

Applications of Core and Drill Cuttings Data – Professional and Ethical Issues

Lisa Griffith, P Geol, Enerplus Resources

Doug Hayden, PL Geol, Hayden Geological Consultants

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Summary

Data obtained from the analysis and interpretation of core and drill cuttings is used extensively to characterize and model geological reservoirs and estimate reserves. Core and drill cuttings are used as establish key reservoir parameters such as porosity, permeability, density and saturations as well as lithological and mineralogical character which are then input to petrophysical analysis to extrapolate reservoir characteristics. Rock and Log data are highly inter-dependent on each other to accurately characterize reservoirs. While most data generated from the analysis of core follows standard procedures and generates reproducible results, there are several assumptions and interpretations necessary to generate this data. The application of data generated from drill cutting examination and interpretation is very purpose-driven and the techniques and details of data extracted from cuttings vary greatly and follow few set standards.

Background

Core has been used for several purposes including “hard data” such as porosity, permeability, saturations, density, lithology, grain size, and mineralogical content, as well as to determine stratigraphic correlations and environmental settings and trends. Drill cuttings have traditionally been used for basic lithological information as well as hydrocarbon shows but most of the data generated from their interpretation has been largely qualitative. Cuttings have been used more extensively in recent years to generate more quantitative data when used in close association with “hard” core data.

Measured vs Interpretive Data

Core is used to generate measured data, such as porosity, permeability, density, saturations, which is publicly available through government regulators and commercial data providers. Interpretive data is obtained from core and drill cuttings in a much more restricted and limited basis, usually by operators on their own wells, and the work is performed by individuals with a wide range of formal training and experience. This data follows few standards and is very purpose-driven, depending on the needs and concerns of the operators. Interpretative data from cuttings would include lithology, grain size, effective (or visible) porosity, permeability, hydrocarbon shows, mineralogy, depositional environments and stratigraphy. The main sources for this data would be Geological Striplogs generated by Wellsite Geologists and Canstrat striplogs. Wellsite Striplogs may or may not be available from regulators depending on province. Historical Canstrat striplogs are available commercially. More detailed interpretations of drill cuttings are provided by specialists in this field and their data is retained and controlled by individual companies.

Measured Data

For optimal application, users of lab measured data need to be aware of the assumptions and interpretations that are applied to generate this data. The potential exists for biased sampling and “over-representation” of thin beds where small plugs are used to characterize longer intervals of core. Differences in measurements may occur in small plug vs full diameter core samples including averaging, up-scaling, presence of dissolvable hydrocarbons, limitations of saturation data. The potential exists for miss-use of improperly extrapolated data to overestimate reserves.

Interpretive / Descriptive Data

Interpretive data, including stratigraphic and facies interpretation from core, or data obtained through examination and testing of drill cuttings will vary greatly in its accuracy and repeatability based on the training and experience of the person performing the work. The type of information obtained and the way it is documented, stored, and applied will vary greatly. The type and detail of the data obtained will be determined by the person or company requesting the analysis and interpretation and the accuracy and reliability of the data will be determined by the specialist performing the work.

Conclusions

The use and application of measured and interpretive data obtained from core and drill cuttings should be applied with care and a practical knowledge of the limits and assumptions that go in to generating that data. Users of this data should educate themselves on how the data is obtained and apply quality control mechanisms to ensure that the data they are using from core and drill cuttings is accurate and reliable before imputing parameters into petrophysical and engineering models to estimate reserves and forecast production rates. Cross-discipline communication between Geoscientists, Engineers, Petrophysicists and Geophysicists is essential to obtain the best results.