'Electronic ears' to guide mining drills

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Preparing to cement an experimental geophone string in a borehole in Central Queensland. Image credit – CSIRO

CSIRO scientists with the Minerals Down Under National Research Flagship have successfully used an electronic listening post to track and control a drill operating more than 300 metres below the Earth's surface.

While there is still a lot of research to be done, CSIRO's successful trial has demonstrated, for the first time in Australia, that the use of 'microseismics' technology has significant potential in delivering cost savings and efficiency improvements in the directional drilling process for exploration and mining applications.

The trial was carried out at a coal field test site in Queensland as part of a program to develop and exploit coal seam gas.

Normally in coal seam drilling for gas, a vertical production well in the subsurface is linked to another borehole that has been drilled through the main seam where the gas is generated and channelled.

The challenge is that when using current methods to try to connect a sub-horizontal borehole to the vertical production borehole, the bit often misses the target. CSIRO's solution was to use seismic monitoring to identify the location of the drill bit from the noise it generated while drilling.

Minerals Down Under Microseismic Team leader, Dr Xun Luo, said the drill string and bit were navigated sub-horizontally towards the target gas production well situated approximately 1200m from the test drilling site.

"We used a multiple geophone array to improve the signal to noise ratio, but even so, the seismic data was still rather noisy and contaminated by periodic electrical noise signals," he said.

"However, we applied a sophisticated filtering and cancelling algorithm with the result that we could successfully identify the drill bit location and were able to intercept the target borehole at the first attempt."

A new technology that contributes to reducing the cost and increasing the efficiency of drilling could produce major benefits for the industry.

Drilling is a critical component of both the exploration and mining industries. It contributes approximately 20 per cent of exploration costs and 10 per cent of mining costs.

The initial trial and future research is being supported by one of the leading producers of coal seam gas in Australia.

Source: CSIRO