

## ***ABSTRACT***

### ***DETERMINATION OF RATE OF PENETRATION (ROP) USING THE BOURGOYNE AND YOUNG METHOD BASED ON OPTIMUM WOB AND RPM IN WELL PF-07, SEMBADA FIELD***

By  
Thomas Pandhu Firmansyah  
NIM: 113210077  
(Petroleum Engineering Undergraduated Program)

*Drilling operations represent a crucial stage in the exploration and production of oil and gas. One of the common challenges encountered during this process is the low value of the rate of penetration (ROP). In practice, drilling operations are always optimized to achieve an efficient ROP in order to enhance drilling performance. The ROP itself is influenced by several factors, including the characteristics of the penetrated formation, drilling fluid properties, drilling hydraulics, mechanical variables such as weight on bit (WOB) and rotary speed (RPM), as well as the type of drill bit employed.*

*In this study, five drilling scenarios were conducted using a trial-and-error approach by varying WOB and RPM data in each case. The ROP for each scenario was then calculated using the Bourgoyne and Young method, which was then validated by considering three parameters: drill string analysis, hole cleaning factor, and economic evaluation. Drill string analysis was performed to ensure that the selected scenarios remain safe against mechanical loads on the drill string. Furthermore, hydraulic analysis was carried out to assess the effectiveness of hole cleaning under the proposed scenarios. Finally, the economic aspect was evaluated using the cost per foot method, considering that an increased ROP can reduce drilling costs by shortening the overall drilling time.*

*Based on the calculations, the best scenario for well “PF-07” achieved average ROP values of 82.37 ft/hr for the 26” hole section, 119.25 ft/hr for the 17.5” section, 102.19 ft/hr for the 12.25” section, and 76.29 ft/hr for the 8.5” section. The planned ROP also met the hole cleaning criteria, with lifting capacity (CTR) values at each section remaining positive and  $\geq 50\%$ , and cuttings capacity annulus (CCA) values maintained below 5%. The obtained cost value is 121832.20 USD, which is lower than the base case value of 147135.65 USD, yielding a cost reduction of 25303.46 USD.*

*Keywords: bourgoyne and young, rate of penetration, RPM, WOB, cost per feet.*

# DAFTAR ISI

|                                                                       | Halaman     |
|-----------------------------------------------------------------------|-------------|
| <b>HALAMAN JUDUL .....</b>                                            | <b>i</b>    |
| <b>LEMBAR PENGESAHAN .....</b>                                        | <b>ii</b>   |
| <b>PERNYATAAN KEASLIAN KARYA ILMIAH.....</b>                          | <b>iii</b>  |
| <b>HALAMAN PERSEMBAHAN .....</b>                                      | <b>iv</b>   |
| <b>PRAKATA .....</b>                                                  | <b>v</b>    |
| <b>ABSTRAK .....</b>                                                  | <b>vi</b>   |
| <b><i>ABSTRACT</i> .....</b>                                          | <b>vii</b>  |
| <b>DAFTAR ISI.....</b>                                                | <b>viii</b> |
| <b>DAFTAR GAMBAR.....</b>                                             | <b>xi</b>   |
| <b>DAFTAR TABEL .....</b>                                             | <b>xii</b>  |
| <b>DAFTAR LAMPIRAN .....</b>                                          | <b>xiii</b> |
| <b>DAFTAR SINGKATAN DAN LAMBANG .....</b>                             | <b>xiv</b>  |
| <b>BAB I PENDAHULUAN.....</b>                                         | <b>1</b>    |
| 1.1. Latar Belakang .....                                             | 1           |
| 1.2. Rumusan Masalah.....                                             | 2           |
| 1.3. Tujuan .....                                                     | 3           |
| 1.4. Batasan Masalah .....                                            | 3           |
| 1.5. Lokasi Penelitian.....                                           | 3           |
| 1.6. Luaran Penelitian .....                                          | 3           |
| 1.7. Manfaat Penelitian .....                                         | 4           |
| <b>BAB II TINJAUAN PUSTAKA DAN LANDASAN TEORI.....</b>                | <b>5</b>    |
| 2.1. Tinjauan Lapangan PF-07.....                                     | 5           |
| 2.1.1. Stratigrafi Regional Cekungan Jawa Timur Utara .....           | 5           |
| 2.1.2. <i>Petroleum System</i> Cekungan Jawa Timur Utara .....        | 9           |
| 2.2. Landasan Teori .....                                             | 11          |
| 2.2.1. <i>Rate of Penetration</i> (ROP) .....                         | 11          |
| 2.2.2. Faktor yang Mempengaruhi <i>Rate of Penetration</i> (ROP)..... | 12          |
| 2.2.2.1. Karakteristik Batuan.....                                    | 12          |
| 2.2.2.2. <i>Weight on Bit</i> (WOB).....                              | 14          |