

Produced Water

Water scarcity and stricter discharge regulations are critical issues at the forefront of today's oil & gas industry. Since oil & gas production both creates wastewater and requires clean water, water treatment in oil & gas and is an important factor for future growth. In light of ongoing water issues, oil & gas producers have taken on new sustainability goals that place greater emphasis on water conservation and reuse.

One type of water that is present in oil & gas production is produced water, which is water trapped in underground formations that is brought to the surface during oil & gas exploration and production. Produced water typically contains high concentrations of various contaminants, making it particularly challenging to treat through traditional methods. Produced water typically has oil levels in the range of 40-2,000 mg/L, total suspended (TSS) in the range of 1.2-1,000 mg/L, total dissolved (TDS) in the range of 1,000-400,000 mg/L and bacteria is often not present. Additionally, each oil & gas well has unique and often-changing water characteristics.

Successful produced water treatment technologies for reuse are those that can adapt to changing feed water quality while providing a reliable effluent stream. The size-exclusion mechanism of removing oil, suspended solids and bacteria from a produced water stream via ultrafiltration (UF) offers an attractive method to produce a consistent effluent stream.

ULTRAFILTRATION

MICRODYN *i*Sep™ 500 UF modules have proven to have a significantly greater oil tolerance than traditional polymeric UF membranes. These modules feature a membrane with a proprietary hydrophilic polyvinylidene fluoride (PVDF) chemistry and a 0.03 micron pore size. The membrane is configured in a spiral-wound, submerged-style (vacuum-operated), module with air-scouring and backwashing capabilities. This membrane was developed for a variety of wastewater applications, and typically treats streams with about 1,000 mg/L TSS and has successfully treated streams with as high as 3,000 mg/L TSS.

*i*Sep UF modules may be operated directly downstream of primary oil removal steps (i.e. coalescers, walnut shell filters or electro coagulation) in produced and flow back water treatment systems. In one specific case-study, *i*Sep UF modules saw oil levels as high as 300 mg/L while suspended solids were consistently greater than 50 mg/L. Undeterred by spikes in incoming water quality, the UF membrane provided consistent effluent quality: <1.0 mg/L oil & grease, <1.0 mg/L TSS and <2.0 silt density index (SDI). In fact, this effluent quality is acceptable for further treatment by reverse osmosis (RO).

REVERSE OSMOSIS

While *i*Sep UF modules greatly reduce oil & grease, suspended solids and turbidity levels, some reuse applications, including boiler feed make-up water or water for irrigation, require further treatment to remove dissolved solids (TDS). In these cases, RO elements (such as TRISEP® X-20™ low-fouling RO elements or MICRODYN RO elements) are typically used after ultrafiltration to remove a high percentage of dissolved solids, salts and contaminants to produce high purity feed water for cyclic steam boilers or for irrigation purposes. Since many oil & gas applications involve high-temperature water, MICRODYN-NADIR also offers RO elements that can handle continuous feeds of up to 80°C/176°F to lower TDS levels.

For more information, please contact MICRODYN-NADIR.

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