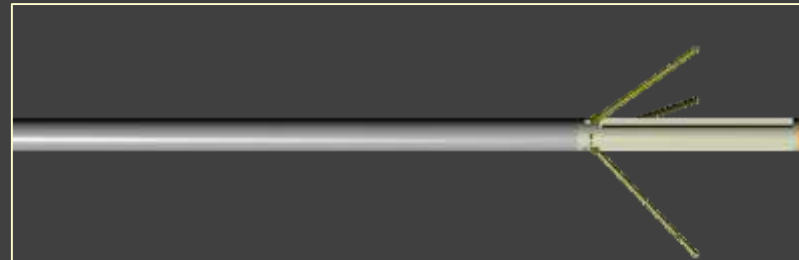
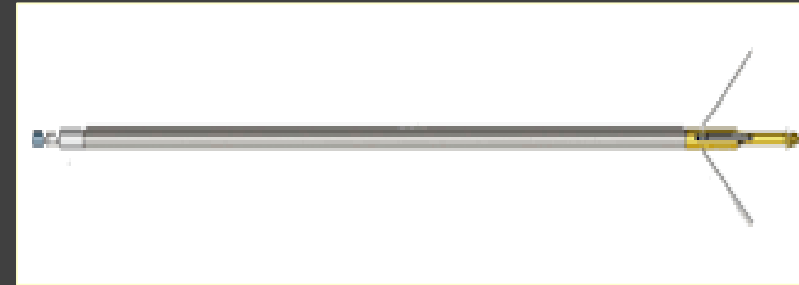


Well Logging

Mechanical Caliper Log

Mining Engineering Department/ 3rd Year

Dr. Maha Muneeb

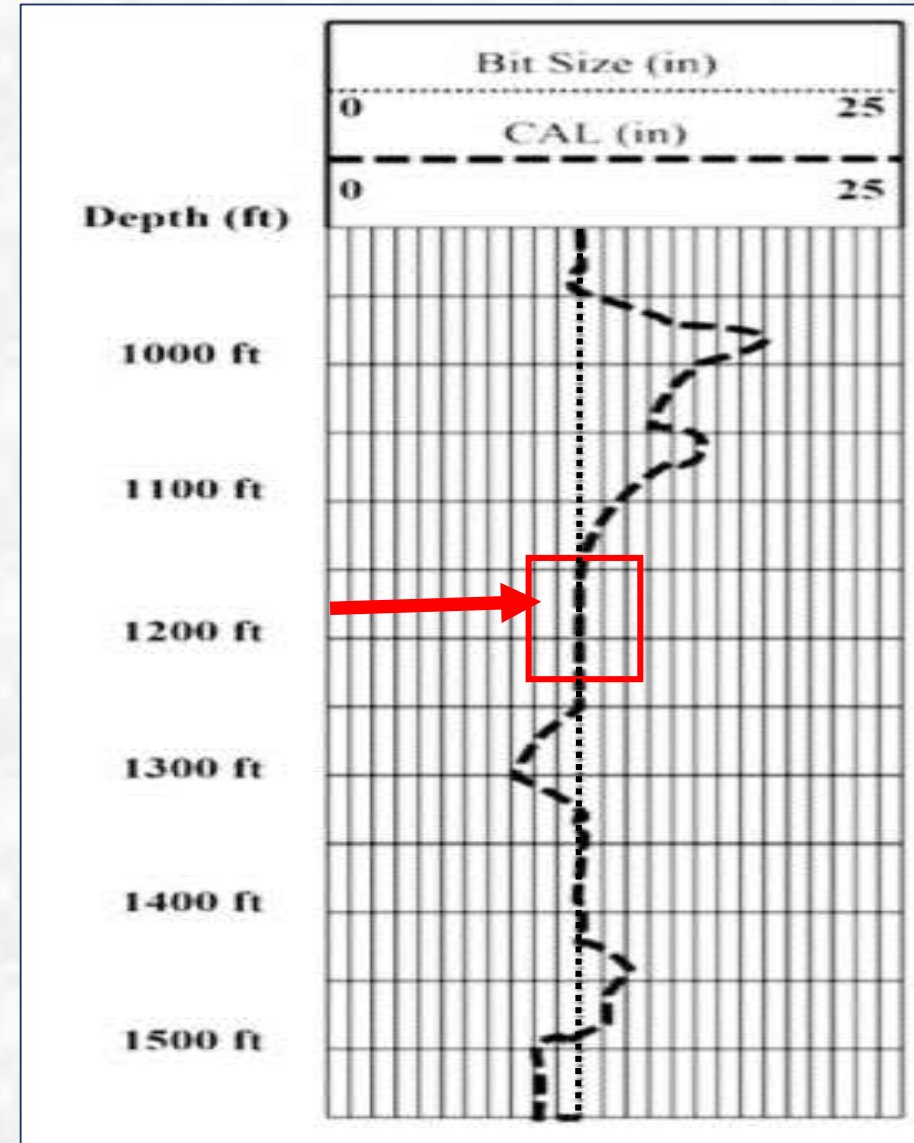


MECHANICAL CALIPER LOG

The mechanical caliper measures variations in *borehole diameter and shape with depth*. Changes in borehole diameters may be related to both *drilling technique* and *lithology*.

How Caliper Measures the Borehole Diameter?

Measures the variation in borehole diameter as it is withdrawn from the bottom of the hole, using two or more articulated arms that push against the borehole wall. **Hole diameter is read directly from the log.**



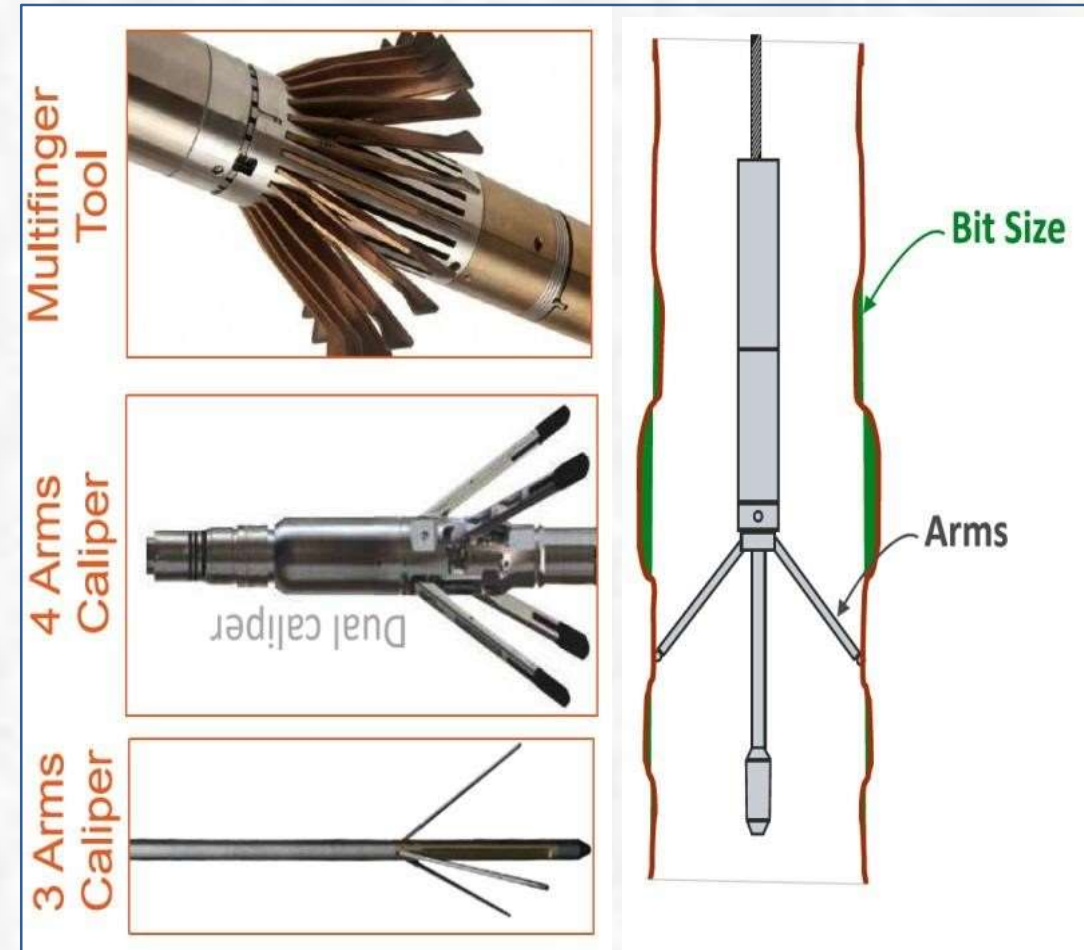
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The well log shows the location of sandstone layers that may contain oil or natural gas.

Types of Mechanical Caliper Log

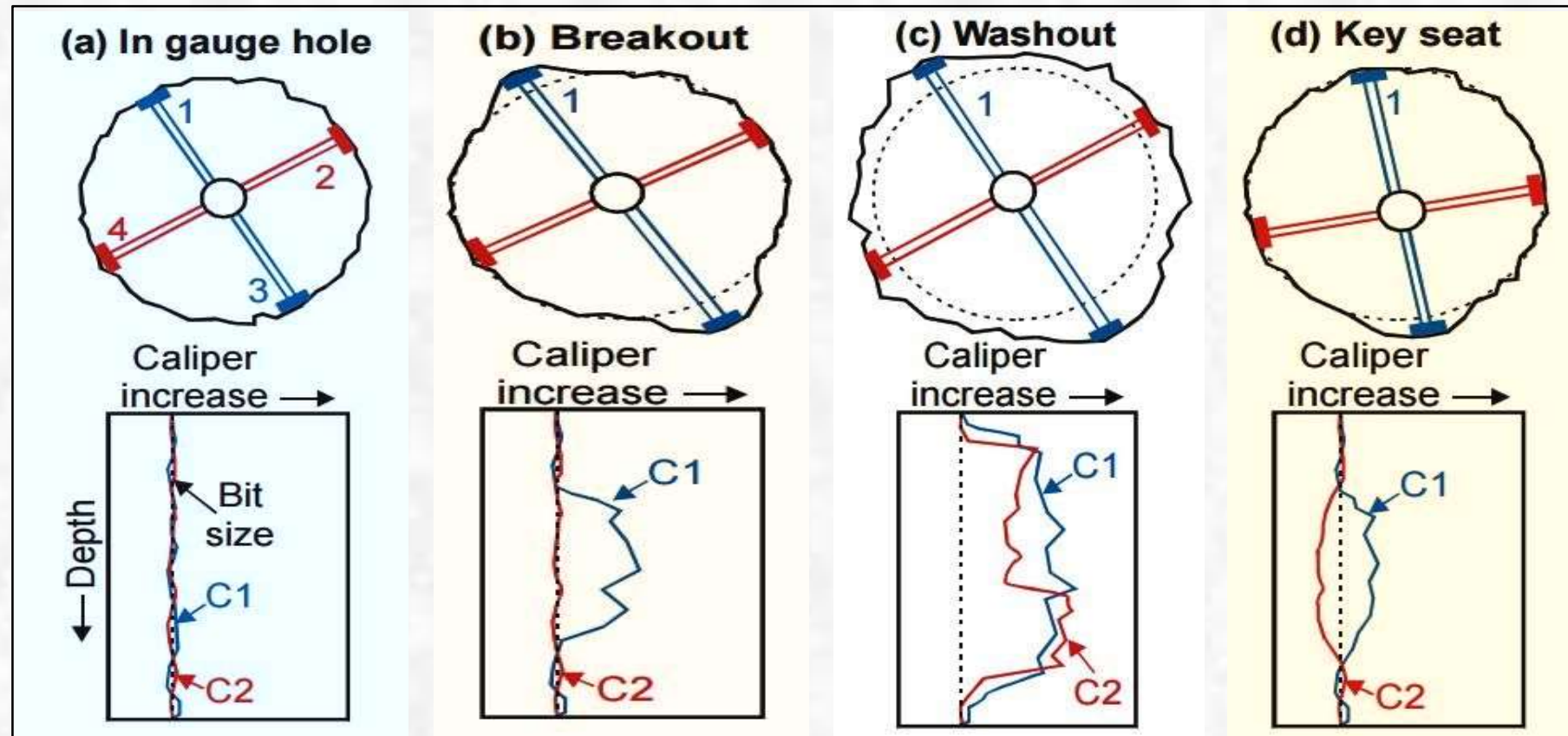
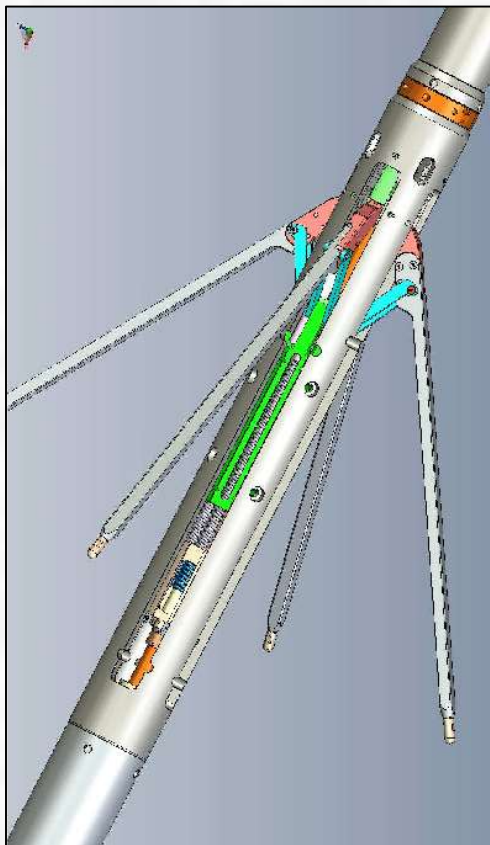
Caliper log has *two, three, four, or more extendable arms*, which can move in and out of the tool. This movement is converted into an electrical signal by a potentiometer.

- two arms tool
- four arms (dual caliper) tool or (**Borehole Geometry Tool**) **BGT**



Borehole Geometry Tool

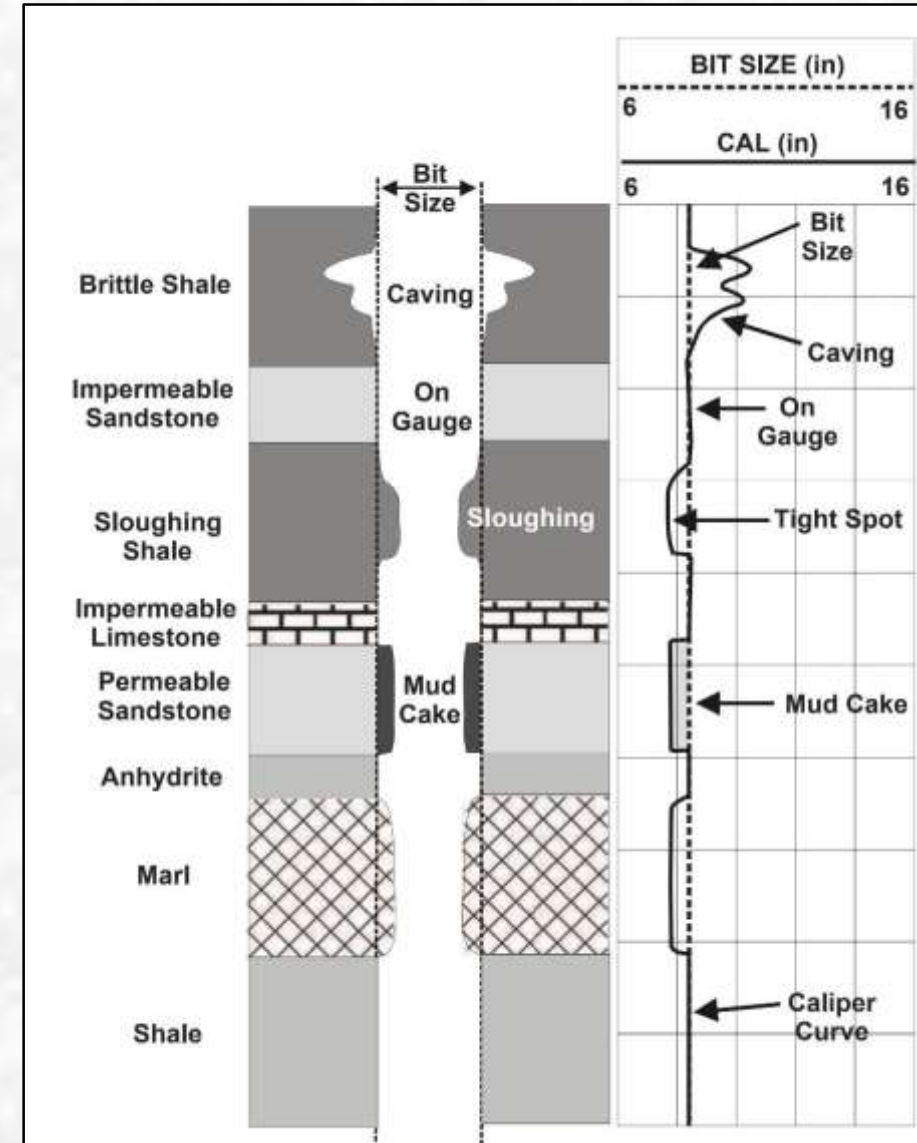
An example of a four arms tool is the *Borehole Geometry Tool (BGT)*. This has *four arms* that can be opened to 30 inches (40 inches as a special modification), and give two independent perpendicular caliper readings



Caliper Log Responses

The scale is generally given in *inches*, which is standard for measuring bit sizes. A hole with the same diameter as the bit-size is called *on gauge*.

On gauge holes are target for all drilling and essentially *indicate good drilling technique*. Borehole diameters larger and smaller than the bit size are possible.



Factors Affecting on Caliper Log

Hole Diameter	Cause	Possible Lithologies
On Gauge	Well consolidated formations Non-permeable formations.	Massive sandstones Calcareous shales Igneous rocks Metamorphic rocks
Larger than Bit Size	1. Formation soluble in drilling mud. 2. Formations weak and cave in.	1. Salt formations drilled with fresh water. 2. Unconsolidated sands, gravels, brittle shales.
Smaller than Bit Size	1. Formations swell and flow into borehole. 2. Development of mudcake for porous and permeable formations.	1. Swelling shales. 2. Porous, permeable sandstones.

Uses of the Caliper Log

1. Caliper logs can give us information about the borehole size and shape.
2. Contributory information for lithological assessment and used to aid in evaluation of rock properties of formations drilled
3. indicator of good permeability and porosity zones (reservoir rocks) due to development of mudcake.
4. Estimation of mudcake thickness, $h_{mc} = (d_{bit} - d_h) / 2$. d_h is caliper reading.
5. Locate fracture zone and assess borehole quality and stability.
6. Measurement of required cement volume.

