Methane still leaking from the ground at site of gas explosion decades ago

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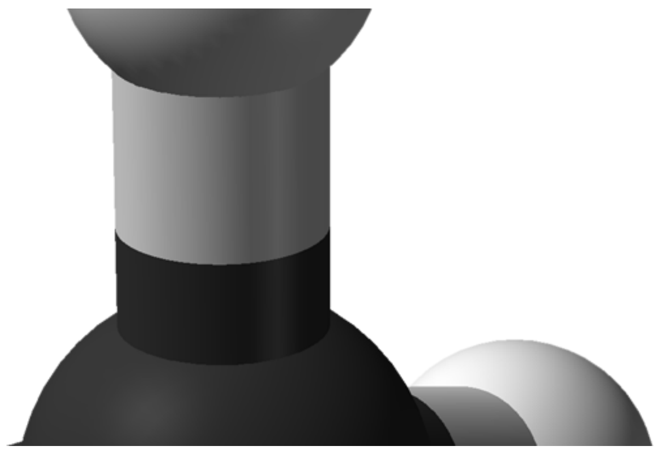

Ball and stick model of methane. Credit: Ben Mills/Public Domain

A team with members from several institutions in the Netherlands has found that the area around a site where a gas explosion occurred in 1965 is still emitting methane gas from the ground into the air. In their paper published in *Proceedings of the National Academy of Sciences*, the group describes their study of the area and the degree of hazard the gas leak poses.

Back in 1965 a team working for the Dutch Petroleum Company (NAM- a venture between Exxon and Shell) accidentally caused a natural gas explosion at a gas field in Sleen, East Drenthe (in a northeastern part of the Netherlands). The blowout turned the sand in the area to quicksand, and a drilling rig sank and disappeared into the ground. After a period of time, the area was converted into a park. But now, the area is back in the news, because the researchers with this new effort have discovered that the site is still leaking methane. NAM has also been in the news of late due to recent evidence implicating the company as the cause of small earthquakes impacting Groningen, a province just north of the former gas field.

The researchers made the discovery while looking into the environmental impact of shale gas production, including its possible contamination of groundwater. To learn more, they began testing well water in and around the park and the farmland that surrounds it. They report finding abnormally high levels of methane in the water and that its isotopic composition (its chemical signature) was very similar to that of the gas reservoir, suggesting that methane is leaking from cracks made below the surface as part of natural gas drilling operations a half-century ago.

The methane gas emissions do not present a health hazard, the researchers note, because methane is regularly cleared from drinking water as part of normal processing. But it could pose a problem if the gas accumulates in a building or structure—that could result in an explosion. But that, too, is unlikely, they further report, because the amount of gas being emitted drops quickly as distance from the site increases.

More information: Gilian Schout et al. Impact of an historic underground gas well blowout on the current methane chemistry in a shallow groundwater system, *Proceedings of the National Academy of Sciences* (2017). DOI: 10.1073/pnas.1711472115

Abstract
Blowouts present a small but genuine risk when drilling into the deep

subsurface and can have an immediate and significant impact on the surrounding environment. Nevertheless, studies that document their long-term impact are scarce. In 1965, a catastrophic underground blowout occurred during the drilling of a gas well in The Netherlands, which led to the uncontrolled release of large amounts of natural gas from the reservoir to the surface. In this study, the remaining impact on methane chemistry in the overlying aquifers was investigated. Methane concentrations higher than 10 mg/L (n = 12) were all found to have δ13C-CH4 values larger than −30‰, typical of a thermogenic origin. Both δ13C-CH4 and δD-CH4 correspond to the isotopic composition of the gas reservoir. Based on analysis of local groundwater flow conditions, this methane is not a remnant but most likely the result of ongoing leakage from the reservoir as a result of the blowout. Progressive enrichment of both δ13C-CH4 and δD-CH4 is observed with increasing distance and decreasing methane concentrations. The calculated isotopic fractionation factors of εC = 3 and εD = 54 suggest anaerobic methane oxidation is partly responsible for the observed decrease in concentrations. Elevated dissolved iron and manganese concentrations at the fringe of the methane plume show that oxidation is primarily mediated by the reduction of iron and manganese oxides. Combined, the data reveal the long-term impact that underground gas well blowouts may have on groundwater chemistry, as well as the important role of anaerobic oxidation in controlling the fate of dissolved methane.

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