Borehole Magnetic Resonance
A layman's description of BMR

Our company's website and documentation is peppered with technical and industry terms, not to mention the latest and greatest buzz words currently doing the rounds. This may make for very interesting reading to those in the know, but any other interested party could be left wondering what exactly it is we do, and how and why we do it.

Enter Qteq's Sales & Marketing support team! In this article we will try to explain in plain English one particular logging tool we have developed, which is surrounded by misconceptions regarding its safety, possible environmental impact and operating principles in general: Qteq's Borehole Magnetic Resonance (BMR) logging tool.

MRI Scanner creating an "image" of a person

BMR relies on the same Nuclear Magnetic Resonance (NMR) physics underpinning Magnetic Resonance Imaging (MRI) technology. While MRI is used in radiology to create detailed images of the human body, BMR is used in georesource industries to characterise the volume, structure and type of fluids occupying the small spaces (pores) within sedimentary rocks. While donut-shaped MRI machines image patients placed inside the machine, BMR tools interrogate a narrow region of rock surrounding the tool as it is slowly moved up a drilled borehole.

The technology used in MRI and BMR generates both a continuous, strong static magnetic field, and precisely timed pulses of a weak oscillating magnetic field. The interaction of these two fields excites hydrogen nuclei in resonance with the static magnetic field. Only hydrogen nuclei that are part of the molecular structure of fluids occupying the rock pores experience this NMR. This resonance is confined to a pre-set region of the rock. Between the weak oscillating magnetic pulses an antenna monitors the gradual relaxation of the excited hydrogen nuclei, caused by gradual exchange of energy from these nuclei with each other, and to the surrounding environment.

BMR tool interrogating surrounding rock (orange ring)

BMR logging is ideally suited for use in various georesource industries to determine different types and quantities of fluids present in sedimentary rocks. Energy and water companies in particular use BMR technology for a variety of applications to assist with evaluation of their resources, allowing them to, where necessary, implement measures to optimise and secure these resources.

The biggest misunderstanding surrounding the use of BMR tools stems from the word "nuclear" in NMR, which is more commonly associated with the use of chemical radioactive sources. However, BMR tools do not employ radioactive sources, nor generate any radioactivity in the rock formations. "Nuclear" simply refers to the nucleus of the hydrogen atoms being excited by the tools' magnets. In fact, NMRI was the acronym used previously, before the medical industry deleted the "N", partially because of patients' misunderstanding over the dangers of nuclear energy, nuclear radioactivity, and the like, around the mid-1980s!

BMR technology, in its current guise, has been used in the oil and gas industry since the early 1990's. However, these tools have typically been too large, complex and therefore too costly for use in other, less profitable, georesources industries. With the development of our BMR tools, we have made this technology available to other types of industries in the georesources sector and are now supplying these tools, and our interpretation services, across a wide range of clients, offering a safe, non-intrusive means of taking stock of our subsurface resources.

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