Accelerate the early production in an environmentally sensitive area

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Abstract

The paper presents the case study on starting-up new offshore multi-lateral wells located in an environmentally sensitive area. Any new well is flowed back to clean from completion and stimulation fluid before connecting to production line. These activities may create high risk for environmental damage and delayed production.

The well flowback includes handling large amount of water (completion and stimulation fluid), oil and gas while flowing the well at high rates at surface with rapidly changing flow conditions. To predict the expected surface flow conditions the transient well clean-up modeling was done to design the well kick-off and the surface equipment and build the procedure for different flow scenarios. This model was integrated with emission calculator to predict the emission and develop the choke sequence strategy to reduce it.

It required to deploy the advanced surface fluid treatment package which can separate efficiently oil, gas and water at any gas to liquid ratio, water content and liquid flow-rate up 15000 Bbld. It included the flow control and fluid heating, multiphase metering, 3-phase separation with adjustable weir height of oil outlet, deep oil treatment to minimize any water droplets in oil and smokeless oil burner.

Moreover, the surface fluid treatment package was integrated into the well intervention barge to improve the efficiency. It allowed to install coiled tubing for stimulation and nitrogen lifting and advanced surface fluid treatment package permanently.

The introduction of the well intervention system on the barge with advanced fluid treatment and disposal package increased the efficiency and improved HSE performance. The efficiency improved thanks to elimination of the operations related to spotting, lifting, skidding to platform of all surface equipment, and reducing the time for rig up/rig down, pressure test by 66 %. The consistency between different wells with the same set-up increased the HSE performance with zero HSE incidents for total 34968 man-hours.

The introduction of three phase separator with smart weir and multiphase metering upstream of the separator minimized the carry-over of water into oil with changing, high water-cut variation from 98% (initial period) and 1% (late period).

The deep oil treatment in a vertical tank with chemical injection and heating capacity removed small water content from oil and this help to avoid any slug of water sent to burner which can lead oil spill.

The system allowed to clean 35 multi-lateral wells in 4 months enabling the accelerated production enhancement for the field.

For the first time, the well intervention barge with advanced fluid treatment and coiled tubing was introduced in Saudi Arabia. It will be used as a reference to develop more intervention barges to bring new wells on production quickly.