

CASE STUDY



REGIONAL MICROBIAL COMMUNITY CLUSTERING IN PERMIAN PIT WATERS

BACKGROUND

OSP partnered on a basin-wide survey of pit-stored waters from Operators in the Delaware and greater Permian basin to better understand the difficulties associated with the use of produced water from this region. Microbial-associated difficulties are often related to biogenic souring, or microbiologically influenced corrosion (MIC). Representative water samples were supplied and OSP was tasked with identifying the microbial communities present in these samples using both LifeCheck DNA qPCR and 16S Sequencing technologies.

OBJECTIVE

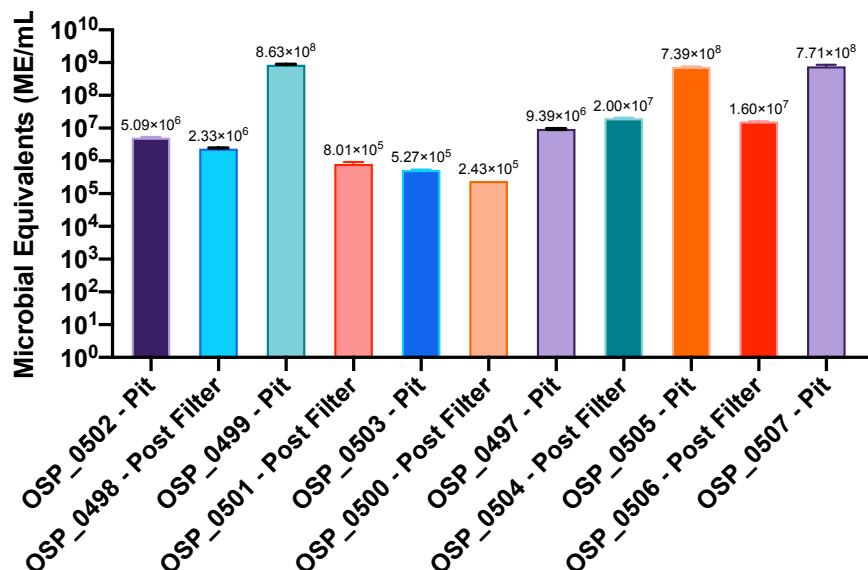
The objective of this study was to assess pit water collected from various operators in the greater Permian basin for the presence of potentially problematic microbes that could result in a souring or MIC threat. Given the large assortment of waters from this region, the identification of trends between these waters and the microbial communities was the focus.

RESULT

MICROBIAL SURVEY OF PERMIAN PIT WATERS

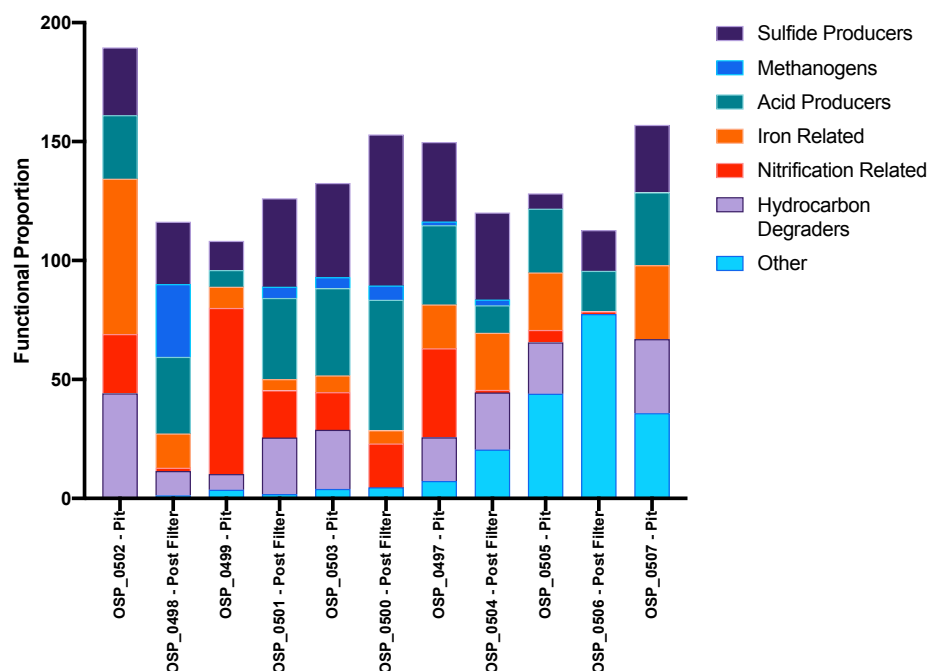
LifeCheck DNA qPCR: Counts the total number of microbes in a sample (dead and alive) as well as those from specific functional groups. This innovative genetic testing was used to highlight what types of microbes were present within the sample, and to enumerate the total microbial load (living and dead).

- The pit and post-frac water samples had moderately high to high total microbial loads between 10^5 to 10^8 ME/ml.

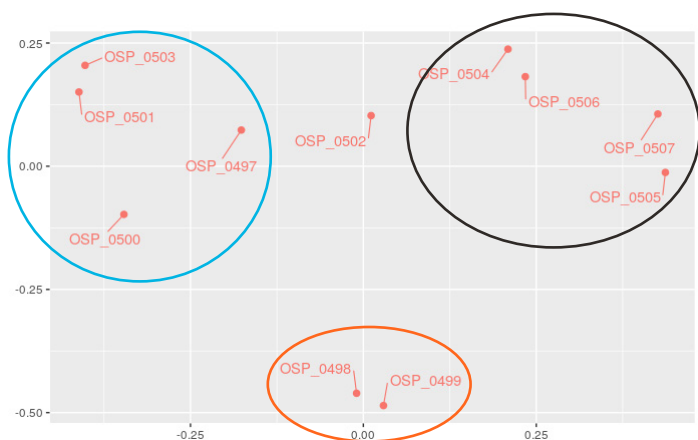


LifeCheck DNA 16S Sequencing: Lists all the microbes in a sample (dead and alive) and provides relative percentages of each within the entire population. 16S Sequencing was used in this study to identify the microbes present in the Permian pit waters. Once identified, the functional capabilities of each microbe were assessed, and the microbial makeup of each water sample scrutinized for potentially problematic members.

The tested pit waters from the Permian contained significant proportions of microbes that pose both biogenic souring and corrosion (MIC) threats. Halophilic microbes (threatening and non-threatening from a souring and corrosion perspective) heavily dominated the communities in all samples examined. These types of microbes prefer saline environments where high concentrations of sodium are present.



1. Biogenic souring and corrosion threats were present in all the samples to varying degrees. 82% of waters contained Halanaerobium, a genus of sulfide producing bacteria (similar to SRB) that presents both a souring and corrosion threat.
2. Methanogens were an additional (MIC) threat in 55% of the waters.
3. Iron related bacteria (reduce or oxidize iron) were present in 90% of the waters at moderate to high levels.
4. Nitrification reducing microbes (reduce nitrate to nitrite) were prevalent in 90% of the pit and post-filter waters tested.



The differences in the microbial composition of these water samples was analyzed by principle coordinates analysis (PCA) which identified trends between these samples, including regional microbial community clustering.

CONCLUSION

By conducting LifeCheck DNA qPCR and 16S Sequencing, it was determined that significant souring and corrosion related microbial threats are present within all the samples tested. Further, PCA highlighted similarities in the microbial profiles observed between the different samples and regional microbial community clustering.