Introduction

The Atomic Dielectric Resonance (ADR) Scanner is a new entrant in the subsurface imaging market for the oil and gas industry. It is a subsurface imaging and material classification system developed by Adrok Ltd in Scotland to directly and precisely log subsurface lithology and the presence of hydrocarbons at depths of up to 5km from the ground surface. The imaging technology is based on the principles of Atomic Dielectric Resonance (ADR) established over 30 years research and development by Adrok's founder, Professor Gordon Stove.

The ADR Scanner is a patented innovative technology. It utilizes imaging technology that identifies subsurface materials by targeting and automating mathematical compositions, rather than solely visual interpretations. The device innovates electronic circuits to manipulate and generate unique waves for diagnostic purposes from the ground surface to depths well beyond the capabilities of traditional methods. ADR has used the technology for a number of commercial airborne surveys. This unique approach enables the ADR Scanner to differentiate between hydrocarbons and rocks not only on the basis of diagnostic signatures but also on the basis of the energy that they emit on receiving the electromagnetic radiation from the ADR Scanner.

In essence, Adrok provides the end user with enough depth and lithological information to help define position decision making and help reduce the requirement for exploratory drilling. The ADR Scanner is presently being used as an advanced technique and will soon be qualified as a small-scale exploration tool.

Adrok scanner performance specification

<table>
<thead>
<tr>
<th>Performance Specification</th>
<th>Value</th>
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<tbody>
<tr>
<td><strong>Time to survey / 50m survey point</strong>:</td>
<td>2 hour</td>
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<tr>
<td><strong>Power requirement</strong>:</td>
<td>IP65 weatherproof</td>
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<td><strong>Depth Resolution</strong>:</td>
<td>person-portable</td>
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<tr>
<td><strong>Range (Proven to 4km)</strong>:</td>
<td>&gt; 2 m</td>
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ADR has demonstrated in trials the ability to

- identify oil / gas / water / rock types;
- determine the distance to a subsurface horizon down to several kilometers depth, classified and with thickness;
- penetrate highly conductive layers (such as seawater, saturated clays and metallic ores).

A Novel Technology for Identifying Rock Sequences & Hydrocarbons

The ADR Scanner is presently being used as an appraisal technique and will soon also be qualified as a small-scale exploration tool.

Technology

Adrok have conducted a series of field and laboratory demonstrations in which rocks and hydrocarbons of different compositions and saturations have been exposed to pulsed beams of ultra-short wave length ADR Scanner measured power, producing a range of differing energy responses detectable by suitable ADR Scanner receivers.

Handheld scanner and software has been configured by Adrok to cover a wide band and generate remotely located tumbling pulsers, at a number of frequencies between 85MHz and 980MHz. The microwave light beam promotes the rock and as it passes through the component minerals it excites the return to release energy according to their compositions. The lower pulse of photons passes through the structure of the earth and emerges to encounter more atoms farther along its path. Electrons from each individual atom release energy in all directions, and by timing the first arrival of this burst of low power energy at a position beside the transmitting source enables the distance to the responding atoms to be determined. The nature of the return signal, its frequency and energy levels are determined by the minerals encountered.

In a rock core the component mineral may vary, but in general sand rocks are composed primarily of quartz. Sodium montmorillonite (NaMC), large grains of million and 2. WARR -Wide Angled Reflection and Refraction ADR Scan of subsurface collected at ground level (that produces depth calculations)