Dutch mathematician simplifies the search for oil

Mathematical research at Delft University of Technology (Netherlands) is making it easier to look for oil. Yogi Ahmad Erlangga, who receives his doctorate on Thursday 22 December, has developed a method of calculation which enables computers to solve a crucial equation much faster. In the past, this stumped oil company computers.

Funded by Shell and SenterNovem, Erlangga's research is pure mathematics. It all centres on the so-called Helmholtz equation. Solving this is important in interpreting the acoustic measurements taken when prospecting for oil. Sound waves are transmitted into the ground and their reflections recorded as they return to the earth's surface. Analysis of this data enables specialists to locate oil deposits.

In the past, these measurements have been taken two-dimensionally. Effectively, the earth was surveyed as a series of flat layers. But the oil companies would rather use a faster method involving three-dimensional blocks. Until recently, though, their computers were not powerful enough to do that. Solving the Helmholtz equation requires huge arithmetical capacity.

As part of his PhD research, Erlangga has succeeded in making the method of calculation used to solve the Helmholtz equation a hundred times faster. And that finally makes it possible for firms like Shell to use 3D calculations when prospecting for oil. So it seems highly likely that oil companies will express an interest in exploiting Erlangga's work.

But other applications are also conceivable. This is because the Helmholtz equation is used to describe many kinds of wave. Not just acoustic ones, as in the oil example, but also electromagnetic waves including visible light. It is quite feasible, therefore, that Erlangga's work could be applied to lasers – in data storage on a Blu-ray Disc, for example – or to radar measurements in aviation.

“Given the responses we have had from industry and foreign universities,” says Dr Kees Vuik, Erlangga's PhD supervisor, “we believe that a thirty-year-old problem has been solved in this work.”

Source: Delft University of Technology