

ABSTRAK

OPTIMASI *CAPILLARY STRING* SEBAGAI METODE *DE-LIQUIFICATION* PADA SUMUR X DAN Y DI LAPANGAN- DYT

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Liquid loading merupakan salah satu penyebab utama penurunan performa produksi pada sumur gas. Akumulasi cairan di dasar sumur menyebabkan tekanan dasar sumur (*bottom hole pressure*) meningkat dan laju alir produksi gas menurun. Kondisi tersebut dialami oleh Sumur X dan Y pada Lapangan DYT yang menunjukkan tren penurunan produksi signifikan serta peningkatan tekanan *flowing tubing high pressure (FTHP)* yang dapat dilihat pada data histori produksi. Untuk mengatasi permasalahan tersebut, dilakukan upaya optimasi sistem *capillary string* pada re-desain surfaktan dan rate injeksi yang dinilai dapat membantu menurunkan kolom cairan dan meningkatkan efisiensi produksi gas. Hal ini dilakukan sebab, sebelumnya telah dilakukan sensitivitas ukuran *choke* dan tekanan kepala sumur. Akan tetapi masih belum dapat membantu mengurangi permasalahan *liquid loading*.

Metodologi penelitian meliputi pengumpulan data dasar sumur, data produksi historis, serta karakteristik fluida reservoir. Analisis dilakukan menggunakan pendekatan *nodal analysis* dengan bantuan perangkat lunak simulasi untuk mengevaluasi kinerja sumur sebelum dan sesudah instalasi *capillary string*. Selanjutnya dilakukan analisis sensitivitas terhadap beberapa parameter desain, seperti, laju injeksi *chemical*, laju produksi gas serta tekanan operasi, untuk mendapatkan konfigurasi optimum. Hasil optimasi dievaluasi berdasarkan perubahan tekanan dasar sumur, laju produksi gas, serta efisiensi aliran fluida di dalam tubing.

Hasil penelitian menunjukkan bahwa optimasi *capillary string* dengan desain pada sumur X dari semula 5 GPD menjadi 8 GPD mampu meningkatkan produksi gas yang semula 121 MSCF menjadi 172.57 MSCF. Optimasi pada sumur Y dari semula 5 GPD menjadi 7 GPD mampu meningkatkan produksi gas yang semula 103 MSCF menjadi 121.2 MSCF. Penerapan metode ini terbukti dapat mengurangi permasalahan *liquid loading* serta meningkatkan produksi sumur sehingga diharapkan sistem *capillary string* ini dapat menjadi solusi *de-liquification* yang efisien untuk sumur gas di Lapangan DYT maupun lapangan lain dengan kondisi serupa.

Kata kunci: *Capillary String*, *De-Liquification*, *Liquid Loading*, Optimasi, Produksi Gas

ABSTRACT

OPTIMIZATION OF CAPILLARY STRING APPLICATION FOR DE-LIQUIFICATION IN WELL X AND Y OF THE DYT FIELD

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Liquid loading is a major cause of decreased production performance in gas wells. The accumulation of fluid at the bottom of the well causes increased bottomhole pressure and a decrease in gas production flow rate. This condition was experienced by Wells X and Y in the DYT Field, which showed a significant trend of declining production and increasing flowing tubing high pressure (FTHP) pressure, as evidenced by historical production data. To address this issue, efforts were made to optimize the capillary string system by redesigning the surfactant and injection rate, which were deemed to help reduce the liquid column and increase gas production efficiency. This was done because previously conducted sensitivity studies on choke size and wellhead pressure were conducted, but these still failed to reduce the liquid loading problem.

The research methodology included collecting baseline well data, historical production data, and reservoir fluid characteristics. The analysis was conducted using a nodal analysis approach with the aid of simulation software to evaluate well performance before and after capillary string installation. Furthermore, sensitivity analyses were conducted on several design parameters, such as chemical injection rate, gas production rate, and operating pressure, to determine the optimum configuration. The optimization results were evaluated based on changes in bottomhole pressure, gas production rate, and fluid flow efficiency within the tubing.

The research results show that optimizing the capillary string design in well X from 5 GPD to 8 GPD was able to increase gas production from 121 MSCF to 172.57 MSCF. Optimization of well Y from the original 5 GPD to 7 GPD was able to increase gas production from 103 MSCF to 121.2 MSCF. The application of this method has been proven to reduce liquid loading problems and increase well production. So it is hoped that this capillary string system can be an efficient de-liquification solution for gas wells in the DYT Field and other fields with similar conditions.

Keywords: capillary string, de-liquification, gas production, liquid loading, optimization.