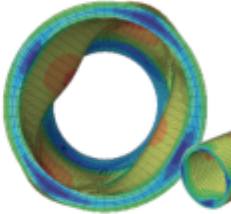


## Case Study – VERTECHS HEDP

*High pass-thru ability, fully dissolvable, eliminates milling, reduce overall operation hours and costs*

June, 2018, a major operator in Middle East requested Vertechs to provide solutions after a multistage frac operation has been suspended due to downhole restriction. Vertechs provided the operator with HEDP dissolvable plug for better passing-through ability, while maintaining high differential pressure holding ability, and leaving no debris downhole once the plug dissolves.

### Customer Challenges VS Vertechs Solutions

|   | <i>Customer Challenges</i>   | <i>Vertechs Solutions</i>  |
|---|--|--|
| 1 | <p><b>Downhole Restriction:</b></p> <p>Casing deformed from 4.5" ID to 4.15" ID</p>     | <p><b>Vertechs HEDP</b></p> <p>OD: 3.85"</p> <p>10,000 psi rated</p> <p>Premium Dissolvable Rubber Element</p>   |
| 2 | <p><b>High Temp: 285degF</b></p>   |  |
| 3 | <p><b>Extended RIH time by eCoil</b></p> <p>Ecoil RIH - 6 hours</p> <p>Trip in &amp; out - 12 hours</p>  | <ul style="list-style-type: none"> <li>• Experience with RIH dissolvable plugs by coil tubing;</li> </ul>  |
| 4 | <p><b>Extended Frac Duration</b></p> <p>18 hours of frac duration with more than 64,000bbls frac volume per stage.</p>   | <ul style="list-style-type: none"> <li>• Sound knowledge on dissolvable technology;</li> <li>• Strict QAQC to ensure every plug's quality;</li> <li>• On-site dissolving time-delay technique;</li> <li>• On-site engineer support;</li> </ul> |
| 5 | <p><b>High Pressure Cycles</b></p> <p>Diversion technique was applied several times during the frac to open new perfs, the plug was exposed to high pressure cycles.</p> | <ul style="list-style-type: none"> <li>• Complete operation heads-up to extend dissolvable plug pressure holding time.</li> </ul>  |
| 6 | <p><b>Dissolving Concerns</b></p> <p>Customer had bad experience with dissolvable tool in the past, where the tool did not dissolve in flowback/produced fluids.</p>     | <p>Pre-Job Dissolving Test in Produced Fluids</p> <ul style="list-style-type: none"> <li>• Dissolving test in produced fluids was conducted to prove and ensure that the plug will dissolve in produced fluid less than 7 days.</li> </ul>     |
| 7 | <p><b>Emergency Delivery Lead</b></p> <p>11 days from call-off to equipment &amp; field engineer deployment.</p>   | <ul style="list-style-type: none"> <li>• Vertechs emergency inventories.</li> <li>• Exceptional global logistic experience.</li> </ul>   |

### Results:

1. Vertechs delivered tools & engineers to Middle East within **11 days** operation lead .
2. Plugs held maximum **57 hours** without failing
3. Plugs held maximum differential pressure rating around **9,000 psi**.
4. Plugs has **dissolved** in produced fluid.