A Continuation Study on Petroleum Recovery Rates: Creating a Pickering Emulsion in Oil Reservoirs to Increase the Accuracy of 4D Seismic Surveys

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Current oil recovery rates are relatively low, ranging below 40%, while the costs of drilling are relatively high, approximately $42,000 a day. This will lead to a reduction in the future availability of world oil reserves. There is a requirement to examine more accurate methods of determining the exact location of fluids in oil reservoirs. Currently, 4D seismic surveys cannot detect a difference in the coefficient of reflection. The main purpose of this second year study is to determine the effectiveness of creating a Pickering emulsion in petroleum reservoirs in order to improve 4D seismic surveys. The first year study measured the coefficient of reflection in a petroleum reservoir model with a Pickering emulsion, in order to accurately pinpoint oil reservoirs. This year's project is expanded to investigate a variety of methods to inject the nanoparticles underground in order to determine the most effective and reliable manner of location determination. After extraction, the nanoparticles are separated from the mixture via fractional distillation. A 4D seismic survey was simulated, and conducted on a constricted area injected with nanoparticles. The results of these experiments showed a constant difference of 37% in the coefficient of reflection in the beaker and in the reservoir model. The fractional distillation had minimal residue of petroleum and water, and 98.3% of reusable nanoparticles. In conclusion, this elaborate statistical and economical study highlights a cost benefit of 60% that would result from using this method for petroleum exploration and potentially supporting the productivity of future oil reserves.

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