Water Injection Plant to treat Components, Particles in Water Shipped from Aquifer

By Mohammed Fenais and Abdullah Alabdrabalnabi

For the first time in the Company, the Marjan and Zuluf Increment Program is designing and constructing a new Water Injection Plant (WIP) at Tanajib Oil Plant to treat the water shipped from aquifer. This water will be treated to remove associated gases, dissolved oxygen, iron, and suspended solid particles, and then pumped by high-pressure pumps and routed through an offshore pipeline for injection into offshore water injection wells to enhance oil production in the Marjan field.

Reservoir requirements

The challenge of meeting the reservoir requirements is that it cannot utilize seawater for injection and instead use aquifer water to maintain the reservoir formation specification. The process of this water treatment is unique because it includes additional separation such as iron oxidation and bulk solid removal, filtration, and thickening and solid handling after degassing by removing the hydrocarbon gas.

Design consideration

Even though this water treatment is a complex process, the philosophy of the design of the system is that it is simple to install, operate, and maintain. The process is fully automated with the requirement of limited intervention. The chemical used to facilitate the treatment is selected based on suitability of the treatment as well as easiness of transporting and storing.

WIP process

There is a need, therefore, to remove iron from the aquifer water to a maximum level of 2 mg/l of dissolved iron. Such removal will prevent blockage of oil formation with iron precipitation in the offshore wells to an appropriately low level, avoiding any complication in the reservoir once the water is reinjected. Following iron removal, the water is filtered to remove any solid particles greater than 2 microns.

The removal of iron is fulfilled by chemical reaction with potassium permanganate (KMnO4) as the oxidant. The process of bulk solids extraction from water can be successfully achieved by passing through a clarifier and filtration unites. This process of the removal of large particles enhances the performance of the offshore reservoir. All filtered solid wastes are collected in a designated tank bunker for contained storage and onward loading for off-site disposal.

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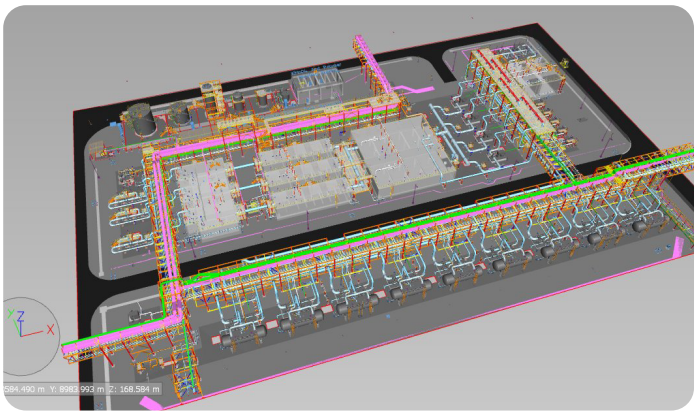

3D Modle for new water Injection plant

Effective solution and wider application

Badr M. Burshaid, manager of Marjan & Zuluf Increment Projects Department, when explaining the mechanism said, “Treated water is redirected back to the water injection wells and, therefore, no water will be wasted. With collaboration from other Saudi Aramco organizations, this type of water treatment plant shall be the reference icon key to reaching more effective solutions and opening more doors to wider application in future projects.”

In conclusion, the new WIP at Tanajib Oil Plant will ensure meeting the reservoir water injection requirement by treating the water from aquifer. As a result, this will increase the oil production from Marjan field.