

Enhanced Oil Recovery Scheme in the Sultanate of Oman

The Facility

This project is an Enhanced Oil Recovery Field and is located in the South-Central area of the Sultanate of Oman, approximately 660 kilometers from Muscat and 560 kilometers from Salalah.

The design requirements for this Development are similar to most self-sufficient oilfields in a remote desert environment. The primary differences are the steam generation and associated water treatment system.

This oil-field was currently producing approximately 10,000 barrels of oil per day. With the addition of a large-scale steam flood facility plans are to increase production to approximately 150,000 barrels per day within the next few years and to recover approximately 1 billion barrels of oil over the life of the project.

Treatment of produced water will be by a Mechanical Vapor Compression (MVC) technology and will be developed in two phases. Each phase will produce 300,000 Barrels of Water Per Day (BWPD) of boiler feed water to the steam generators for generation of steam. The brine from the MVC units will be collected in a settling pond and then injected into a deep well disposal system.



The Solution

The system offered for this project is a fully integrated automated system incorporating a multiple effect MVC Brine Concentrator. The high purity distillate produced in this system will be used as feed water for the steam generator plant.

This water treatment facility is one of the largest produced water treatment systems. The system consists of seven identical MVC trains each having 42,860 BWPD (1,250 gpm) capacity.

In a Steamflood Enhanced Oil Recovery process, steam is injected in the wells, approximately 800 well pairs at this particular Oman Plant. Steam injection lowers the viscosity of heavy oil suitable for extraction through the production wells. The fluid from the wells is a mixture of oil, water & gas and goes through a separation system to separate the three. The separated water is called Produced Water and is heavily contaminated with dissolved solids and hydrocarbons. At this Oman plant approximately 90% of this Produced Water is purified through MVC system that generates a product of < 10 ppm total dissolved solids content to feed the OTSGs for production and injection of steam. Thus the facility has a very high recycle / reuse of waste for use in the facility that would otherwise be compensated through fresh water from the aquifer (Ghariff).

Since the system is based on MVC technology it lends itself well to a zero liquid discharge configuration at a later stage if the facility starts experiencing disposal limitations.



PROJECT PROFILE SERIES #57

DESIGN WATER ANALYSIS

pH Units.....7.5 – 8.2
 Ca.....300 – 609
 Mg.....60 – 296
 TH (as CaCO₃).....995 – 2,742
 Na.....7,936 – 8,555
 K.....100 – 224
 Li.....0.1 – 0.2
 Ba.....0.11 – 0.3
 Fe.....0.0 – 0.1
 Sr.....2.1 – 20

HCO₃.....145 - 470
 Cl.....4,350 – 13,700
 SO₄.....10 – 909
 SiO₂.....20 – 250
 B.....1.8 – 5
 TDS (calc.).....8,056 – 23,650
 TSS mg/l.....2 – 15
 Oil ppm.....1.8 – 20
 Dissolved H₂S.....4 – 30
 Water Temperature.....30 – 85 °C

PROCESS FLOW DIAGRAM

