

Removal of very fine oil particles from produced water by microbubble flotation in conjunction with coagulation technic

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During the oil production process, oily waste water is coproduced at a rate several times that of oil. This water is known as produced water. Most produced water requires treatment to prevent groundwater contamination because it contains very fine oil particles as dispersed and dissolved oil, which are very difficult to separate by gravity separation. It also contains heavy metals, boron, corrosive fluids such as H₂S, and other chemicals. The treatment and disposal of produced water is a significant operating expense for oil and gas companies. Therefore, treatment levels and technologies are selected based on disposal method or reutilization objectives, environmental impacts, economics, and other such factors.

A 50 m³/day capacity pilot plant was designed, fabricated, and utilized to conduct produced water treatment trials in Oman. Pilot treatment trials of produced water from three different oilfields in Oman were carried out by nitrogen microbubble flotation in conjunction with coagulation/flocculation. Filtration and adsorption treatment processes were tested as advanced process for reutilization objectives.

Oil concentration in one of the produced waters was reduced to below the Omani standard for re-use, through microbubble flotation combined with coagulation/flocculation treatment. Oil concentrations in the other two produced waters, which had higher-initial concentrations, were reduced to below the Omani standard for marine discharge. With additional adsorption treatment, these concentrations were further reduced of the level of the re-use standard as well.

Additionally, aeration treatment was effective for removal of sulfur compounds such as sulfide from produced water.

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