Removal of Residual Oil from Produced Water Using Nanoparticles

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Oil Removal Process using Nanoparticles

- Preparation of nanosuspension

- Treatment Procedure

  - Mixing nanosuspension with produced water

  - Magnetic separation of nanoparticles covered with oil

- Nanoparticle Recycling

  - Solvent washing of the oil-covered nanoparticles

  - Solvent recovery using distillation techniques

Type and Characteristics of Nanopartciles

- Maghemite Nanoparticles (NP)

- Strong surface charge

- Highly magnetic and oilofilic

- Small size (10 to 50 nm)

- High surface area

- Recyclable

Treated Emulsion
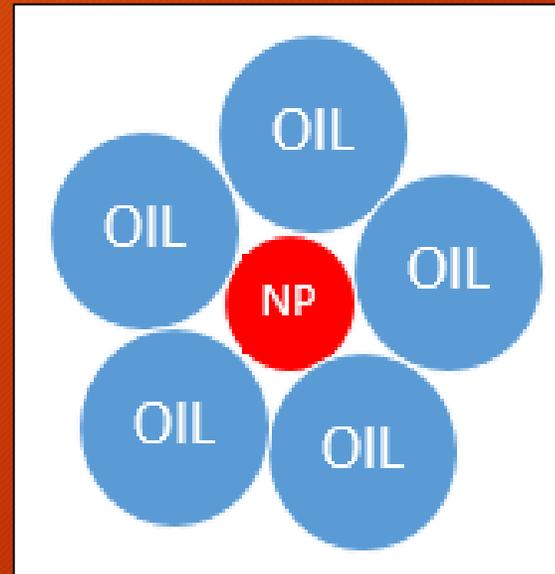
Preparation of Nanosuspension

Sonifier and Homogenizer
(Branson SFX550)

Before mixing

After mixing

Concentration: 5 mg/mL

Sonication : 2 mins @ 20% Amplitude

4

Treatment Procedure

1000 ppm O/W emulsion

Emulsion

Synthesized γ-Fe₂O₃ suspension

Nanosuspension

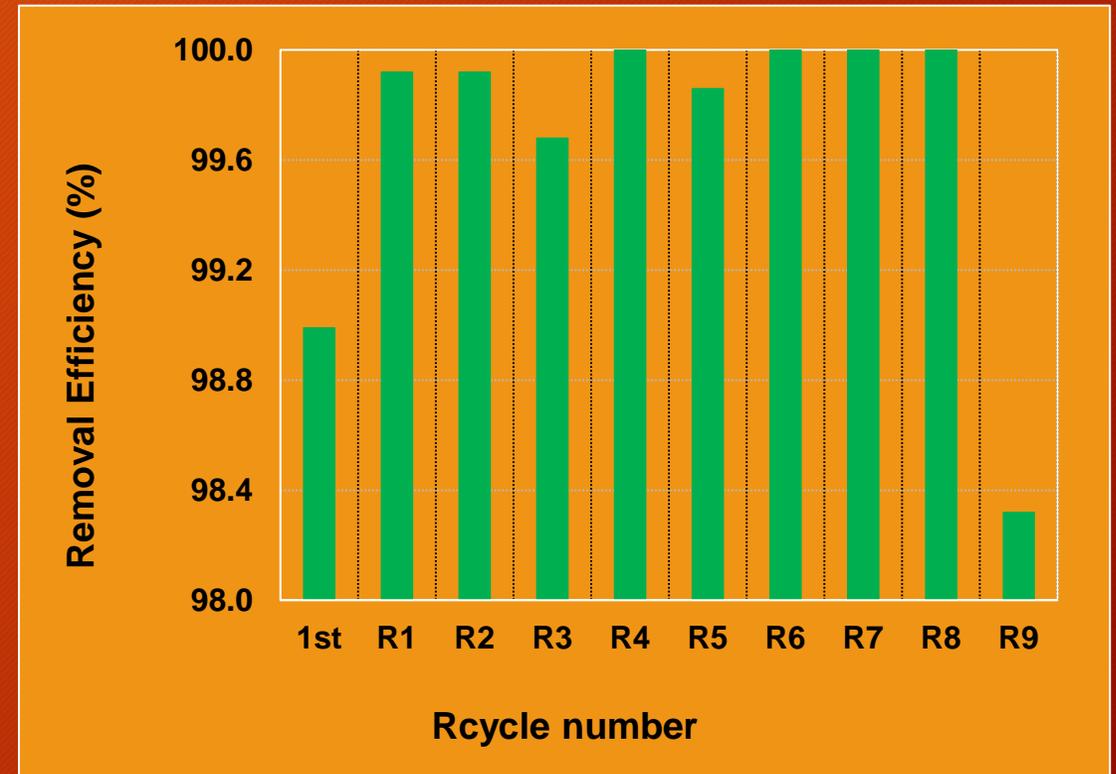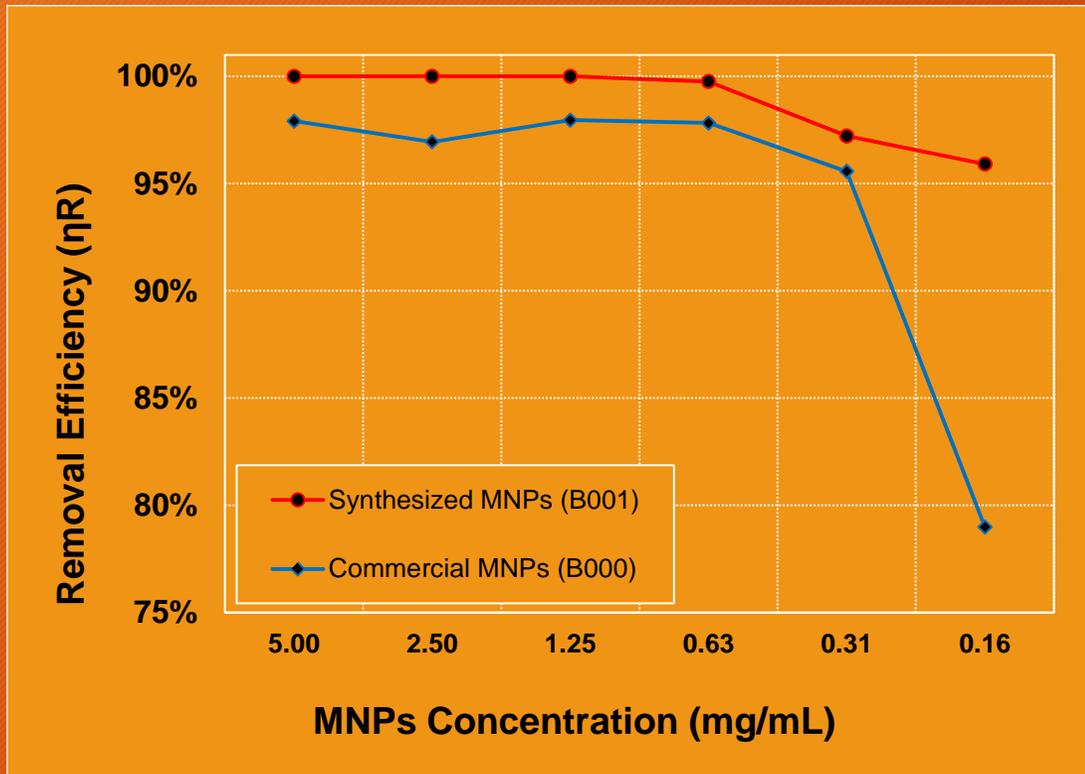γ-Fe₂O₃ suspension + emulsion

Mixture

Treated water

Magnetic Separation

Removal Efficiency and Recyclability

References for Additional Information

- Theurer, J., Ajagbe, O., Osorio, J., Elgaddafi, R., Ahmed, R., Walters, K. and Abbott, B. 2020. Removal of Residual Oil from Produced Water Using Magnetic Nanoparticles. Paper SPE-199466-PA, SPE Journal, August, DOI https://doi.org/10.2118/199466-PA.

- Theurer, J., 2019. Removal of Residual Oil From Produced Water Using Magnetic Nanoparticles. MS Thesis, University of Oklahoma, https://shareok.org/handle/11244/321399.

Thank You