# RINGKASAN

Lapangan Prabumulih merupakan salah satu penghasil minyak dan gas terbesar di wilayah kerja PT Pertamina Hulu Rokan Zona 4 dengan rata-rata produksi sebesar 7.206 BOPD dan 129 MMSCFD. Rekapitulasi data *low and off* tahun 2021 menunjukkan permasalahan kenaikan kadar air telah menyebabkan kehilangan produksi sebesar 131.951 barrel oil. Sumur NCM-60 mengalami permasalahan kenaikan kadar air dengan kehilangan produksi sebesar 12.039 barrel oil. Metode yang digunakan saat ini untuk mengidentifikasi permasalahan kenaikan kadar air masih bersifat kualitatif dan menggunakan banyak asumsi sehingga keberhasilan pekerjaan *water shut off* masih rendah.

Metode identifikasi permasalahan kenaikan kadar air secara tepat dan akurat dilakukan dengan beberapa tahapan. Tahap pertama adalah pengumpulan data potensi lapisan, data produksi, data *Open Hole Log*, data *Cement Bond Log* (CBL), data *Variable Density Log* (VDL), data penampang dan riwayat sumur. Tahap kedua adalah pembuatan dan analisa C*han Diagnostic Plot*. Tahap ketiga adalah menerapkan metode *advance flow diagnostic* menggunakan *Acoustic Leak Flow Analyzer* (ALFA) Log pada kondisi sumur statis dan dinamis. Profil aliran, profil tekanan dan profil *temperature* yang dihasilkan dari ALFA log digunakan untuk menentukan spesifik *interval crossflow behind casing*, spesifik *interval casing/barrier leaks*, dan spesifik *interval identified thief zone* pada sumur produksi. Tahap keempat adalah optimasi *water shut off* dengan pemilihan metode *specific remidial cementing*. Tahap kelima adalah reperforasi lapisan produktif. Tahap keenam adalah evaluasi hasil *water shut off* dengan melakukan pengukuran ulang ALFA log dan observasi produksi.

Hasil penerapan metode *advance flow diagnostic*, sumur NCM-60 mengalami *channeling* dari lapisan D3 (1110.5-1111.5 mMD) ke lapisan D2 (1095-1096 mMD), *channeling* dari lapisan D1 (1084.5-1087 mMD) ke permukaan dan tidak ada kecoboran di *bridge plug*. Sumur NCM-60 dilakukan *squeezed cementing* pada lapisan D1 dan lapisan D2 dengan volume *slurry* sebesar 4.53 bbl. Reperforasi dilakukan pada lapisan produktif eksisting D1 dan D2. Hasil evalusi pengukuran ulang ALFA log sudah tidak ada *channeling behind casing* antara lapisan D1, D2, dan D3, sedangkan hasil observasi produksi sumur NCM-60 memperoleh Gross/Nett/WC sebesar 201 BLPD/43 BOPD/ 78%. Berdasarkan hasil pengamatan produksi tersebut optimasi *water shut off* dan reperforasi dengan metode *advance flow diagnostic* pada sumur NCM-60 dinyatakan berhasil menurunkan kadar air sebesar 22% dan meningkatkan produksi sebesar 43 BOPD. Perhitungan keekonomian diperoleh POT sebesar 373 hari, dengan potensi keuntungan per tahun sebesar Rp 13,745,681,000.

**Kata Kunci:** ***Penurunan produksi, kenaikan kadar air, metode advance flow diagnostic, optimasi water shut off, reperforasi.***

## ABSTRACT

Prabumulih Field is one of the biggest oil and gas producer in the working area of PT. Pertamina Hulu Rokan Zona 4 with average oil production rate and gas production rate are 7,206 BOPD and 129 MMSCFD respectively. A 2021 Low & Off summary showed that the increasing water cut problem had caused total loss oil production of 131,951 bbl. The NCM-60 well experienced an increase of water cut issue which caused the production loss rate of 12,039 bbl. Currently used method to identify the increasing water cut problem is still qualitative and using too much uncertain assumptions so that the success ratio of water shut-off jobs is still quite low.

The quick and accurate method of identifying the increasing water cut problem was performed in several steps. The first step was to collect the data of potensial layer, production history, Open Hole log, Cement Bond Log (CBL) result, Variable Density Log (VDL) result, well profile and well history. The second step was to develop and analyze Chan's Diagnostic Plot. The third step was to implement Advance Diangostic Plot using ALFA log in static and dynamic condition. The flow, pressure, and temperature profile from ALFA log were used to determine the specific crossflow behind casing interval, casing/barrier leaks interval and identified-thief zone interval in the production well. The fourth step was to optimize water shut-off jobs by choosing specific remedial cementing method. The fifth step is reperforation of the productive layer. The last step was to re-evaluate the water shut off result by re-running ALFA log and production observation.

The evaluation result of ALFA log in NCM-60 well showed that the channeling occurred from layer D3 (at 1110.5-1111.5 mMD) to layer D2 (1095-1096 mMD) and from layer D1 (1084.5-1087 mMD) to surface, while the Bridge Plug was considered to be in good condition/no leakage. At the NCM-60 well, the squeeze cementing job was performed at layer D1 and layer D2 with the cement slurry volume of 4.53 bbl. Reperforation was carried out on the existing productive layers D1 and D2. The evaluation results of ALFA log re-measurements showed that there was no channeling behind casing between layers D1, D2 and D3, while the production observation, the NCM-60 well obtained Gross / Nett / WC / Gas Rate of 201 BLPD / 43 BOPD / 78%. Based on the production test result, the optimization through water shut-off and reperforation jobs using Advance Flow Diagnostic method in the NCM-60 well was considered successful in decreasing water cut by 22% and increasing production by 43 BOPD. Economic calculations result of POT is 373 days, with potential profit per year is IDR 13,745,681,000.



**Keyword:** ***Production decline, increasing water cut, advance flow diagnostic method, water shut-off optimization, reperforation.***