336 – 151 mg/l).

TEST B

The aerobic test gave the following results:

SAMPLE	MINELRAL OIL mg/l	MLSS %
Original	180	4,17
Final after a 48 hrs treatment	120	

The percentage of oil reduction after 48 hrs was 33 %.

On the filtered sample before and after treatment, at time t 0 and t 48 hrs, were measured the concentrations of heavy metals, giving the following results:

PARAMETER	U.M.	CONC. t 0	CONC. t 48 h	% REDUCTION
Cadmium	Mg/l	0	0	
Copper	Mg/l	3,63	0,56	84,64
Lead	Mg/l	5,05	0,93	81,58
Total Chromium	Mg/l	1,75	1,29	26,29
Iron	Mg/l	620,50	89,53	85,57
Zinc	Mg/l	13,75	2,32	83,10
Boron	Mg/l	5,98	3,83	35,99
Nickel	Mg/l	2,68	0,41	84,67

PH measurements at initial time and after 4 hrs show neutrality, indicating that the heavy metal reduction process does not happen chemically/physically with pH variations (alcalinization of the system).

CONCLUSIONS

The results show an evident degrading action of the organic complex molecules and a substantial reduction of heavy metal content due to the inoculation of NEPH products.