



Case Study

CUSTOMER: Exploration and Production

LOCATION: Fox Creek, AB

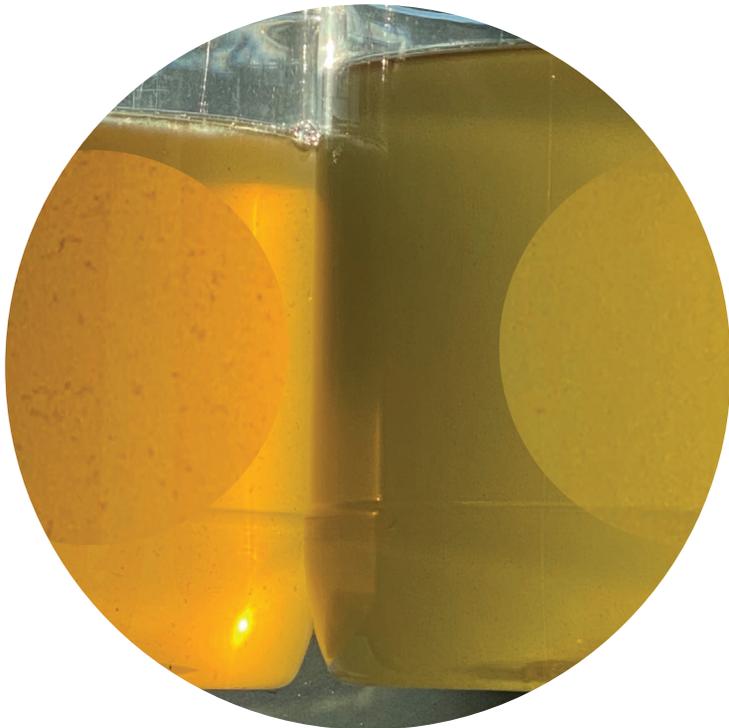
EQUIPMENT: CleanMud Magnetic Filtration System

APPLICATION: Hydraulic Frack Water

THE TEST

A CleanMud Magnetic Filtration System was used to identify the efficiency of a magnetic filter and a bag filter on both an upstream and downstream system. The tests were completed on water that had been pre-cleaned by a 10 micron-rated bag filter. During the test, the water was cycled through CleanMud System for 20 hours, after which, solid samples were captured and sent to a lab for analysis.

The goal of the test was to determine if a CleanMud System would improve the cleanliness of the water so that, in return, it would protect the pumps, fracking equipment and the formation.



CleanMud Magnetic Filtration Systems, pictured above, use patented magnetic filtration technology to capture wear contamination down to and below one micron.

Pictured left are the before and after samples from running the frack water through a CleanMud system. In the before sample on the left, you can clearly see the contamination. The sample on the right is after the frack water travelled through CleanMud. There is no visible contamination remaining in the after sample.

THE ANALYSIS

An analysis was completed on the solid contamination removed from the CleanMud system. The results showed significant levels of iron and various iron compounds along with substantial levels of halite.

In the downstream sample, 54% of the particles were below four microns and, of those, 25% were below one micron. In the upstream sample, 47% of the particles were below four microns and, of those, 15% were less than one micron.

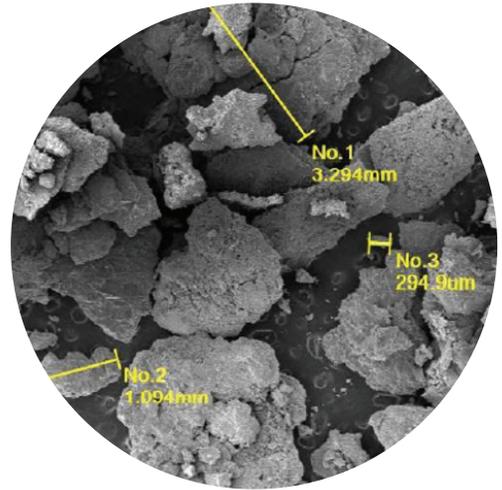
The SEM analysis image below shows an up-close example of the contamination captured in the sample. Some of the particles were larger than one millimeter, others were platelet-shaped particles which is indicative of rolling wear.



Pictured is the magnetic filter element just after being lifted from the CleanMud vessel. After cycling pre-filtered frack water for 20 hours, the CleanMud system was able to capture additional missed wear contamination.



This close-up picture shows the wear contamination captured on the magnetic filter element. The CleanMud system was able to capture small and damaging wear particles that slipped through the bag filter.



The SEM analysis shows the micron-sized particles that were captured by the CleanMud system. Components under load have low tolerance and, wear particles below four microns that travel within the frack water are the most damaging.

THE RESULTS

After running the samples through a CleanMud System



30%
of the particles captured
were larger than 10 microns.

Wear contamination under four microns is like sandpaper on drilling components and is a leading cause of premature wear. Wear metals are not compressible, they cause damage to the pump and plug the formation and create an environment for bacteria growth. By removing wear contamination from the stream, operators extend the life of their equipment.

Cleaning frack water with a CleanMud system eliminates disposable, single-use filters, it reduces exposure and person-hours spent checking and maintaining equipment. It also uses less energy because the system has fewer flow restrictions than traditional filters.

CleanMud[®]