



Reducing Energy Intensity of Oilfield Wastewater Treatment

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The Water Conundrum in Oil & Gas

In the GCC region, we suffer from too little water and too much water at the same time



A very large area of the Arabian peninsula is arid desert, with scarce water resources



For every barrel of oil produced, up to 9 barrels of water are extracted at the same time

Produced Water (PW)

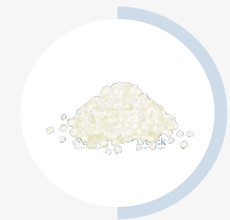
Oil and gas producers deal with water as a by-product of hydrocarbon production.



Produced water is water that is brought to the surface as part of the oil and gas production process. It contains many elements:



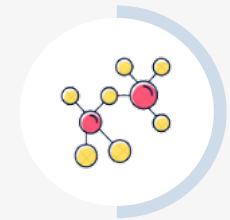
Inorganic Metals and By-products



Mineral Salts



Trace Amounts of Naturally-Occurring Radioactive Materials



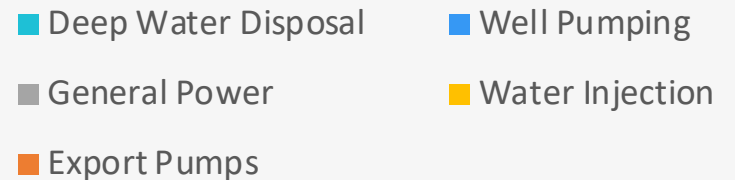
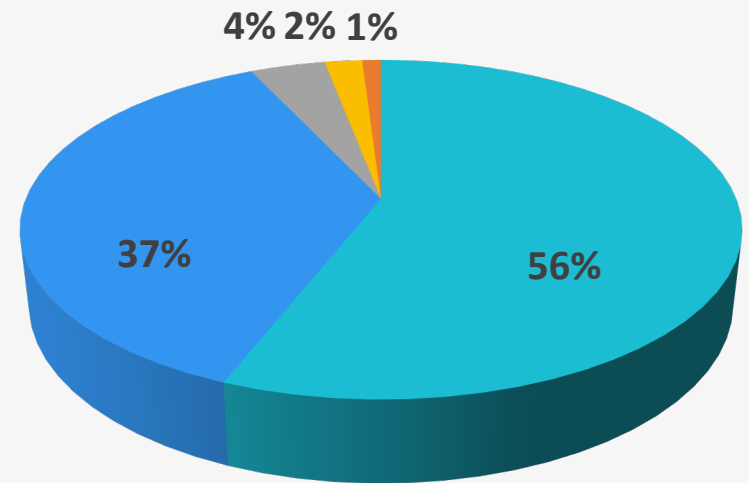
Organic Compounds (Hydrocarbons & Organic Acids, Waxes, Oils)

PW Disposal Energy Intensity Issue

Excess produced water is often disposed of via deep water disposal (pumping the water very deep, below producing reservoirs at high pressure).

This is an **energy-intensive** process up to 5.5 kWh/m³ of energy is required with associated CO₂ emissions of ~2.9 kg/m³.

Typical Power Consumption in a High Watercut Field



Example: 100,000 m³ daily water disposal requires over 200,000 MWh electricity and emits ~106,000 t of CO₂ per year.

A Water-Energy Nexus Solution – Reed Beds

Produced water, below a certain salinity, can be treated efficiently and cost-effectively using Reed Beds.

Reed beds have microbes in their roots that naturally feed on hydrocarbons. They act as a filter to remove oil from the water.



Nimr Reed Beds Project in Oman (I)

175,000 cubic metres of produced water is treated **daily** from the Nimr oil field.

Gravity flow of the produced water through the reed beds eliminates the use of pumps and injection equipment reducing total energy consumption by ~ **98%**

Disposal Options	Energy Required
Deep Well Disposal	Up to 5.5 kWh/m ³
Reed Beds	0.1 kWh/m ³



Advantages

- Fossil fuel energy savings
- GHG emissions reduction
- Clean water for irrigation
- New eco system creation
- Develop biosaline agriculture
- Local job opportunities

