

When producing oil from a thin layer with a gas cap, gas is generally unwanted since the reservoir loses pressure. The pressure loss might cause the fluid vertical migration and therefore a misplacement of the horizontal production well. This is the main reason why the oil production is held back when a gas breakthrough occurs. The well is choked, or run on lower production rates, until the oil column is recovered, but it is not known how long this will take. If the gas-oil contact could be monitored over time, then the gas breakthrough could be better prevented by reducing production from a particular well branch or even by blinding a specific part of the branch.

The aim of this research is to test if monitoring of the gas-oil contact by a seismic acquisition inside the horizontal well is feasible. This could be done much cheaper, more often and with better repeatability than classical 4D seismic. The feasibility was investigated on 2D Troll subsurface models, using finitedifference acoustic modelling. Receivers are planned in the horizontal part of the production well and suggesting the best source position was one of objectives. The influence of variations in geological settings was also investigated. The most accurate information about the gas-oil contact shape and its distance from the well is delivered by multiple sources in the horizontal part of the well. Since these multiple sources are rather difficult to install in reality, the sources placed at the sea bed and in the well junction are the most feasible. These two acquisition scenarios provide only a rough idea about the gas-oil contact shape and further modelling would be required to particularize the actual gas-oil contact position.