

DarcyLog

Porosity and Permeability from Drill Cuttings

Drill cuttings improve reservoir characterization when cores are not available.

Porosity is measured using conventional method with improvements to account for small size and volume.

DarcyLog allows permeability measurements on cuttings, with permeabilities ranging from 0.05 to 100 mDarcy.



Permeability comparison between core measurements and measurements after crushing cores.



Correlation between permeability and porosity on cuttings from a Canadian well.



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Specifications for Use

- > Size of cuttings: 1-5 mm; Volume of cuttings > 3 cc.
- > Porosity: higher than 5%.
- > Permeability range: 0.05 to 100 mDarcy.

Porosity from Drill Cuttings

- > Volume of solid from mass of dry cuttings using average grain density. Pore volume measured using brine or oil.
- > Accuracy within 1 to 3 porosity units.

Permeability using DARCYLOG

- > Air is trapped inside cuttings during spontaneous imbibition in viscous oil.
- > Pressure is applied (10 bar) to force oil to flow inside cuttings and compress air bubbles.
- > Permeability is derived using numerical calculation from pressure relaxation curve (similar to technique used in well test).
- > Accuracy verified by comparison with crushed samples of known permeabilities.

Experimental Limitations

- > Darcylog is not a push-button apparatus. Interpretation of the relaxation curve requires expertise.
- > Cuttings are not always representative of reservoir: high permeability sandstone can be crushed into sand.
- > Cuttings represent the "matrix" permeability: fractures and vugs are lost during drilling.

References

- > Egermann et al.: "A fast and direct method of permeability measurements from drill cuttings," SPEREE (August 2005) 4, 269-275.
- > Egermann et al., "Petrophysical measurements from drill cuttings: an added value for the reservoir characterization processes", paper SPE 88684, SPE Reservoir Evaluation and Engineering, August 2006, pp303-307.
- > Ortega et al., " Use of Drill Cuttings for Improved Design of Hydraulic Fracturing Jobs in Horizontal Wells", SPE-155746-MS, SPE Americas Unconventional Resources Conference, 5-7 June, Pittsburgh, Pennsylvania USA.

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