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## Application of cleaner energy to enhance oil production using magnets and nanoparticles at optimum concentration

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There is extensive growing research in using environmentally friendly methods to enhance oil recovery (EOR) from mature reservoirs. In this work, a new study using the combined effect of a magnetic field and nanoparticles (NPs) on oil-wet carbonate reservoirs is investigated. To investigate the effect of magnetic field and aluminium oxide and iron oxide nanoparticles (NPs) on oil recovery based on measurements of contact angle, rock surface charge, and surface tension. To conduct spontaneous imbibition experiments, Amott cells with a surrounding magnetic belt up to 6000 G strength was used. In oil-wet cores with an exceptionally low recovery factor (RF) of 2,73% when samples imbibed by deionized water, adding alumina to magnets led to a substantial increased in incremental RF of 14,7%. However, changing the displacement fluid from deionized water to seawater led to a lower recovery of 9.2% from alumina, which can be attributed to poor dispersion of alumina NPs. The addition of iron oxide NPs to the displacement fluid in the presence of magnets also resulted in higher recovery factors, with increases of 22.27 % and 12.78 % observed for deionized water and seawater respectively. Moreover, aluminum oxide and iron oxide NP concentrations were decreased by factors 40 and 5 relative to previous studies respectively. This technique therefore offers oil industry a cleaner EOR, helps the oil industry to maximize oil production by magnets with the lowest chemical usage and eventually increases revenues in the long term (Amrouche et al., 2021).

**Keywords:** carbonate rock, enhanced oil recovery, zeta potential, contact angle, surface tension

### Biography:

Farida Amrouche has a background in chemical engineering and aeronautical engineering. Farida is a chemical engineering researcher, and a member of the editorial board for the International Journal of Petroleum Technology. Farida is a regular reviewer for the International Journal of Astronautics and Aeronautical Engineering and reviewer for the International Conference on Hydraulic Engineering and Smart Application. She has published several papers in well-known journals, such as the Journal of Cleaner Production, Energy and Fuels and Energies.