Canstrat Cavings and Foreign Material Guide

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Source of Cavings

Cavings are chips from formations other than the one drilled. Causes of cavings are variable and include:

Poor mud choices:

- Drilling with low viscosity mud or water can cause cuttings to not be properly suspended and will be a mixture of cavings, cuttings and fine material. There will be a mixture of every lithology drilled with no differences seen from sample to sample.
- Not drilling with the appropriate mud: anhydrites, gypsum and salt should be drilled with inhibited muds so as not to dissolve the lithology; lithologies not drilled with the proper mud will be a concentration of shallow cavings or there will be no returns at all.

Disturbing the hole when testing, coring or tripping:

- Agitation of the mud supply results in material being reintroduced to the mud as the drill pipe is being lifted or lowered. Uphole cavings from collapse of hole walls in shale, friable sand sections or fractured rock can occur if the filter cake over these sections is somehow disturbed.

Settling during stopped circulations.

- Settled cavings result from the settling of chips in the mud when drilling circulation is stopped. These cavings will contaminate the first 1 or 2 samples; it is important to try and not trip just before your zone of interest so as not to contaminate the sample. Try to trip the pipe out at least 2 samples beforehand.

Dull bits:

- Dull bits produce powdered samples and vibrations in the drill string can produce cavings. A poorly lubricated bit will pulverize the samples being drilled resulting in a paste which will wash out of the samples during preparation. The resulting sample will be overly concentrated in shallow rock types.

Cavings Recognition

Recognizing cavings is an important skill when analyzing drill cuttings. Below are several key point to watch out for.

- Generally, cuttings are 1/8” to 5/8” with cavings being larger. They therefore work their way to the top of a sample vial or bag due to vibration.
- Faulty sample catching or washing samples with screens that are too large will result in only larger cavings being preserved; make sure to retain the fine grained fraction of the cuttings as well.
- Lost circulation zones will only return lost circulation material and perhaps a few up hole cavings. Always make note of when circulation is lost to help in sample interpretation.
- It is important to know what rock type caved in any offset wells and study those samples. This knowledge of the caved lithology will help separate what is formational and what is caving.

Example of cavings:

- Two large shale cavings in uniform sized cuttings can be seen in the middle of this example.
- Cavings are a different mineralogy and colour than the smaller formation shales.
- Black shales in this example are Cretaceous cavings; red shales are indicative of the Spearfish Formation.
- PDC bits are typically used in shales and create large splintery chips due to their cutting action.

Reliable Sample Recognition

- Good samples have chips of relatively uniform size and lithology, however if there are different lithologies, they will have a relationship, for example: brown shale and limestone with brown shale stringers.

- Loose sands or sands with soft cement tend to break apart and will be found on the bottom of the tray.

- Cements from fractures and vugs will occur as scattered crystals in the bottom of the sample tray.

- Grain supported limestones may break apart and occur as separate grains on the tray bottom.

- Always ask whether the sample is reliable if a different rock type is observed.

- In most samples there is a carry along of uphole debris and it may be difficult to know if it is a repeat of a particular lithology.

- Watch for significant increases in the lithology and check the mechanical log to see if the lithology fits.

Foreign Material Identification

Lost circulation material or LCM is used to plug porous zones which are ether spalling into the well bore or taking in mud resulting in mud loss. Various materials can be used help plug up porous zones including calcium carbonates, wood chips, hay, straw, shredded plastic, walnut hulls, grain, rubber fragments, cotton seed hulls, and mica.

Leather Floc:

Fiber:

Walnut:

Poly:

Mica: