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# Will Wireline Formation Tests Replace Well Tests?

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### Abstract

Well testing in exploration and appraisal wells has become increasingly unpopular. Reasons include costs, safety and environmental impact. Well testing has also become rare in production wells because of the potential revenue loss during build-ups. Whether suitable alternatives can be found for sampling and reservoir parameter estimation is the subject of regular debate. Alternatives are wireline formation tests in exploration and appraisal, and continuous recording with permanent pressure gauge in production wells.

The quality of pressure and rate transients measured during wireline formation tests has improved greatly in recent years. The transients obey the same laws of physics as those measured during a well test and can theoretically be interpreted in the same way. The scale of the measurements, however, is very different. The challenge is to understand what the wireline formation test interpretation results mean and how they can be upscaled to the information provided by a well test.

The paper discusses these key issues with examples that illustrate the quality of the data and the analysis process. The interpretation methods are essentially the same as those used in well test analysis with the addition of the formation rate analysis plot, which is particularly useful in high permeability formations where other methods are limited by pressure gauge resolution.

### Introduction

Well testing is often used in the exploration and development of hydrocarbon reservoirs to:

1. Obtain representative formation fluid samples;
2. Measure initial reservoir pressure;
3. Demonstrate and/or establish well productivity;
4. Determine permeability thickness product, kh, and skin, S;
5. Identify the drainage area of the well and any boundary effects that may exist within;
6. Identify and quantify depletion.

These objectives can be compared with those of a wireline formation test:

1. Determine formation pressures at zones of interest, and establish pressure gradients for fluid type identification;
2. Identify zones in hydraulic communication or isolation;
3. Collect representative formation fluid samples;
4. Estimate formation fluid mobility.

Clearly, an overlap exists between the two techniques and whether one can replace the other depends on the specific well objectives. For example, some exploration wells are drilled solely for the purposes of confirming the existence of a hydrocarbon column, in which case a wireline formation test is probably sufficient. Other wells may be drilled to prove a minimum volume of hydrocarbon fluids-in-place for which a reservoir limit well test is then the only option. Between these two extremes, there are a number of cases where it may be unclear whether a well test is required.

The strongest reason not to perform the well test is, of course, financial. Environmental cost is also increasingly important. The decision to test has to be made taking into account the cost of acquiring the information. This implies an understanding of what that information is and whether it can be acquired by other means.[1]

The collection of representative fluid samples is often an important objective of both wireline formation tests and well tests. This is clearly an area of overlap where wireline formation tests have proved to be a valid alternative to well tests.[2] However, there are cases where the collection of fluid samples at surface may also be considered necessary.[3]

In this paper, the focus is on the information that can be obtained from the pressure transients recorded during a wireline formation test and how the information compares with the data recorded during a well test.

The interpretation of pressure transients from well tests has been the subject of much research and development over the last thirty years and, with the introduction of fast PCs and properly designed analysis software, the process has become

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