

ISOTOPE RATIO ANALYSIS



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Source Determination with Stable Isotopes

Natural gas leaks from surface casing vents and soils have been a regulatory and industry concern for many years. Many of these leaks have the potential to contaminate ground-water, kill vegetation or become a safety concern. Gas migrated to surface can have many sources of origin.

Sources of Migration

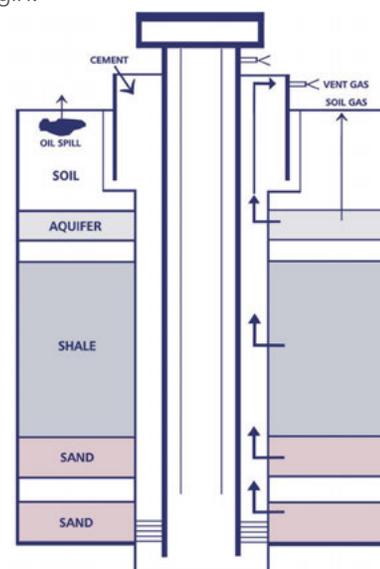
- Producing reservoirs
- Formations above producing reservoirs
- Rotting organics
- Replenishing aquifers
- Coal seams

Background

The Canadian Association of Petroleum Producers (CAPP) sponsored a research program at the University of Alberta that resulted in a method of identifying migrating gas sources based on carbon isotope abundance signature. Identifying the source of the migrating gas prior to spotting a service rig on site can translate into a substantial reduction in cost for well abandonment or rectification. It is important to identify the migrating gas source to enable customers to make the correct assessment and decisions concerning well abandonments. The challenge for industry is to determine the exact source of the leak so a well can be sealed properly in a cost-effective manner.

Benefits of Carbon Isotope Fingerprinting

Carbon isotope fingerprinting of migrating gas in conjunction with other interpretive tools such as sound & temperature logs, can reduce the costs of rectification by minimizing the number of cement squeezes required to abandon a well. By analyzing production gases from known formations and collecting mud gas samples during drilling, many formations have been isotopically fingerprinted from in situ gases. Gases have been identified in many formations, all of which are possible sources for migrating gas to surface. Understanding where the migrating gas is sourced in well abandonment allows for better use of resources, time and money.



Gas Migration from Formations

Natural gas leaks in an oil or gas well can originate from many potential sources.

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How it Works

Using ethane (C_2) as the stable carbon isotope ratio marker, an obvious difference between the top of the Colorado group and the bottom of the Colorado group is apparent. There is an obvious difference between the Colorado and Mannville formations as well (see Figures 1 and 2).

It is possible to determine the depth or the approximate geological age of the source gas and therefore the origin of the leak. It was found that there was sufficient gas in mud samples to enhance isotopic profiling of areas that allowed us to investigate the Colorado shales more thoroughly.

Figure 1

Ethane (C_2) Stable Isotope Ratio vs. Depth

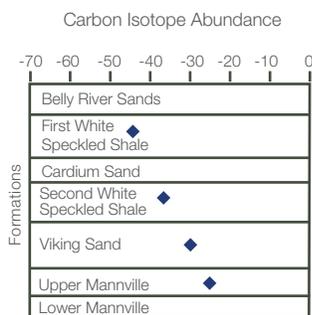
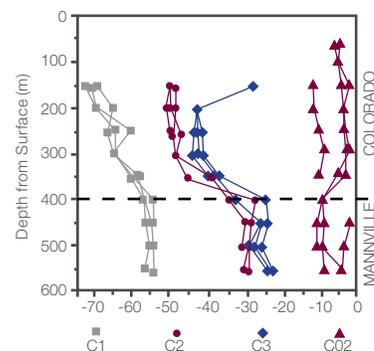


Figure 2

Isotopic Profile of Mud Samples From Three Wells*



* NOTE: From mud gas at three different wells north of Lloydminster, AB.

The Maxxam Advantage

Maxxam continues to be on the forefront of the well abandonment and gas migration industry through ongoing involvement with Canadian Association of Petroleum Producers (CAPP), Energy Resources Conservation Board (ERCB) and Saskatchewan Energy and Mines (SEM). As a founding organization involved in the technology and analytical development for gas migration research, Maxxam now has 20 years of experience and an extensive Western Canadian database of isotopic ratios. Maxxam has made major investments in this technology and offers unsurpassed analytical capabilities to support the oil and gas industry.

Our turn-key solutions include the following services:

- Sample collection
- Gas analysis
- Carbon isotope analysis
- Expert data interpretation

Customers appreciate our expertise, fast turn-around times and rush service capabilities.

Maxxam is the Canadian market leader in analytical services and solutions to the energy, environmental, food and DNA industries and a member of the Bureau Veritas Group of companies – a world leader in testing, inspection and certification services. We support critical decisions made by our customers through the application of rigorous science and the knowledge and expertise of our over 2500 employees.

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