

Validation of T2 Bin Derived Permeability - A Case Study from Atoka Wash, Oklahoma

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The Atoka Wash in Oklahoma is a segment of the arkosic detrital material that eroded from the Wichita Mountain uplift. The rock ranges in age from Precambrian to Middle Pennsylvanian. The particular Atoka Wash segment is similar in deposition to the Granite Wash formation also in western Oklahoma and the Texas panhandle. The distinguishing characteristic is the composition of carbonate matrix material as opposed to the siliceous nature of the more studied Granite Wash. The deposition can vary from finely grained to very coarse depending upon the energy of transport.

Petrophysical properties of this rock contributed to confusion over the ability of the rock to produce hydrocarbon and the volume of reserves possible. Standard triple combo logs were the logs typically run to evaluate the formation. Historically, attempts to complete the reservoir could be attempted when density/neutron crossplot porosity was in excess of 8%. Even with that threshold, many completion attempts were unsuccessful as the reservoirs would not produce at commercial rates. As unsuccessful attempt followed each other, drilling for this horizon became a discouraging and costly business.

The advent of T2 Bin Derived Permeability from NMR measurements cast this formation in a new light. NMR logs were used to evaluate other horizons in wells and data was acquired in certain wells where mud logs indicated shows in this Atoka Wash. The surprising result was the existence of high permeability areas in parts of the well with very low porosity. Some wells had indicated density/neutron porosity of less than 3%, but with excellent indications of permeability from the T2 bin distribution. Completion attempts were made in some of these NMR indicated productive zones with excellent results.

This paper presents the observed logs and the techniques utilized to ascertain these productive horizons. Usefulness of NMR bin derived permeability to design completions is also emphasized. Finally, we will provide a comparison of the calculated productivity versus actual production for a series of these Atoka Wash wells, thereby validating the derivation and application of this NMR derived permeability.