Disposal of a Pretreated Oil Sludge by the Cementation Method

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INTRODUCTION

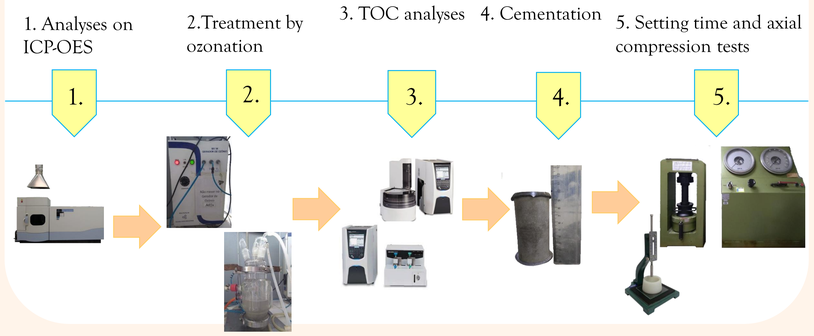
Radioactive oil sludge is generated in oil production rigs worldwide and in large quantities. However, in Brazil, there is no disposal route or well-defined treatment option for this waste. This sludge is classified as TENORM due to the presence of Potassium-40 and the radionuclides of the natural decay chains of thorium and uranium. The management of this radioactive waste has been in situ packaging on the offshore platforms, followed by its transport to storage facilities onshore. Long term storage is problematic due to the high content of hydrocarbons, sulfur and water, which generates the toxic gas H_2S and the corrosive sulfuric acid. Ozonation, an advanced oxidation process (AOP) can be considered an attractive option of treatment, and followed by cementation can improve safety in long-term storage.

OBJECTIVE

This work aims at investigating if the ozone process was able to enhance the immobilization capacity of oil sludge.

MATERIALS AND METHODS

Main steps of the experiment



MATERIALS AND METHODS

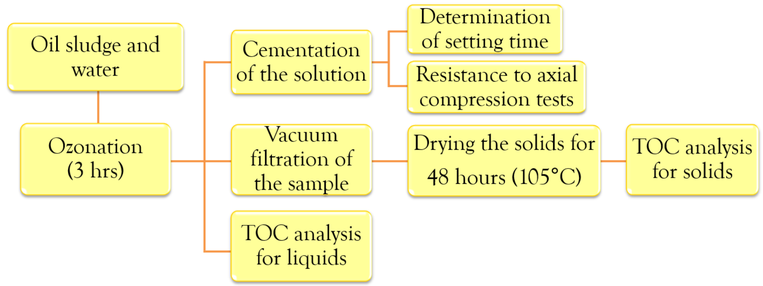


Fig 1. *Experimental setup of experiments*

RESULTS

Untreated oil sludge	Treated oil sludge
Total mass = untreatred oil sludge + cement + water; $\frac{W}{C} = 0.3$	Total mass = treatred oil sludge + cement + water; $\frac{W}{C} = 0.3$

Comparison between untreated and treated oil sludge by ozonation.

Proof bodies	Pressure (MPa)
B-1	13
B-2	14.4
B-3	14.2
B-4	13
B-5	15
B-6	13.6

Tab 1. *Results of untreated oil sludge obtained after seven days.*

Proof bodies	Pressure (MPa)
B-1	35
B-2	38
B-3	40
B-4	30.2
B-5	36
B-6	28

Tab 2. *Results of treated oil sludge obtained after 28 days.*

The setting time of the untreated oil sludge was observed during 10 hours.

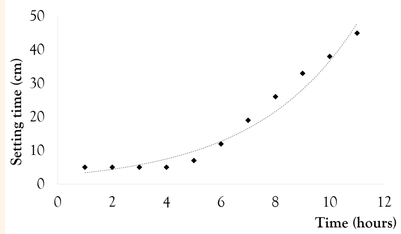


Fig 2. *Results of setting time.*

RESULTS

Oil sludge from different drums and mixed oil sludge (obtained by mixing equal parts of each drum) were analyzed by ICP.

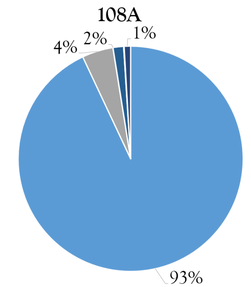


Fig 3. *Major heavy metals (HM) present in oil sludge 108A.*

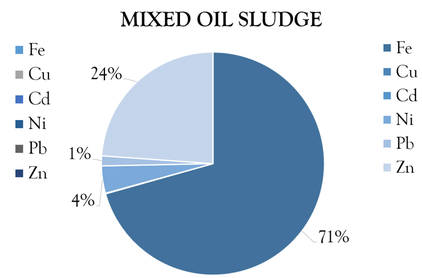


Fig 4. *Major HM present in mixed oil sludge.*

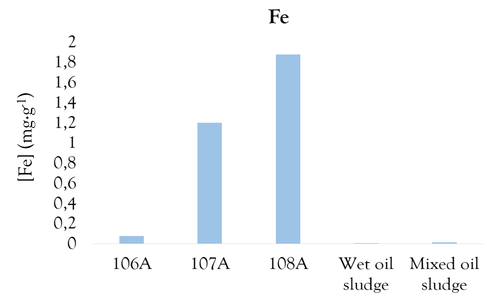


Fig 5. *Comparison between various oil sludge compositions as regards Fe concentrations*

CONCLUSION

Solidification of oil sludge with Portland cement enhances safety of the waste disposal. In addition, ozonation treatment is efficient in the degradation of organic compounds, increasing the resistance of the solidified material.

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