Operator and Halliburton partner to surpass perforation records
MaxFire® electronic firing system successfully initiated perforation in Gulf of Mexico

Location: Gulf of Mexico

Overview
A Gulf of Mexico operator needed to perforate its deepwater well at a depth where standard perforating solutions were not feasible. Because of extreme downhole conditions, the operator was worried about exceeding pressure limitations of other tools and equipment downhole during the perforating event. Through close collaboration with Halliburton, the operator chose to use the MaxFire® memory-based electronic firing system (EFS) because of its safety, flexibility, and ability to actuate at low pressure. The job was successfully executed as proposed, resulting in both the operator and Halliburton achieving individual perforation records—the operator for the deepest true vertical depth (TVD) well and Halliburton for the deepest perforation with an EFS.

The MaxFire® electronic firing system helped both the operator and Halliburton achieve perforation records in the Gulf of Mexico.

<table>
<thead>
<tr>
<th>CHALLENGES</th>
<th>SOLUTIONS</th>
<th>RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operator needed to perforate its deepwater well at a depth where standard perforating solutions could not be utilized. There were concerns about exceeding pressure limitations of other tools and equipment downhole during the perforating event</td>
<td>The MaxFire EFS was utilized and is pressure rated to an industry-leading 40,000 psi (275 MPa), but can be set up to actuate with low pressure. This allowed Halliburton to perforate the well without exceeding pressure limitations of other downhole tools and equipment</td>
<td>The perforated interval was at 28,219 ft (8,601 m) TVD with a temperature of +/-300°F (150°C) and pressure of 21,696 psi (1,496 bar). Perforation was accomplished with 550 psi (38 bar) overbalance. Pressure limitations of others tools and equipment were not exceeded. The MaxFire EFS initiated the perforation gun with a low activation pressure</td>
</tr>
<tr>
<td>Operator needed a safe, flexible, and precise low actuating pressure firing system</td>
<td>The MaxFire EFS is designed with safety in mind. It is set up to initiate at a predetermined sequence of pressure cycles, which allows the flexibility for other pressure-required operations to be conducted safely prior to perforating the gun</td>
<td>Other pressure-required operations (such as pressure testing, etc.) were safely and successfully carried out prior to initiating the gun</td>
</tr>
</tbody>
</table>
The MaxFire® electronic firing system triumphs in extreme downhole conditions

A Gulf of Mexico operator needed to perforate its deepwater well at a depth where standard perforating solutions could not be used. Because of extreme downhole conditions (high pressure, high temperature, and corrosive fluid), the operator was worried about exceeding pressure limitations of other tools and equipment downhole during the perforating event. They needed a safe, flexible, and precise low actuating pressure firing system.

The operator collaborated with Halliburton for a solution. The MaxFire® memory-based electronic firing system (EFS) was the answer to meet these challenges. The MaxFire EFS is a safe, precise, and adaptable electronic firing system that can initiate a gun system through a predetermined sequence of pressure cycles. Firing can be aborted with reset pressure, at any time, and the tool can last up to 30 days in extreme downhole conditions—the highest in the market. It can either be run on top or bottom of the gun.

With effective communication and planning with the operator, the job was successfully executed as proposed. This tool successfully initiated the perforation string with low actuating pressure in this deep, true vertical depth (TVD), high-pressure, high-temperature (HP/HT) well without exceeding the pressure limitations of other downhole tools and equipment.

The operator and Halliburton each surpassed individual perforation records. This was the operator’s deepest TVD well perforated (previous record was at 18,039 ft (5,498 m) TVD) and Halliburton’s deepest perforation with an EFS (previous record was at 27,748 ft (8,458 m) TVD). This well was perforated at 28,219 ft (8,601 m) TVD with a temperature of +/-300°F (150°C) and pressure of 21,696 psi (1,496 bar). The MaxFire EFS initiated the perforation gun with a low activation pressure of 550 psi (38 bar) in a heavy and corrosive calcium bromide wellbore fluid environment. The MaxFire EFS allowed Halliburton to perforate the well under these extreme conditions without exceeding pressure limitations of other downhole tools.