Mobile Gas Lift Compressor and Well Unloading System for Enhancing Oil Production and Reserves, While Reducing Greenhouse Gas Emissions in Offshore Environments

Abstract

The mobile offshore gas lift system discussed in this paper is a novel concept combining two production enhancement methods for oil wells which enables the unlocking of vast oil resources from offshore reservoirs. The system has been successfully trialed in Benchamas Field, Gulf of Thailand (GoT), adding significant incremental production and reserves, while reducing greenhouse gas emissions from legacy ‘Well Unloading Units’ used in the field.

The innovative system, named WUUC, optimizes oil production by allowing wells to be subject to very low backpressure at surface while also being gas lifted simultaneously, using otherwise vented hydrocarbon gas.

The system incorporates a 3 phase separator and surge tank to separate fluids from the production stream, with an inlet pressure as low as 30 psi. Liquids are pumped back into the production pipeline at system pressure while the gas is captured in a 3 stage reciprocating compressor, compressed to approximately 1100 psi, and directed to a gas lift manifold which distributes the gas to multiple wells for gas lifting.

A unique aspect of this system is its mobility. The entire system is modular and can be rigged up or down in a single 12 hour shift offshore, using standard platform cranes. This enables the unit to service multiple wellhead platforms offshore for maximum usage, supporting a low cost, pay-as-you-go rental model for the equipment. Its small footprint offshore allows flexibility to perform wireline activities simultaneously while operating the unit, an important benefit in high activity operations such as Thailand.

The system began field testing in July 2009 on the ‘REX’ platform in Benchamas Field, GoT. 2 MMscf/d of associated gas is captured from the production stream, compressed to high pressure and used to gas lift four oil wells (previously shut-in and depleted) on the remote platform, adding 2,000 bopd incremental oil. The production results and system reliability have been outstanding. After 2 ½ years of operation the unit has had 97% reliability and added over 900 Mstb of incremental oil. These are reserves which would otherwise have been left unrecovered due to economic constraints of installing a conventional gas lift compressor and/or electrical submersible pump (ESP) on the remote wellhead platform.

In addition to these production gains, the system has prevented the release of over 1.5 Bscf of greenhouse gas, which would otherwise have been vented to atmosphere, and utilized it instead for gas lifting application.

Due to its mobility, low risk pay-as-you-go business model, and small footprint, the WUUC system has potential to be applied in multiple offshore locations globally, adding significant oil production and reserves, while reducing greenhouse gas emissions.