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## Report

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### Arsenic analysis in produced formation water (PFW) from Chinguetti FPSO in Mauritania

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## 1. Introduction

Woodside Mauritania has commissioned IMARES to organize testing of produced formation water (PFW) from Chinguetti FPSO in Mauritania for arsenic (As (III) and As (V)). This report provides the results of the testing, observations made during the sampling and discussion of the results.

## 2. Strategy and methods applied

Sampling of PFW was performed on 3.8.2006. In total, 500 ml of PFW was collected into five 100-ml polyethylene bottles within 20 min. Samples were taken from the valve just before the on-line analyser and were collected into the bottles directly to avoid contamination. Samples were stored and shipped to IMARES, under temperature conditions of between 4 and 8°C, prior to laboratory testing. The samples were delivered to IMARES on 10.8.2006 and to the testing laboratory on 15.8.2006. They were analysed on 16.8.2006.

Before analysis, the content of five bottles was mixed together and homogenized to create one average sample, which was then analysed for As (III) and As (V) by hydride generation atomic absorption spectrometry (HG-AAS) according to the NEN 6432-93 norm. For the confirmatory purposes, the same sample was analysed for total arsenic content by another method – inductively coupled plasma atomic emission spectrometry (ICP-AES) – according to the NEN 6426 norm.

## 3. Results

The results of the analyses are:

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**Arsenic (III+V) (Method HG-AAS (NEN6432-93))**

Arsenic III	1 µg/l
Arsenic V	< 1 µg/l

**Arsenic (Method ICP-AES (NEN 6426))**

Arsenic	< 20 µg/l
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Comment: Detection limit for arsenic is higher due to matrix interferences

## 4. Observations and discussion

Based on the reported concentrations it can be concluded that the total concentration of arsenic in the sample is about 1 µg/l and that arsenic is present mainly as As (III).

The testing lab reported that due to the matrix interferences the limit of detection for total arsenic by ICP-AES method was increased to 20 µg/l. The matrix interferences might be an explanation as to why previous PFW samples sent to a laboratory in Senegal returned significantly elevated levels of arsenic in the results, by comparison.

500 ml of PFW was collected in five 100-ml bottles within ca. 20 min (one bottle every ca. 4 min). There were observed differences in colour among PFW in the bottles over this sampling period. This indicates that composition of the PFW varies significantly over the time. It is advisable to remind that the reported results show the concentration of arsenic at the time of sampling. If more representative results would be required, sub-samples should be taken every day during few days and then combined them into one sample. Alternatively, sub-samples can be taken in regular intervals within one day.

The following table shows arsenic concentrations reported by MRAG in sea water at two distances from FPSO and two water depth. Both samplings were done prior PFW discharges and reported concentrations 1.2 - 1.8 µg/l can be considered to be background levels of arsenic in sea water. It is obvious that there is not a big difference between the levels in sea water and tested PFW.

Distance from FPSO (m)	Water depth (m)	1st sampling (µg/l)	2nd sampling (µg/l)
500	3	1.2	1.6
500	40	1.6	1.8
2000	3	1.4	1.5
2000	40	1.6	1.6

At the time that this sampling was completed, a more extensive PFW sampling campaign was soon to be undertaken for full chemical characterization of the PFW, including further arsenic analysis. The results of the full characterisation, when available, should be used to compare against these results to formulate further conclusions about actual arsenic levels in the samples.

Signature

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Date:

19 September 2006