

## HELIUM EXPLORATION

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So, why do I want to fill up a bunch of balloons? This is the most common question when selling a natural gas project with high-helium potential. What most people fail to understand is helium's importance in Magnetic Resonance Imaging (MRI) functionality, Space Shuttle launches, and cold-temperature physics laboratories such as CERN which uses 2 million cubic feet (MMCF) of helium per year. Indeed helium plays a role in filling balloons and blimps but the advanced uses mentioned far outweigh lifting-gas consumption.

Helium, which accumulates in natural gas reservoirs in certain parts of the world, is a product of the radioactive decay of Uranium and Thorium. As these products continue their decay chain (ultimately to stable lead isotopes), alpha particles (a helium nucleus), beta particles (an electron), and gamma particles (X-rays) are expelled. As alpha particles are ejected, they pick up two electrons to become a helium atom. High helium reservoirs occur when there is high Uranium and/or Thorium in the basement rock, deep faulting, and strong seals. If any one of these three events are missing, no helium will accumulate. There are only a few places on earth where all three conditions are met, most of which are in the United States. Once purified, helium has a value well above \$100 per MCF.

The United States currently produces the majority of the world's helium from helium-rich fields (defined as being greater than 0.3% helium) primarily in the Central Plains and Rocky Mountain regions. Currently, the largest helium-bearing field is the giant (and depleting) Hugoton Basin that stretches from the Texas Panhandle up into Western Kansas. This gas contains, on average, 1.0% helium and is extracted in crude form (over 70% pure helium) from private plants, pipelined, and subsequently stored in the Government's Cliffside Field storage facility. As helium is withdrawn from Cliffside, it is further purified to higher grades.

Exxon Mobil, the largest single domestic producer of helium in the United States supplies roughly 25% of the nation's helium. Discovered in 1962 by Mobil, helium reserves were found in the LaBarge anticline in southwest Wyoming. Helium production, however, did not begin until Exxon's Shute Creek gas plant came on stream in 1986. The average helium content of the LaBarge anticline is 0.6% and is also nearing depletion.

Outside the United States, helium production exists via the production of Liquefied Natural Gas (LNG). Helium, having the lowest liquefaction temperature of any element, remains a gas when all other components in a gas stream have liquefied. Older plants in Poland and Russia and newer facilities in Algeria and Qatar refine helium but output is not enough to meet world demand. In 2006, The United States exported 2.18 BCF of helium which accounted for roughly 45% of U.S. helium sales. Domestic consumption was roughly 2.8 BCF. (Pacheco 2007)

In short, the world needs more helium and currently there are not enough new sources to meet this growing demand. Unfortunately, much helium is lost in the burning of natural gas due to either perceived high-cost extraction infrastructure, or oil and gas operators are simply blissfully unaware that helium exists in their gas. If helium is not extracted from a natural gas stream, it is lost forever where it ultimately leaves the earth's atmosphere.

Discovering new helium-rich fields is a crucial step if we are going to meet future demand. The United States and the rest of the world cannot rely on the helium stored in the Government's Cliffside Field as it is set to end its storage life by 2015 (mandated by Congress).

Luckily, there are hundreds of places in the United States (and world-wide) where extraction of helium is an economic reality. Kansas alone has countless smaller, discrete features where concentrations of helium reach upwards of 5%. In many cases, especially in Kansas, numerous older wells were plugged because the gas would not burn (i.e. nitrogen and helium).

On the grand scale, New Mexico will likely be the largest helium producer in the world within the next decade. Recent discoveries have tested high-helium percentages throughout the state. New Mexico, with its rich uranium basement rock, ample basement faults, and impermeable seals, will make New Mexico the next new frontier in helium exploration and production.

An exploration method that has been extremely useful in locating potential reservoirs with high helium concentrations is helium soil-gas analysis. Isolating helium in the soil using a highly sensitive mass spectrometer which measures helium in the parts per billion (ppb) range, highlights movement and accumulation of helium and (hopefully) associated hydrocarbons. Although it will not locate specific drilling locations, it does identify excess helium relative to ambient air which is indicative of an adequate source in the strata below. Ambient air's helium content is 5,240 ppb.

There are various other identified areas where helium exploration will eventually become a reality but due to a general lack of knowledge on the subject, more exploration will probably only begin when it is too late. Helium production has declined significantly while soaring world demand is struggling to cope with increasingly higher prices. In the meantime, there are very few organizations which are actively exploring for this rare and valuable commodity.