

# Rock Hog Problem Solver Manual

Manual No. 49004

# Button Breaks

Loss of the button dome is the most common failure that occurs on the DTH bits. There are (3) general modes for the failure:

Overload  
Shear  
Surface Cracks

## Overload

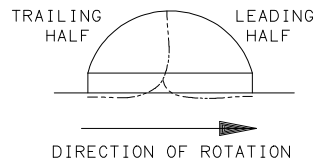
An overload failure occurs when the button is over stressed. Excessive stresses are caused by:

1. Incorrect settings of the hold-down pressure and rotation speed on the drill rig for the formation being drilled. Remember, the formation changes as the bit penetrates into the ground. The required setting at 100 ft down may change drastically at 101 ft. Only the driller's work experience in the geographic area can determine the proper settings and even this will not prevent all failures.
2. Flat/dull buttons. When buttons are sharp, piston-impact energy is transferred through the button and into the rock thus causing the rock to break. As buttons become dull, more and more energy is absorbed by the steel and button instead of transferring through to the rock thus decreasing penetration and increasing the stress on both the steel and buttons. As a rule of thumb, buttons should be sharpened when the flat width reaches 1/3 to 1/2 the button diameter. This situation can be duplicated by taking (2) common nails, one pointed and one filed flat on the end. Drive both nails into a piece of hardwood and see which nail bends first.

Typical Flat Buttons

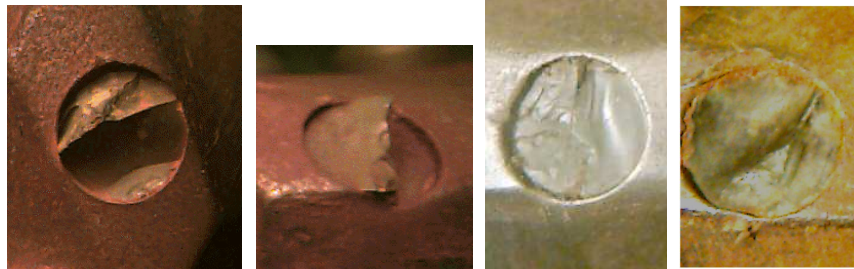


Overload failures first start with loss of either the leading or trailing half of the button. In most cases the trailing half goes first.

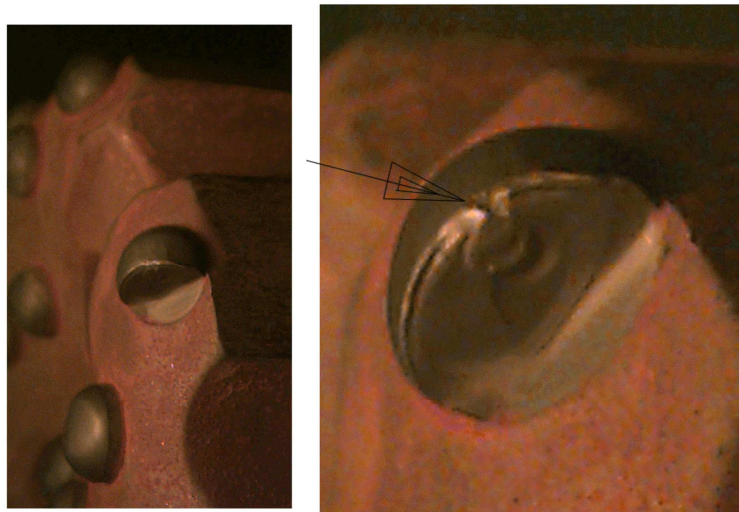


One characteristic unique to an overload failure is a peak on the button's broken surface running across the direction of rotation.

#### Typical Overload Breaks



Shown here is a classic overload break. The button is not dull but was still stressed to the point of failure. The exact point of where the overload stress was applied is visible.



Another instance where buttons become overloaded is when the bit is put into an existing hole that is smaller than the gage size of the bit such as when drilling an old well deeper or using undersize casing. In this case, high loads are applied on the outer edge of the button.

Note that the peak runs with the rotation, not across the rotation



Normally there is an abnormal wear pattern visible on the outer edge of the gage buttons

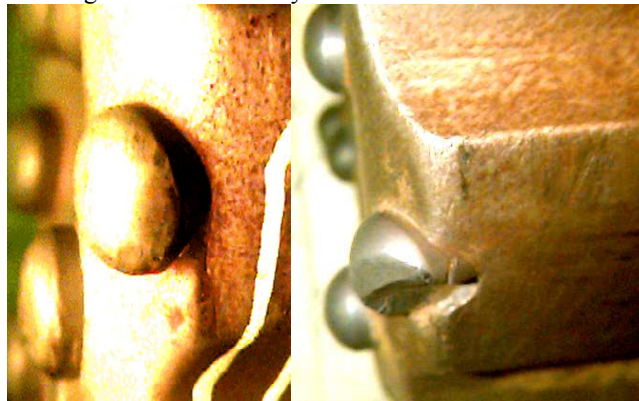


## Shear

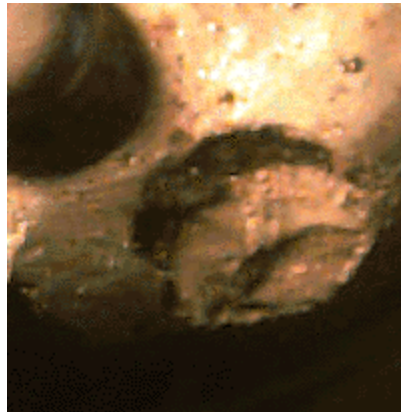
A shear failure occurs on the gage buttons when there is no longer material behind the button to support it. This loss of support material is due to wear on the bit. Two types of wear can occur:

1. Loss of steel support.
2. Loss of the button material itself.

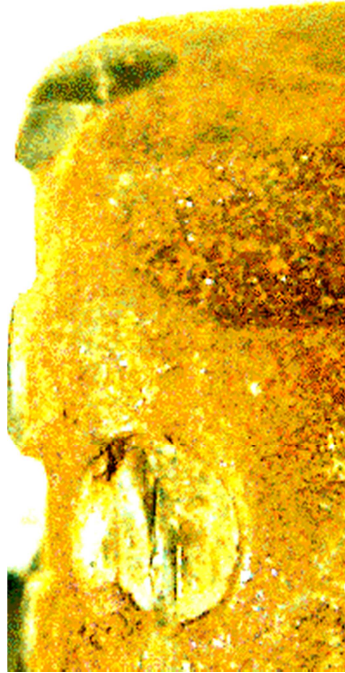
**Loss of steel support** Some formations drilled will wear away the steel body much faster than the buttons. In this situation, the buttons will eventually be standing out so far that they break or shear off.



Shear breaks usually have an erratic pattern on the failed surface. Normally the inside edge will be broke under the steel while the outside edge is broke down to the steel.



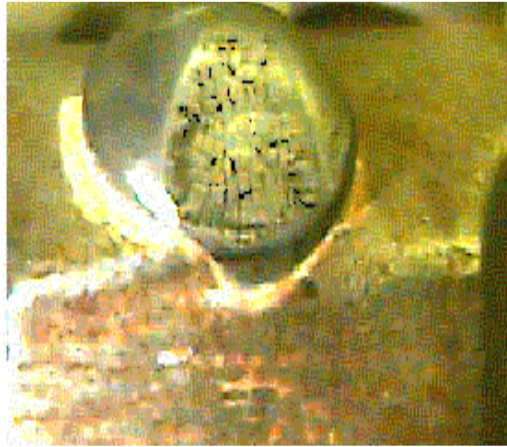
**Loss of carbide support** Some formations drilled will wear away the buttons at a rapid rate, while the steel does not wear. In this situation, the buttons will eventually be worn down to the steel forming a button with a very weak profile.



## Surface Cracks

Surface cracks fall into (2) categories, fatigue and thermal.

Fatigue or “snakeskin” cracks occur when drilling in formations that do not wear the buttons, such as limestone. Because the button surface does not wear away, continuously exposing a new one, the same old surface becomes fatigued and begins to crack. These cracks are very fine and are best visible with a 10x lens under bright light. As drilling continues, these cracks move deeper into the button with each blow of the hammer piston. Eventually the button dome breaks off.



Thermal cracks occur when the button surface overheats. Overheating can occur when drilling in soft formations, when the buttons are dull and are rubbing instead of cutting, when face flushing is poor, and when rotation is too fast. As with fatigue cracks, thermal cracks will eventually result in loss of the button dome.

