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Filed demonstration of a portable TS-af-HFM nanofiltration process for the cost-effective treatment of oilfield produced water

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Statement of the Problem: Flowback and/or produced water (P/F water) is the largest byproduct stream associated with oil and gas production. The P/F water contains elevated concentrations of dissolved salt (20,000 to 300,000 ppm), suspended solids, soluble organics and low concentration of BTEX. Management of F/P water is a particular concern due to the wide range of constituents which are of concern to both unconventional shale gas developers and the environment. The overall objective of this project is to develop and demonstrate the performance and cost-effectiveness of a portable Two-Stage, Antifouling Hollow Fiber Membrane (TS-af-HFM) nanofiltration process to convert produced water into a clean water product for a reused fluid or direct discharge.

Methodology & Theoretical Orientation: Large amounts of super hydrophobic PVDF/Si-R hollow fiber membranes and super hydrophilic PES/SiO_2 hollow fiber membranes were fabricated to assemble the pilot-scale hollow fiber membrane modules for the installation of the TS-af-HFM nanofiltration system. The nanofiltration system was installed and tested in a production facility located at Carlsbad, New Mexico.

Conclusion & Significance: It was found that the permeate water flux and water recovery was proportional to the feed rate. The optimal feed rate for a single hollow fiber membrane module was in the range between 10.96-12.95 bbl/day, with the water recovery around 60%. The performance of the nanofiltration system was not influenced by the temperature. The TS-af-HFM system exhibited good antifouling ability during a continuous filtration process. A comprehensive cost analysis reveals that the TS-af-HFM system can help generate $61,468 of capitals compared to without the system

Biography

Jianjia Yu is a Research Scientist at Petroleum Recovery Research Center of the New Mexico Institute of Mining and Technology (NMIMT). His research interests include CO_2 foam EOR, CO_2 capture and produced water remediation. He has authored/or coauthored more than 35 technical papers and holds 1 US patent. He holds a PhD degree in Petroleum Engineering from NMIMT.

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