Case History

Customer - Talisman

Location - Flotta Oil Terminal - Orkney

Treated - Produced Water & Ballast Water

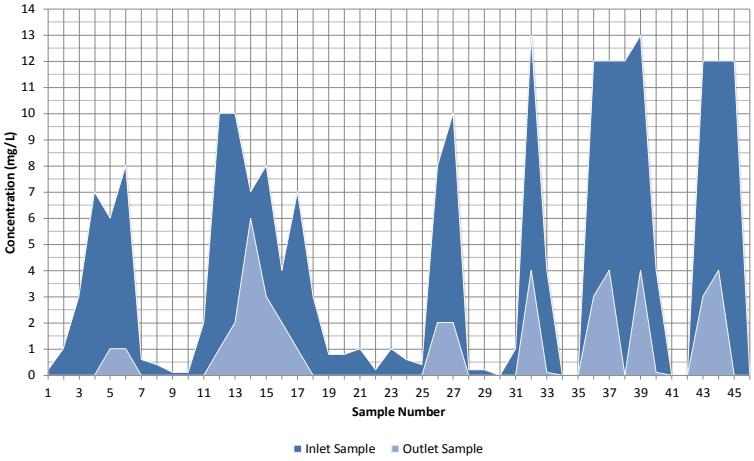
Trial Period - 6 Weeks

Background & Client Scope

During the second phase of technical development of Greenthreads' AquaPurge® unit; it was deployed onshore for a six week period in order to verify the positive experimental results from its advanced oxidation process. The unit was required to provide tertiary water treatment to a sustained flow of produced water. The testing would utilize the single pass treatment method and the Ozone output of the unit would be restricted to approximately 50%; testing would give the ability to gauge the efficiency of the single pass configuration under worst case conditions while allowing the Ozone unit to complete the correct 'running in' procedure from new.

Flotta is an onshore production terminal that accepts hydrocarbon production from several offshore platforms as well as ballast water from semi-subs, wind turbines and ships for treatment. Frequent pigging operations result in varying degrees of contamination in the produced water as well as varied compounds contaminating the waste streams. The AquaPurge® system would be tasked with addressing these waste streams which contain pollutants such as H2S, BOD, Oils and other hydrocarbons.

Flotta Oil Terminal - H2S Concentration Reduction

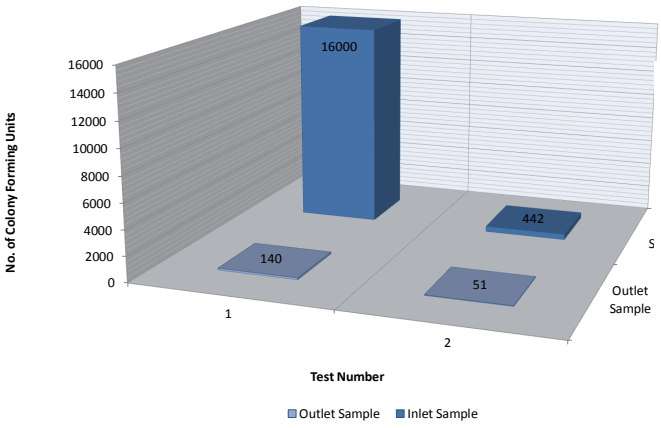


Results—Hydrocarbon Removal

The graph to the right shows the difference in concentrations of three groups of hydrocarbons between the inlet and outlet samples during the trial. Samples were analysed using Fourier Transform Infrared spectroscopy , this method allows accurate measurements of certain hydrocarbon groups, the groups being dependant on the type of analyser.

Substantial reductions of 46-49% concentration were observed in the three sample groups. Alkenes showed the highest reduction which is commonly attributed to the fact the compounds are unsaturated with a carbon to carbon double bond. If full Ozone production was utilized these results would show significantly higher levels of hydrocarbon removal.

Flotta Oil Terminal - Biological Count



Results—H_2S

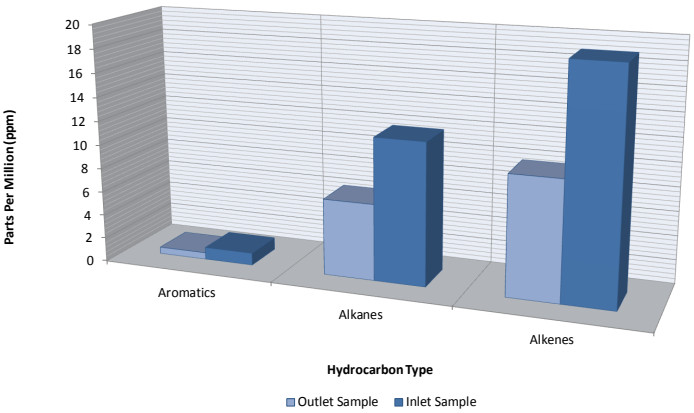
During the 6 week trial a total of 46 inlet and outlet samples were collected and tested for concentration of hydrogen sulphide.

The results from testing are displayed in the graph to the left. Every set of samples shows a great improvement between inlet and outlet water quality with the maximum reduction being 100% removal. The average reduction over all tests is 88%.

The high reduction in H_2S concentration can be attributed to the joint action of Ozone and hydroxyl radicals oxidising the hydrogen sulphide molecule. In this case the AquaPurge® unit was tested running on 50% Ozone production, this allows evaluation of the AOP in a 'worst case scenario' while following the manufacturers 'running in' routine for a new Ozone generator. In normal operation the output would be set to 80% Ozone production.

By utilizing Greenthreads' Reverse-Recirculation technology, the performance of the oxidation reactions are improved further.

Flotta Oil Terminal - Hydrocarbon Removal



Results—Biological Count

During the Flotta trial, inlet and outlet water samples were taken, cultures were grown from the biological matter, and the colonies grown were counted.

The produced water sample showed a reduction from 16,000 colonies to 140 with a percentage reduction of 99%. The ballast water sample showed a reduction from 442 colonies to 51 with a percentage reduction of 88.5%

These exceptionally high reductions in biological matter support the reasons O_3+UV treatment is already widely used in industry for water disinfection. Higher reduction still, could be seen if the AquaPurge® unit was operating under normal condition or Greenthreads' Reverse-Recirculation technology was implemented.

AquaPurge®

Greenthread water management solutions enable operators to exceed the increasingly challenging legislative limits ensuring compliance to global environmental standards and demands.

Greenthreads' patented **AquaPurge®** System is based on an Advanced Oxidation Process. AOP is essentially a natural process using Ozone (created from dry air) and UV to break down hydrocarbons and other organic substances to their component parts of carbon dioxide and water. The process breaks molecular bonds reducing complex molecules to simpler ones; resulting in zero waste stream.

AquaPurge® will treat

- Hydrocarbons in water
- Organic fluids miscible in water such as methanol
- BTEX and other toxic compounds
- Hydrogen Sulphide and associated bacteria
- Hydrocarbon concentration in wet sands
- Hydrocarbons in fluids contaminated with solids

AquaPurge® units

- AP15000-S-FA-II
- AP5000-S-SA-III
- AP1500-S-SA-II

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