ABSTRAK

DESAIN *LIGHTWEIGHT CEMENT SLURRY* PADA *TUBING* 3½" *MONOBORE CEMENTED CASING COMPLETION:* STUDI KASUS SUMUR NA-27 LAPANGAN NAP

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Fenomena *lost circulation* selama proses pengeboran merupakan tantangan yang sering dihadapi oleh perusahaan minyak dan gas bumi. Kehilangan *cement slurry* ke dalam formasi menjadi salah satu akar permasalahan dalam pengendalian sumur dan biaya lumpur yang tinggi. Kondisi ini juga berlaku pada operasi penyemenan, terutama pada formasi dengan tekanan yang rendah, *depleted zone,* dan *weak formation.* Kondisi tersebut ditemukan pada Sumur NA-27 di Lapangan NAP, yang memiliki formasi bertekanan rendah akibat *depleted zone* dan berpotensi mengalami *lost circulation* selama proses penyemenan berlangsung.

Penelitian ini dilakukan melalui tahapan perancangan formulasi *lightweight cement slurry* menggunakan material *hollow glass microsphere*, dilanjutkan dengan pengujian laboratorium untuk mengevaluasi sifat *slurry* sesuai standar API. Hasil pengujian digunakan sebagai dasar perhitungan volume, *pump schedule*, serta perhitungan *equivalent circulating density* (ECD). Tahap akhir mencakup analisis keekonomian untuk menilai kelayakan desain pada penyemenan tubing 3½" dengan konfigurasi *monobore cemented casing completion* di Sumur NA-27.

Hasil pengujian menunjukkan bahwa *slurry* dengan densitas 13 ppg untuk *lead* dan *tail* memenuhi standar teknis API. Penambahan *hollow glass microsphere* menurunkan densitas tanpa mengurangi kekuatan mekanis. *Compressive strength* melebihi 1000 psi dalam 24 jam dan *static gel strength* meningkat bertahap sehingga risiko *gas migration* dapat ditekan. Nilai *free fluid* dan *fluid loss* berada di bawah batas maksimum. Nilai ECD pada TD di 8066 ft TVDSS sebesar 13,14 ppg, masih di bawah *fracture gradient*. Desain ini terbukti efektif untuk penyemenan tubing 3½" dengan konfigurasi *monobore cemented casing completion* pada formasi tekanan rendah Sumur NA-27.

Kata kunci: *hollow glass microsphere, lightweight cement slurry, monobore cemented casing completion.*

ABSTRACT

LIGHTWEIGHT CEMENT SLURRY DESIGN FOR 3½" TUBING MONOBORE CEMENTED CASING COMPLETION: CASE STUDY OF WELL NA-27 NAP FIELD

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The phenomenon of lost circulation during the drilling process is a challenge often faced by oil and gas companies. The loss of cement slurry into the formation is one of the root problems in well control and the high cost of sludge. This condition also applies to cementing operations, especially in formations with low pressure, depleted zones, and weak formations. This condition was found in the NA-27 Well in the NAP Field, which has a low-pressure formation due to the depleted zone and has the potential to experience lost circulation during the cementing process.

his research was carried out through the design stage of lightweight cement slurry formulation using hollow glass microsphere material, followed by laboratory testing to evaluate the properties of the slurry according to API standards. The test results were used as the basis for calculating volume, pump schedule, and calculating equivalent circulating density (ECD). The final stage includes an economic analysis to assess the feasibility of a design on the cementing of a 3½" tubing with a monobore cemented casing completion configuration in Well NA-27.

The test results showed that the slurry with a density of 13 ppg for lead and tail met API technical standards. The addition of hollow glass microspheres lowers the density without reducing mechanical strength. Compressive strength exceeds 1000 psi in 24 hours and static gel strength increases gradually so that the risk of gas migration can be suppressed. The value of free fluid and fluid loss is below the maximum limit. The ECD value at TD at 8066 ft TVDSS was 13.14 ppg, still below the fracture gradient. This design proved to be effective for cementing 3½" tubing with a monobore cemented casing completion configuration on the NA-27 Well's low-pressure formation..

Keywords: *hollow glass microsphere, lightweight cement slurry, monobore cemented casing completion.*