## WellSharp Surface Baker #1

<table>
<thead>
<tr>
<th><strong>Hole Dimensions</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth (MD/TVD)</td>
<td>10800 feet</td>
</tr>
<tr>
<td>9 5/8” Casing shoe</td>
<td>8950 feet</td>
</tr>
<tr>
<td>Hole size</td>
<td>8 ½ inch</td>
</tr>
<tr>
<td>Current mud weight</td>
<td>11.3 ppg</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Internal Capacities</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6 1/2” Drill collars (length 600 feet)</td>
<td>0.00768 bbl/foot</td>
</tr>
<tr>
<td>5” Drill pipe - capacity</td>
<td>0.01776 bbl/foot</td>
</tr>
<tr>
<td>5” Drill pipe - metal displacement</td>
<td>0.00650 bbl/foot</td>
</tr>
<tr>
<td>5” Drill pipe- closed end displacement</td>
<td>0.02426 bbl/foot</td>
</tr>
<tr>
<td>5” HWDP (length 500feet) - capacity</td>
<td>0.0088 bbl/foot</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Annular Capacities</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Open hole / Drill collar</td>
<td>0.0292 bbl/foot</td>
</tr>
<tr>
<td>Open hole / Drill pipe</td>
<td>0.0459 bbl/foot</td>
</tr>
<tr>
<td>Casing / Drill pipe</td>
<td>0.0505 bbl/foot</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>LOT</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoe test mud weight</td>
<td>10.5 ppg</td>
</tr>
<tr>
<td>Leak off pressure</td>
<td>1850 psi</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Pump Details</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump Output</td>
<td>0.119 bbl/stk</td>
</tr>
<tr>
<td>SCR at 40 SPM</td>
<td>450 psi</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Shut in data</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SIDPP</td>
<td>500 psi</td>
</tr>
<tr>
<td>SICP</td>
<td>700 psi</td>
</tr>
<tr>
<td>Pit gain</td>
<td>12 bbls</td>
</tr>
</tbody>
</table>
Surface Baker #1

Well Info:
- Hole TVD: 10800
- Current MW ppg: 11.3
- Slow Pump Pressure: 450
- Slow Pump SPM: 40

Kick Info:
- (SIDP): 500
- (SICP): 700
- Pit Gain bbls: 12

KWM = (SIDP ÷ .052 ÷ TVD) + Current Mud Weight

Round up KWM = 12.2

ICP = Slow Pump Pressure + SIDP

ICP = 450 + 500 = 950

FCP = KWM ÷ CMW x Slow Pump Pressure

FCP = 12.2 ÷ 11.3 x 450 = 486

Shoe Pressures:
- H. = 8950
- LOT Pressure: 1850
- Test MW: 10.5

Round down MAMW = 14.4

Or

Frac. Gradient

(MAMW) - (B) x .052 x (H) = 1442

= MASP before kick with Current MW

(MAMW) - (KWM) x .052 x (H) = 1023

= MASP after kill with Kill MW

Strokes to Bit

<table>
<thead>
<tr>
<th>Strokes</th>
<th>Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>950</td>
</tr>
<tr>
<td>1</td>
<td>152</td>
</tr>
<tr>
<td>2</td>
<td>304</td>
</tr>
<tr>
<td>3</td>
<td>456</td>
</tr>
<tr>
<td>4</td>
<td>608</td>
</tr>
<tr>
<td>5</td>
<td>760</td>
</tr>
<tr>
<td>6</td>
<td>912</td>
</tr>
<tr>
<td>7</td>
<td>1064</td>
</tr>
<tr>
<td>8</td>
<td>1216</td>
</tr>
<tr>
<td>9</td>
<td>1368</td>
</tr>
<tr>
<td>10</td>
<td>1523</td>
</tr>
</tbody>
</table>

ICP (CMC) = 46 psi

(FCP-ICP) ÷ 10 = 46 psi
**Volume Info:**

- Hole MD: 10800
- Shoe MD: 8950
- Pump Output (bbls/stk): 0.119
- Choke Line Length: 600

**Drillstring Volume (surface to bit):**

<table>
<thead>
<tr>
<th>Length (ft)</th>
<th>Internal Capacity</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>9700</td>
<td>0.01776</td>
<td>172.27</td>
</tr>
<tr>
<td>500</td>
<td>0.0088</td>
<td>4.40</td>
</tr>
<tr>
<td>600</td>
<td>0.00768</td>
<td>4.61</td>
</tr>
</tbody>
</table>

Total Drillstring Volume

\[
\text{Total Drillstring Volume} = 181.28 \div 0.119 = 1523
\]

**Miscellaneous Calculations:**

- Pressure drop per step (one-tenth of strokes to bit):
  \[
  \text{(ICP—FCP) ÷ 10} = 46
  \]
- Pressure drop per 100 strokes to bit:
  \[
  \text{(ICP—FCP) × 100 ÷ Strokes to Bit} = 30
  \]

**Annular Volumes and Strokes**

(Subsea only)

- Choke Line Capacity
  \[
  \text{(d)} \times \frac{\text{DP/HW Length x Casing}}{\text{Csg. Annular Capacity}} = \frac{\text{Volume}}{\text{Strokes to displace }} = \frac{\text{Choke line}}{(g)}
  \]

- DP/HW x Casing:
  \[
  \text{Subsea} = (b) - (e)
  \]

- Surface = (b)

- DP/HW x OH:
  \[
  (a) - (b) - (f) =
  \]

- DC Length x OH
  \[
  (a) =
  \]

- DP/HW Length OH
  \[
  1250 \times 0.0459 = 57.38
  \]

- OH Annular Capacity
  \[
  \text{Volumes} +
  \]

- Bit to Shoe Volume
  \[
  74.9 \div 0.119 = 629
  \]

- Bit to Shoe Strokes
  \[
  = 4427
  \]

- Dynamic (adjusted) casing pressure after pump start-up:
  \[
  \text{(SICP - CLF) =}
  \]

- Strokes from bit to surface through choke line:
  \[
  = (g) + (h) + (i) =
  \]

- (Surface Only) Strokes from bit to surface:
  \[
  = (h) + (l) = 4427
  \]
1) **Maximum allowable mud weight before the kick**

\[
\text{MAMW} = \left(\frac{\text{LOT pressure}}{0.052} \div \text{Casing Shoe TVD}\right) + \text{Test Mud Weight}
\]

\[
(1850 \text{ psi} \div 0.052 \div 8950) + 10.5 = 14.4 \text{ ppg}
\]

2) **MAASP before the kick**

\[
\text{MAASP} = (\text{MAMW ppg} - \text{Current MW ppg}) \times 0.052 \times \text{Casing Shoe TVD}
\]

\[
(14.4 - 11.3) \times 0.052 \times 8950 = 1442 \text{ psi}
\]

3) **Kill mud Weight**

12.2 ppg

4) **Initial Circulating Pressure**

950 psi

5) **Final Circulating Pressure**

486 psi

6) **Strokes from surface to Bit**

1523 strokes
7) **Pressure drop per step (one-tenth of strokes to Bit)**
   
   46 psi

8) **Pressure drop per 100 strokes from surface to Bit**
   
   
   \[(ICP – FCP) \times 100 ÷ \text{Strokes from surface to Bit}\]
   
   \[(950 – 486) \times 100 ÷ 1523 = 30.46 \text{ psi} \text{ (round down to 30 psi)}\]

9) **MAASP after well has been killed**
   
   \[\text{MAASP} = (\text{MAMW ppg} – \text{KWM ppg}) \times 0.052 \times \text{Casing Shoe TVD}\]
   
   \[(14.4 – 12.2) \times 0.052 \times 8950 = 1023 \text{ psi}\]

10) **Strokes from bit to surface**

    4427 strokes

11) **Strokes from bit to shoe**

    
    \[\text{Open Hole Annular Volume ÷ Pump Output}\]
    
    \[(57.38 + 17.52) ÷ 0.119 = 629 \text{ strokes}\]
**WellSharp Surface Baker #2**

<table>
<thead>
<tr>
<th>Hole Dimensions</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth</td>
<td>MD 12,200 feet</td>
<td>TVD 11,850 feet</td>
</tr>
<tr>
<td>9 5/8&quot; Casing shoe</td>
<td>8750</td>
<td></td>
</tr>
<tr>
<td>Hole size</td>
<td>8 ½ inch</td>
<td></td>
</tr>
<tr>
<td>Current mud weight</td>
<td>10</td>
<td>ppg</td>
</tr>
</tbody>
</table>

**Internal Capacities**

| 6 1/2" Drill collars (length 600 feet) | 0.0077 | bbl/foot |
| 5" Drill pipe - capacity            | 0.01776 | bbl/foot |
| 5" Drill pipe - metal displacement  | 0.0065 | bbl/foot |
| 5" Drill pipe - closed end displacement | 0.0246 | bbl/foot |
| 5" HWDP (length 650 feet) - capacity | 0.0086 | bbl/foot |

**Annular Capacities**

| Open hole / Drill collar | 0.0292 | bbl/foot |
| Open hole / Drill pipe   | 0.0459 | bbl/foot |
| Casing / Drill pipe      | 0.0489 | bbl/foot |

**LOT**

| Shoe test mud weight     | 10 | ppg |
| Leak off pressure        | 1175 | psi |

**Pump Details**

| Pump Output             | 0.119 | bbl/stk |
| SCR at 40 SPM           | 695 | psi |

**Shut in data**

| SIDPP                   | 580 | psi |
| SICP                    | 840 | psi |
| Pit gain                | 20  | bbls |
**Vertical Kill Sheet**

### Well Info:
- **Well Name:** Surface Baker #2
- **Date:**
- **Hole TVD:** 11850
- **Current MW ppg:** 10.0
- **Slow Pump Pressure:** 695
- **Slow Pump SPM:** 40

### Methodology:
- **KWM (Kennedy Wellbore Mudline):**
  \[
  \text{KWM} = \frac{580}{0.052} \div \frac{11850}{10.0} + 10.0 = 11.0
  \]
- **ICP (Inflow Control Pressure):**
  \[
  \text{ICP} = \text{Slow Pump Pressure} + \text{SIDP} = 695 + 580 = 1275
  \]
- **FCP (Flow Control Pressure):**
  \[
  \frac{11.0}{10.0} \times \frac{695}{685} = 765
  \]

### Strokes and Pressure:

<table>
<thead>
<tr>
<th>Strokes</th>
<th>Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1275</td>
</tr>
<tr>
<td>1</td>
<td>172</td>
</tr>
<tr>
<td>2</td>
<td>344</td>
</tr>
<tr>
<td>3</td>
<td>516</td>
</tr>
<tr>
<td>4</td>
<td>688</td>
</tr>
<tr>
<td>5</td>
<td>860</td>
</tr>
<tr>
<td>6</td>
<td>1032</td>
</tr>
<tr>
<td>7</td>
<td>1204</td>
</tr>
<tr>
<td>8</td>
<td>1376</td>
</tr>
<tr>
<td>9</td>
<td>1548</td>
</tr>
<tr>
<td>10</td>
<td>1720</td>
</tr>
</tbody>
</table>

### Shoe Pressures:
- **Shoe TVD:** 8750
- **LOT Pressure:** 1175
- **Test MW:** 10.0

### Kick Info:
- **(SIDP):** 580
- **(SICP):** 840
- **Pit Gain bbls:** 20

### Kick Pressure Calculations:
- **MASP before kick with Current MW:**
  \[
  \left( \frac{12.5}{10.0} \times 0.052 \times \frac{8750}{682} \right) = 1137
  \]
- **MASP after kill with Kill MW:**
  \[
  \left( \frac{12.5}{10.0} \times 11.0 \times 0.052 \times \frac{8750}{682} \right) = 682
  \]
**Volume Info:**

- **Hole MD:** 12200
- **Shoe MD:** 8750
- **Pump Output (bbls/STK):** 0.119
- **Choke Line Length:**
- **Riser Length:**
- **DC Length:** 600

**Drillstring Volume (surface to bit):**

<table>
<thead>
<tr>
<th>Length (ft)</th>
<th>Internal Capacity</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>10950</td>
<td>0.01776</td>
<td>194.47</td>
</tr>
<tr>
<td>650</td>
<td>0.0086</td>
<td>5.59</td>
</tr>
<tr>
<td>600</td>
<td>0.0077</td>
<td>4.62</td>
</tr>
</tbody>
</table>

**Total Drillstring Volume**

\[ \frac{204.68}{0.119} = 1720 \]

**Miscellaneous Calculations:**

Pressure drop per step (one-tenth of strokes to bit):

\[ \frac{(ICP-FCP)}{10} = 51 \]

Pressure drop per 100 strokes to bit:

\[ \frac{(ICP-FCP) \times 100}{\text{Strokes to Bit}} = 29 \]

**Dynamic (adjusted) casing pressure after pump start-up:**

\[ (SICP - CLF) = \]

**Annular Volumes and Strokes**

**Strokes to displace Choke line**

- **Choke Line Capacity:**
- **Subsea only**

**DP/HW x Casing:**

- **Subsea:** (b) - (e)
- **Surface:** (b)

**DP/HW x OH:**

- **(a) - (b) - (f) =**

---

**Subsea only**

- **DP/HW Length x Casing:** 8750 x 0.0489 = 427.88

**Volume**

\[ \frac{427.88}{0.119} = 3596 \]

**Strokes from bit to surface through choke line:**

\[ g + h + i = \]

**Surface Only**

**Strokes from bit to surface:**

\[ h + i = 4843 \]

**Bit to Shoe Strokes**

\[ \frac{148.34}{0.119} = 1247 \]
1) **Maximum allowable mud weight before the kick**

\[ \text{MAMW} = \left( \frac{\text{LOT pressure}}{0.052} \div \text{Casing Shoe TVD} \right) + \text{Test Mud Weight} \]

\[ (1175 \text{ psi} \div 0.052 \div 8750) + 10.0 = 12.5 \text{ ppg} \]

2) **MAASP before the kick**

\[ \text{MAASP} = (\text{MAMW ppg} - \text{Current MW ppg}) \times 0.052 \times \text{Casing Shoe TVD} \]

\[ (12.5 - 10.0) \times 0.052 \times 8750 = 1137 \text{ psi} \]

3) **Kill mud Weight**

11.0 ppg

4) **Initial Circulating Pressure**

1275 psi

5) **Final Circulating Pressure**

765 psi

6) **Strokes from surface to Bit**

1720 strokes
7) **Pressure drop per step (one-tenth of strokes to Bit)**
   
   51 psi

8) **Pressure drop per 100 strokes from surface to Bit**
   
   \[(ICP - FCP) \times 100 \div \text{Strokes from surface to Bit}\]
   
   \[(1275 - 765) \times 100 \div 1720 = 29.65 \text{ psi (round down to 29 psi)}\]

9) **MAASP after well has been killed**
   
   \[\text{MAASP} = (\text{MAMW ppg} - \text{KMW ppg}) \times 0.052 \times \text{Casing Shoe TVD}\]
   
   \[(12.5 - 11.0) \times 0.052 \times 8750 = 682 \text{ psi}\]

10) **Strokes from bit to surface**
    
    4842 strokes

11) **Strokes from bit to shoe**

    \[\text{Open Hole Annular Volume} \div \text{Pump Output}\]
    
    \[(130.82 + 17.52) \div 0.119 = 1247 \text{ strokes}\]