

## **A SIMPLE METHOD TO REMOVE DRILLING OIL IN SEDIMENT CUTTINGS FOR ELEMENTAL ANALYSIS: A CASE STUDY FROM THE MANNAR BASIN, OFFSHORE SRI LANKA**

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The Gulf of Mannar is an exploration frontier extending between the south and the southeast coast of India and the western coastline of Sri Lanka. The Sri Lankan sector of the Gulf of Mannar is commonly referred to as the Mannar Basin, which extends over 45,000 km<sup>2</sup> in water depths of 10 m to more than 3000 m. Pearl-1 drilled in 1981 was the only exploration well drilled in the Mannar Basin until 2011. Cairn Lanka Private Limited (CLPL) drilled three exploration wells, Dorado, Dorado-North and Barracuda, in the northern part of the Mannar Basin in 2011. The Dorado and Barracuda wells encountered natural gas-bearing Late Cretaceous sandstones confirming the occurrence of an active petroleum system in the Gulf of Mannar. Unwashed drill cuttings samples from the three wells were collected for geochemical analyses to understand the petroleum system of the Gulf of Mannar. Apparently, drill cuttings had an oily substance indicating the use of oil during drilling. Drilling oil in cuttings could be reduced by washing them in organic solvents and/or surfactants. Accordingly, 10g of each cutting sample, of which the bitumen extract was used for Gas Chromatography (GC) and Gas Chromatography and Mass Spectrometry (GC-MS) analyses, were washed in 30 ml hexane under ultrasonication (2 × 15 min. each) prior to pulverization. However, the method was not effective enough to remove drilling oil in cuttings to an acceptable level. GC and GC-MS analyses of the saturate fraction of the samples washed with hexane show no peaks after 40 minute retention time. The peaks within the 40 minute retention time shows the abundance of C<sub>8</sub> to C<sub>21</sub> normal alkanes and other hydrocarbons. This mixture resembles diesel, probably used during drilling. Cuttings washed prior to pulverization in dichloromethane and methanol, which have higher polarity than hexane, also gave similar results. Therefore, relative abundance of biomarkers, the S<sub>1</sub> peak from Rock Eval pyrolysis and the Total Organic Carbon (TOC) determined on the samples from Dorado, Dorado-North and Barracuda wells may lead to erroneous results and interpretations.

To determine organic carbon content, 42 drill cutting samples from the Dorado well and 26 claystone samples between the depths of 4260- 4740 m in the Barracuda well were selected. 5g of each sample were freeze dried for 20 hours prior to pulverization. Each powdered sample with less than 75 µm particle size was washed with 15 ml mixture of dichloromethane and methanol (v/v 1:1, and 1:0, respectively) under ultrasonication (2 × 15 min. each). The results show that the method could reduce drilling oil in cuttings to as low as reasonably possible. However, this procedure is expected to remove a significant quantity of bitumen (Bit) in the samples leading to underestimating the actual TOC value of the cuttings. Since Bit/TOC ratio in most sediments is smaller than 0.25, removal of bitumen may not significantly underestimate the TOC. However, the underestimation would be relatively greater in oil-prone sediments in the oil window.