**WellPlan**TMReport

04. КМГ-Бурение

Well Name: 2737

Wellbore: 2737

Design: План с полкой рев 02

Case: 2159

Date: October 5, 2023 at 5:35 PM

Created By:

|  |  |
| --- | --- |
|  |  |
|  |  |

# General Information

* 1. **General Case Information**

|  |  |  |  |
| --- | --- | --- | --- |
| **Company** | 04. КМГ-Бурение | | |
| **Project** | Молдабек | **Site** | 2737 new |
| **Well** | 2737 | **Wellbore** | 2737 |
| **Design** | План с полкой рев 02 | **Case** | 2159 |
| **Hole MD** | 404.00 m | **Hole TVD** | 355.85 m |
| **Air Gap** | 0.00 m | **Ground Elevation** | 0.00 m |
| **Reference Point** | WELL @ 0m | **Well Type** | Onshore |

* 1. **Active Fluid**

### **Fluid Data**

|  |  |  |  |
| --- | --- | --- | --- |
| **Fluid** | KC1 | **Type** | Mud |
| **Mud Base Type** | Water | **Base Fluid** | Water |
| **Rheology Model** | Bingham Plastic | **Foamed** | N |

### **Rheology Data**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Temperature  (°C) | Pressure  (atm) | Base Density  (kg/m³) | Ref Fluid Properties | PV (Mulnf)  (cp) | YP (Tau0)  (lbf/100ft²) | Fann Data | |
| **Speed**  **(rpm)** | **Dial**  **(°)** |
| 30 | 1 | 1170 | Yes | 14 | 18 |  |  |

* 1. **Hole Section**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Section**  **Type** | **Section Depth**  **(m)** | **Section Length**  **(m)** | **Shoe Depth**  **(m)** | **ID**  **(mm)** | **Drift**  **(mm)** | **Eff. Hole Diameter**  **(mm)** | **Coefficient**  **of**  **Friction** | **Linear Capacity**  **(L/m)** | **Volume**  **Excess**  **(%)** |
| **Casing** | **160** | **160** | **160** | **224.41** | **222.25** |  | **0.25** | **39.55** |  |
| **Open Hole** | **404** | **244** |  | **215.9** | **222.25** | **215.9** | **0.36** | **36.61** | **0** |

* 1. **String Details**

| **Type** | **Length**  **(**m**)** | **Depth**  **(**m**)** | **Body** | | **Stabilizer / Tool Joint** | | | | **Weight** | **Material** | **Grade** | **Class** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **OD**  **(**mm**)** | **ID**  **(**mm**)** | **Avg Joint Length**  **(**m**)** | **Length**  **(**m**)** | **OD**  **(**mm**)** | **ID**  **(**mm**)** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| Drill Pipe | 346.566 | 346.57 | 127 | 108.61 | 9.144 | 0.433 | 152.4 | 82.55 | 32.62 | CS\_API 5D/7 | G | 2 |
| Heavy Weight | 36 | 382.57 | 127 | 76.2 | 9.14 | 1.219 | 165.1 | 76.2 | 73.13 | CS\_1340 MOD | 1340 MOD |  |
| MWD | 10.4 | 392.97 | 172 | 83 | 10.4 |  |  |  | 149.77 | SS\_15-15LC | 15-15LC MOD (1) |  |
| Sub | 0.91 | 393.88 | 170.69 | 60.96 | 0.91 |  |  |  | 156.36 | SS\_15-15LC | 15-15LC MOD (1) |  |
| Mud Motor | 9.71 | 403.59 | 171.45 | 76.2 | 9.71 |  |  |  | 103.53 | CS\_API 5D/7 | 4145H MOD |  |
| Bit | 0.414 | 404 | 215.9 |  | 0.414 |  |  |  | 150 |  |  |  |

### **Grade in Use**

| Grade | Minimum Yield Stress (psi) |
| --- | --- |
| 1340 MOD | 55,000 |
| 15-15LC MOD (1) | 110,000 |
| 4145H MOD | 110,000 |
| G | 105,000 |

### **String Nozzles**

| Component | MD  (m) | Port Open | Diverted Flow | Amount Diverted  (%) | Nozzle  (32nd") | TFA  (in²) |
| --- | --- | --- | --- | --- | --- | --- |
| Polycrystalline Diamond Bit | 404 | NA | NA | NA | 5.0X14.0 | 0.752 |

### **Mud Motors**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Component | Length (m) | Steering tool | | | Kick pad | | | Pressure loss @ Flow rate ( @ ) | Lobe config | Eccentricity () | Rotor mass () | Rev. per Volume () |
| **Bend angle (°)** | **Ref angle (°)** | **Offset (m)** | **Length (m)** | **OD (mm)** | **Offset (m)** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | @  @  @  @ |  |  |  |  |

* 1. **Tortuosity (Random Inc and Az)**

|  |  |
| --- | --- |
| **Tortuosity Period** | 30.00 m |
| **Interpolation Interval** | 30.00 m |

|  |  |
| --- | --- |
| Measured Depth Top  (m) | Magnitude  (°) |
| 0.00 | 0.50 |
| 160.00 | 1.00 |
| 465.00 | 1.50 |

* 1. **Wellpath - Calculation Method: Minimum Curvature**

| MD  (m) | INC  (°) | AZ  (°) | TVD  (m) | DLS  (°/30m) | AbsTort  (°/30m) | RelTort  (°/30m) | VSect  (m) | NS  (m) | EW  (m) | Build  (°/30m) | Walk  (°/30m) |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0.00 | 0.00 | 357.88 | 0.00 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 | 0.00 | 0.000 | 0.000 |
| 30.00 | 0.00 | 357.88 | 30.00 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 | 0.00 | 0.000 | 0.000 |
| 40.00 | 0.00 | 357.88 | 40.00 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 | 0.00 | 0.000 | 0.000 |
| 60.00 | 1.67 | 357.88 | 60.00 | 2.500 | 0.833 | 0.000 | 0.29 | 0.29 | 0.00 | 2.500 | 0.000 |
| 90.00 | 4.17 | 357.88 | 89.96 | 2.500 | 1.389 | 0.000 | 1.82 | 1.82 | 0.00 | 2.500 | 0.000 |
| 120.00 | 6.67 | 357.88 | 119.82 | 2.500 | 1.667 | 0.000 | 4.65 | 4.65 | 0.00 | 2.500 | 0.000 |
| 150.00 | 9.17 | 357.88 | 149.53 | 2.500 | 1.833 | 0.000 | 8.78 | 8.78 | 0.00 | 2.500 | 0.000 |
| 170.50 | 10.87 | 357.88 | 169.72 | 2.500 | 1.913 | 0.000 | 12.35 | 12.35 | 0.00 | 2.500 | 0.000 |
| 173.00 | 10.87 | 357.88 | 172.17 | 0.000 | 1.886 | 0.000 | 12.82 | 12.82 | 0.00 | 0.000 | 0.000 |
| 180.00 | 12.80 | 357.88 | 179.02 | 8.250 | 2.133 | 0.000 | 14.25 | 14.26 | 0.00 | 8.250 | 0.000 |
| 195.00 | 16.92 | 357.88 | 193.52 | 8.250 | 2.604 | 0.000 | 18.10 | 18.10 | 0.00 | 8.250 | 0.000 |
| 210.00 | 21.05 | 357.88 | 207.70 | 8.250 | 3.007 | 0.000 | 22.98 | 22.98 | 0.00 | 8.250 | 0.000 |
| 225.00 | 25.17 | 357.88 | 221.49 | 8.250 | 3.357 | 0.000 | 28.87 | 28.87 | 0.00 | 8.250 | 0.000 |
| 240.00 | 29.30 | 357.88 | 234.83 | 8.250 | 3.662 | 0.000 | 35.73 | 35.73 | 0.00 | 8.250 | 0.000 |
| 255.00 | 33.42 | 357.88 | 247.63 | 8.250 | 3.932 | 0.000 | 43.53 | 43.54 | 0.00 | 8.250 | 0.000 |
| 270.00 | 37.55 | 357.88 | 259.84 | 8.250 | 4.172 | 0.000 | 52.24 | 52.24 | 0.00 | 8.250 | 0.000 |
| 285.00 | 41.67 | 357.88 | 271.40 | 8.250 | 4.387 | 0.000 | 61.80 | 61.80 | 0.00 | 8.250 | 0.000 |
| 300.73 | 46.00 | 357.88 | 282.74 | 8.250 | 4.589 | 0.000 | 72.69 | 72.69 | 0.00 | 8.250 | 0.000 |
| 320.76 | 47.00 | 357.88 | 296.52 | 1.500 | 4.396 | 0.000 | 87.22 | 87.22 | 0.00 | 1.500 | 0.000 |
| 330.00 | 49.65 | 357.97 | 302.67 | 8.595 | 4.514 | 0.000 | 94.12 | 94.13 | 0.01 | 8.592 | 0.294 |
| 345.00 | 53.94 | 358.10 | 311.94 | 8.595 | 4.691 | 0.000 | 105.90 | 105.91 | 0.04 | 8.592 | 0.266 |
| 360.00 | 58.24 | 358.22 | 320.31 | 8.595 | 4.854 | 0.000 | 118.35 | 118.36 | 0.10 | 8.593 | 0.238 |
| 375.00 | 62.54 | 358.33 | 327.72 | 8.595 | 5.003 | 0.000 | 131.39 | 131.40 | 0.19 | 8.593 | 0.217 |
| 390.00 | 66.83 | 358.43 | 334.13 | 8.595 | 5.141 | 0.000 | 144.94 | 144.95 | 0.31 | 8.593 | 0.201 |
| 405.00 | 71.13 | 358.52 | 339.51 | 8.595 | 5.269 | 0.000 | 158.94 | 158.95 | 0.46 | 8.593 | 0.188 |
| 420.00 | 75.43 | 358.61 | 343.83 | 8.595 | 5.388 | 0.000 | 173.31 | 173.31 | 0.63 | 8.593 | 0.179 |
| 435.00 | 79.72 | 358.70 | 347.05 | 8.595 | 5.499 | 0.000 | 187.95 | 187.95 | 0.83 | 8.593 | 0.172 |
| 450.00 | 84.02 | 358.78 | 349.17 | 8.595 | 5.602 | 0.000 | 202.80 | 202.80 | 1.05 | 8.593 | 0.167 |
| 465.00 | 88.32 | 358.87 | 350.17 | 8.595 | 5.698 | 0.000 | 217.76 | 217.76 | 1.30 | 8.593 | 0.165 |
| 467.38 | 89.00 | 358.88 | 350.23 | 8.595 | 5.713 | 0.000 | 220.14 | 220.14 | 1.34 | 8.593 | 0.164 |
| 480.00 | 89.00 | 358.88 | 350.45 | 0.000 | 5.563 | 0.000 | 232.76 | 232.76 | 1.56 | 0.000 | 0.000 |
| 510.00 | 89.00 | 358.88 | 350.97 | 0.000 | 5.236 | 0.000 | 262.75 | 262.75 | 2.08 | 0.000 | 0.000 |
| 540.00 | 89.00 | 358.88 | 351.50 | 0.000 | 4.945 | 0.000 | 292.75 | 292.74 | 2.61 | 0.000 | 0.000 |
| 570.00 | 89.00 | 358.88 | 352.02 | 0.000 | 4.685 | 0.000 | 322.74 | 322.73 | 3.13 | 0.000 | 0.000 |
| 600.00 | 89.00 | 358.88 | 352.54 | 0.000 | 4.450 | 0.000 | 352.74 | 352.72 | 3.65 | 0.000 | 0.000 |
| 630.00 | 89.00 | 358.88 | 353.07 | 0.000 | 4.239 | 0.000 | 382.73 | 382.71 | 4.18 | 0.000 | 0.000 |
| 660.00 | 89.00 | 358.88 | 353.59 | 0.000 | 4.046 | 0.000 | 412.73 | 412.70 | 4.70 | 0.000 | 0.000 |
| 690.00 | 89.00 | 358.88 | 354.12 | 0.000 | 3.870 | 0.000 | 442.72 | 442.69 | 5.22 | 0.000 | 0.000 |
| 720.00 | 89.00 | 358.88 | 354.64 | 0.000 | 3.709 | 0.000 | 472.72 | 472.68 | 5.75 | 0.000 | 0.000 |
| 750.00 | 89.00 | 358.88 | 355.16 | 0.000 | 3.560 | 0.000 | 502.71 | 502.67 | 6.27 | 0.000 | 0.000 |
| 767.06 | 89.00 | 358.88 | 355.46 | 0.000 | 3.481 | 0.000 | 519.76 | 519.72 | 6.57 | 0.000 | 0.000 |

* 1. **Geothermal Gradient Data**

|  |  |  |  |
| --- | --- | --- | --- |
| **Ambient Temperature** | 26.000 °C | **Mudline Temperature** | 4.444 °C |
| **Temperature @ Depth** | 30.000 °C @ 355.85 m | **Gradient** | 1.12 °C/100m |

# Schematics

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Well:** | 2737 | **Wellbore:** | 2737 | **Case:** | 2159 | **String Name:** | 215,9 мм |
|  |  |  |  |  |  |  |  |
| Schematic | | | | | | | |

# Torque & Drag Setup Data

* 1. **Settings**

|  |  |  |  |
| --- | --- | --- | --- |
| **Measured Depth of Bit** | 404.00 m | **Bending Stress Magnification** | Yes |
| **Block Weight** | 1.00 tonne | **Stiff String Analysis** | No |
| **Enable Sheave Friction Correction** | No | **Viscous Torque and Drag** | No |
| **Pump Rate** | 28.000 L/sec | **Contact Force Normalization Length** | 9.50 m |
| **Mechanical Efficiency (Single Sheave)** | 97.00 | **Lines Strung** | 12 |
|  |  | **Side Force** | 0.00 kgf |
| **Offset from Wellhead** | m | **Angle at Wellhead** | ° |
| **Buckling limit factor** | 1 |  |  |

* 1. **Run Parameters**

|  |  |  |  |
| --- | --- | --- | --- |
| **Start MD** | 160.00 m | **End MD** | 417.00 m |
| **Step Size** | 9.30 m |  |  |

* 1. **Normal Analysis Operational Parameters**

|  |  |  |  |
| --- | --- | --- | --- |
| Drilling | WOB/Overpull  (tonne) | Torque at Bit  (kN-m) | Include Pump Rate |
| Rotating On Bottom | 5.00 | 4.1670 | NA |
| Slide Drilling | 2.00 | 0.0000 | NA |
| Backreaming | NA | NA | NA |
| Rotating Off Bottom |  |  | NA |
| Tripping | **Speed**  **(m/min)** | **RPM**  **(rpm)** | **Include Pump Rate** |
| Tripping In | 10.00 | 0 | NA |
| Tripping Out | 10.00 | 0 | NA |

* 1. **Friction Factors**

| Section Type | Coefficient of Friction |
| --- | --- |
| Casing | 0.25 |
| Open Hole | 0.36 |

* 1. **String Fill Up**

|  |  |  |  |
| --- | --- | --- | --- |
| **Use String Fill Up (Tripping In only)** | No | **Period** | m |

# Torque and Drag Results

* 1. **Mechanical Limitations**

|  |  |  |  |
| --- | --- | --- | --- |
| **Overpull Margin during a Tripping Out operation** | 80.72 tonne | using | 80.00% of yield |
| **Minimum Weight on Bit to Sinusoidal Buckle during a rotating on bottom operation** | 15.55 tonne | at | 0.00 m |
| **Minimum Weight on Bit to Helical Buckle during a rotating on bottom operation** | 17.52 tonne | at | 0.00 m |
| **Pick-Up Drag** | 2.67 tonne | | |
| **Slack-Off Drag** | 2.35 tonne | | |
| **Block Rating (Hoisting System)** | 225.00 tonne | | |
| **Torque Rating (Rotating Equipment)** | kN-m | | |

* 1. **Load Summary**

| Load Condition | Stress Failure | | | Buckling Limits | | | Torque Failure | Torque at the Rotary Table  (kN-m) | Total Windup with Bit Torque  (revs) | Total Windup without Bit Torque  (revs) | Measured Weight  (tonne) | Total Stretch  (m) | Axial Stress = 0 | | Neutral Point Distance from surface  (m) | Neutral Point Distance from Bit  (m) |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Fatigue | 90% Yield | 100% Yield | Sinusoidal | Helical | Lockup | Distance from Surface  (m) | Distance from Bit  (m) |
| Спуск |  |  |  |  |  |  |  | 0.0000 | 0.0 | 0.0 | 9.45 | 0.03 | 289.88 | 114.12 | 404.00 | 0.00 |
| Подъём |  |  |  |  |  |  |  | 0.0000 | 0.0 | 0.0 | 14.47 | 0.05 | 346.57 | 57.43 | 404.00 | 0.00 |
| Бурение ротором |  |  |  |  |  |  |  | 6.7496 | 0.4 | 0.1 | 6.80 | 0.01 | 178.72 | 225.28 | 207.89 | 196.11 |
| Бурение ГЗД |  |  |  |  |  |  |  | 0.0000 | 0.0 | 0.0 | 6.92 | 0.02 | 187.25 | 216.75 | 221.60 | 182.40 |
| Вращение над забоем |  |  |  |  |  |  |  | 1.8959 | 0.1 | 0.1 | 11.80 | 0.04 | 346.57 | 57.43 | 404.00 | 0.00 |

# Torque and Drag Plots

|  |
| --- |
|  |
| * 1. **Эффективное натяжение** |
| * 1. **Вес на крюке** |
| * 1. **Момент** |
| * 1. **Мин. вес на долоте** |

# Hydraulics Setup Data

* 1. **Calculation Engine**

|  |  |  |
| --- | --- | --- |
| Model Used | WellPlan |  |

* 1. **Cuttings Loading Calculation Option**

|  |  |  |  |
| --- | --- | --- | --- |
| Rate of Penetration | 8.00 m/hr | **Rotary Speed** | 40 rpm |
| Cuttings Diameter | 3.18 mm | **Cuttings Density** | 2.500 sg |
| Bed Porosity | 36.00 % | **MD Calculation Interval** | 30.48 m |

* 1. **Surface Equipment Information**

|  |  |  |  |
| --- | --- | --- | --- |
| Pressure Loss Calculation | Specify Pressure loss | **Maximum Working Pressure** | 270.0000 atm |
| Equipment Mode | NA | **Surface Pressure Loss** | 6.8046 atm |
| Equipment Type | NA |  |  |

* 1. **Pump Pressure Information**

|  |  |  |  |
| --- | --- | --- | --- |
| Maximum Surface Pressure | 340.0000 atm | **Pump Rate** | 28.000 L/sec |
| Maximum Pump Power | hp | **Maximum Allowable Pump Rate** | L/sec |
| Use Roughness | N |  |  |
| Pipe Roughness | NA | **Annulus Roughness** | NA |
| Booster Pump |  | **Injection Depth** |  |
| Injection Temperature |  | **Injection Rate** |  |
| Include Tool Joint Pressure Losses | N |  |  |
| Include Back Pressure |  | **Back Pressure** | 0.0000 atm |
| Sea Floor Returns | N | **Sea Water Density** | NA |

* 1. **Run Parameters**

|  |  |  |  |
| --- | --- | --- | --- |
| Start MD | 160.00 m | **End MD** | 417.00 m |
| Step Size | 9.30 m |  |  |

* 1. **Flow Rate (Q= 28.000 L/sec)**

### **Bit Parameters**

|  |  |  |  |
| --- | --- | --- | --- |
| **Pump Rate** | 28.000 L/sec | **Stand Pipe Pressure** | 94.7333 atm |
| **Bit Pressure Loss** | 21.3277 atm | **Percent Power at Bit** | 22.51 % |
| **Bit Hydraulic Power / Area (HSI)** | 1.4 hp/in² | **Bit Nozzle Velocity** | 57.74 m/s |
| **Bit Hydraulic Power** | 81.14 hp | **Bit Impact Force** | 192.89 kgf |
| **Surface Equip. Pressure Loss** | 6.8046 atm | **Total Bit Flow Area** | 0.752 in² |

* 1. **Gel Strength**

|  |  |  |  |
| --- | --- | --- | --- |
| 0 Second | 5.000 lbf/100ft² | **10 Second** | 9.000 lbf/100ft² |
| 10 Minute | 18.000 lbf/100ft² | **30 Minute** | 25.000 lbf/100ft² |
| Maximum | lbf/100ft² |  | |

* 1. **Mud Temperature Information**

|  |  |  |  |
| --- | --- | --- | --- |
| Include Mud Temperature Effects | N | **Circulation Time** | NA |

# Hydraulics Plots

|  |
| --- |
|  |
| * 1. **Потери давления на долоте** |
| * 1. **Мин. расход по глубине** |
| * 1. **Высота шламовой подушки по глубине** |
| * 1. **Потери мощности компонента** |
| * 1. **Потери давления компонента** |