

Scientists aim to boost world energy supplies -- with microbes

British and Canadian scientists expect to begin trials next month (May) to find out whether microbes can unlock the vast amount of energy trapped in the world's unrecoverable heavy oil deposits. An estimated six trillion barrels of oil remain underground because the oil has become either solid or too thick to be brought to the surface at economic cost by conventional means.

However, scientists at Newcastle University, England, and the University of Calgary, Canada, have set up a company, Profero Energy Inc, to build on their recent research, which demonstrated how naturally-occurring microbes convert oil to natural gas (methane) over tens of millions of years.

The company is preparing to move on-site to begin pumping a special mixture of nutrients, dissolved in water, down an oil well above exhausted oil deposits in western Canada. If the scientists' calculations are correct, natural gas should flow back out, as the microbes thrive on the nutrients, multiply, and digest the tar-like oil at a greatly increased rate.

Profero Energy has financial backing from Newcastle-based venture capital company Novotech Investments Ltd and is being watched with great interest by the oil and gas exploration industry. With the price of natural gas soaring in recent months, companies are becoming increasingly interested in new technologies.

A major advance in the understanding of the way that petroleum is degraded by microbes underground was made by a research team, led by Professor Ian Head and Dr Martin Jones of Newcastle University and Professor Steve Larter, who works at both Newcastle University and the University of Calgary, which published a ground-breaking paper in January this year in the international academic journal, *Nature*.

The research provided the answers to a long-standing geological puzzle by revealing that two types of microbe found in environments containing crude oil were responsible for converting it into methane. First, bacteria called Syntrophus digest the oil and produce hydrogen gas and acetic acid (the pungent ingredient of vinegar). Secondly, methanogens, a type of organism known as archaea, combine the hydrogen with carbon dioxide to produce methane.

The research team also discovered that the geological timescale of this process could be shortened to a few hundred days in the laboratory by feeding the oil-based microbes with special nutrients. They reasoned that similar results could be obtained in an oilfield in a timescale of a year to tens of years.

Professor Head, an environmental microbiologist in the Institute for Research on Environment and Sustainability at Newcastle University, commented: 'The research we published was important scientifically because it settled an argument that has been running for decades about how oil is degraded in oilfields; it turns out it is converted to natural gas.

'The discovery of how this process works could have major implications for the oil and gas industry because we think we will be able to extend the 20-30 year operating lifespan of a typical oil reservoir.

In North East England, similar processes may occur in abandoned coal mines, opening the door to a possible means for recovery of the region's extensive abandoned energy resources as clean-burning methane, said Professor Head.

Both Newcastle and Calgary universities have financial stakes in Profero Energy, which is being financed

with an initial £500,000, and a further £4 million earmarked for the future, by Novotech Investments Ltd, a venture capital company which was established to provide backing for very high value new technologies. Novotech has also invested in e-Therapeutics plc, which has powerful new drug discovery technology, and OGS Ltd, which is developing post-Google search engine technology, with UK Government help. Both of these companies are derived from research at Newcastle University.

David Rafter, a Canadian businessman specialising in technology start-ups, has been appointed Chief Executive of Profero Energy. He has negotiated with an oil company for the use of the worked-out oil well in Canada to conduct the trials.

'In a couple of years time we should know a lot more about how this technology works in practice and what proportion of the oil which is currently unrecoverable could be converted to methane gas,' he said. 'Even a small fraction could be a very attractive commercial proposition.'

Mindful of environmental considerations, Mr Rafter accepts that burning fossil fuels may contribute to climate change but points out that the world will have to rely on fossil fuels for part of its energy needs for some time to come. He argues that Profero Energy's technology is less environmentally damaging than some other technologies which oil companies have attempted to use to extract heavy oil reserves and that burning methane is environmentally preferable to burning oil.

In theory, the technology could also be used to produce hydrogen gas from inaccessible oil reserves, he said. Although no market yet exists for this clean fuel, one is likely to develop in the greener world of the future.

Profero Energy was established in a remarkably short space of time following consultation between the scientists, the commercial development teams at Newcastle and Calgary universities, and Novotech.

Newcastle University's Business Development Directorate handled the intellectual property issues and brokered the financing deal with Novotech. The Directorate worked closely with IGNITE, University Technologies International's company creation division, where Profero Energy is based. University Technologies International is the technology transfer, commercialisation and incubation centre at the University of Calgary

Robin Lockwood, Head of Commercial Development at Newcastle University, said: 'This groundbreaking research clearly had commercial potential and we knew that we had to act quickly and decisively to take full advantage.

'The days when universities did the research and left the private sector to develop the commercial potential are long gone. These days, governments expect universities to play a major role in economic development and that means being much more savvy about commercial opportunity,' he said.

Source: Newcastle University

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