Dynamic Underbalance: Designing the Effects to meet Operators Needs

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Perforation Cleanup
Types of Underbalance

Static vs. Dynamic

Max UB Surge

Pressure

Time

$P_{\text{wellbore}}$

$P_{\text{reservoir}}$
Approach - Decreasing Shot Density

![Graph showing pressure over time for different shot densities. The graph illustrates the pressure in psi on the y-axis and time on the x-axis, with two lines representing 6 spf and 5 spf. The reservoir pressure is indicated at a constant level.]
Passive Sand Control
Keeping Shot Density and Dynamic UnderBalance
Reliable Delivery of the Design

Gauge Data vs Simulation

Well Pressure
= 6252 psi

Pressure (Psi)

Time (sec)
Enhanced Effects

![Graph showing pressure over time with different lines for 6 spf, 5 spf, and Targeted Volume, with a reservoir indicating line at 5,000 psi.](image)
Dynamic Workover Success
### Turning Back Time

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<tbody>
<tr>
<td>15153-15210</td>
<td>Qo = 2014 POBD Pwf = 5697 psi</td>
<td>Qo = 1791 POBD Pwf = 5330 psi</td>
<td>Qo = 1098 POBD Pwf = 4380 psi</td>
<td>Qo = 1746 POBD Pwf = 5322 psi</td>
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<td>15222-15253</td>
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Project Under Budget

Production Flow Profile %
Theoretical vs. Actual (3/8” Choke)

Depth Intervals

- 15106’-15151’
- 15198’-15225’
- 15247’-15275’

Results:
- $P = 7784$ lpc
- $K = 6.11$ mD
- $Skin = -1.34$
- $Kh = 217$ mDft

$Q_0 = 580$ BOB
$Pwf = 5870$ psi
Minimizing Dynamic Underbalance
Extreme Underbalance
Different Characteristics

Model

Gauge

Model

Gauge
Workover without Perforations
Challenge of the Well
**Production Results**

- Oil: 430 STB/D, 23%
- Gas: 550 Mscf/D, 8.6%
- Water: 266 STB/D, 5.2%
Scale Recovered at Surface
What challenges and questions do you have?

Bjørnar Kalsvik