ABSTRAK

INTEGRATED RESERVOIR MODELLING DALAM OPTIMASI PENGEMBANGAN LAPANGAN "ZZ" DENGAN METODE PRODUKSI *GAS LIFT* MENGGUNAKAN SIMULATOR TNAVIGATOR

Oleh
Azhar Faari Fatahillah
NIM: 113210003
(Program Studi Sarjana Teknik Perminyakan)

Lapangan "ZZ" merupakan lapangan *greenfield*, sehingga diperlukan perencanaan pengembangan lapangan tahap awal untuk menentukan strategi produksi yang tepat. Meskipun masih pada tahap pengembangan lapangan awal, kondisi *offshore* dan ketersediaan gas yang melimpah menjadikan metode *gas lift* sebagai pilihan yang tepat. Selain itu, kompleksitas pengembangan lapangan yang melibatkan reservoir, sumur, dan fasilitas permukaan memerlukan pendekatan yang terintegrasi untuk mendapatkan perencanaan pengembangan yang optimal.

Penelitian ini dilakukan dengan pendekatan *Integrated Reservoir Modelling* (IRM) menggunakan simulator tNavigator. Tahapan penelitian meliputi pengumpulan data, inisialisasi reservoir, penempatan sumur menggunakan algoritma *Particle Swarm Optimization* (PSO), serta *running basecase* tanpa metode *artificial lift*.

Dari lima sumur *basecase*, dua sumur yaitu Dev_19_GL dan Dev_21_GL terpilih berdasarkan *screening criteria* untuk dilakukan desain parameter *gas lift*, mencakup laju dan tekanan injeksi, serta *spacing valve* berdasarkan teori Brown (1984). Hasil simulasi menunjukkan bahwa *gas lift* mampu meningkatkan produksi minyak secara signifikan, dengan *incremental oil* sebesar 6.068 MMSTB pada pendekatan konvensional dan 3.474 MMSTB pada IRM. Deviasi antara kedua pendekatan tercatat sebesar 3–5% untuk total produksi minyak dan 28% pada *peak* laju produksi *liquid*. Nilai produksi yang lebih rendah pada pendekatan IRM disebabkan oleh berbagai *constraint* teknis dari *subsurface* hingga *surface*. Meskipun demikian, IRM memberikan estimasi yang lebih akurat karena mempertimbangkan keterkaitan antara sistem reservoir, sumur, dan fasilitas permukaan secara terintegrasi, sehingga menjadikan IRM sebagai pendekatan yang lebih realistis dalam perencanaan pengembangan lapangan.

Kata kunci: *gas lift*, *integrated reservoir modelling*, simulasi pengembangan awal.

ABSTRACT

INTEGRATED RESERVOIR MODELLING FOR FIELD "ZZ" DEVELOPMENT USING GAS LIFT PRODUCTION METHOD WITH TNAVIGATOR SIMULATOR

By
Azhar Faari Fatahillah
NIM: 113210003
(*Petroleoum Engineering Undergraduated Program*)

Field "ZZ" is a greenfield development, thereby requiring an initial field development planning stage to determine an appropriate production strategy. Although still in the early development phase, the offshore setting and abundant gas availability make gas lift a suitable artificial lift method. Moreover, the complexity of field development, which involves the integration of reservoir, well, and surface facilities, necessitates a comprehensive approach to achieve an optimal development plan.

This study was conducted using an Integrated Reservoir Modelling (IRM) approach with the tNavigator simulator. The research workflow includes data acquisition, reservoir initialization, well placement using the Particle Swarm Optimization (PSO) algorithm, and the execution of a base case scenario without any artificial lift application.

Out of five base case wells, two wells namely Dev_19_GL and Dev_21_GL were selected based on screening criteria for gas lift parameter design, including injection rate, injection pressure, and valve spacing following Brown's (1984) theory. Simulation results indicate that the application of gas lift significantly increase oil production, with incremental oil of 6.068 MMSTB for the conventional approach and 3.474 MMSTB for the IRM approach. The deviation between the two approaches is recorded at 3 to 5 percent in cumulative oil production and 28 percent in peak liquid production rate. The lower production observed in the IRM scenario is attributed to various technical constraints ranging from subsurface limitations to surface facility capacities. Nevertheless, the IRM approach provides a more accurate estimation of field performance by accounting for the integration among the reservoir, wells, and surface facilities, making it a more realistic basis for field development planning.

Keywords: early-stage development simulation , gas lift, integrated reservoir modelling, optimization.