A customer in the Middle East was facing costly casing remediation operations in order to continue producing from an aging offshore well. The existing completion design, which included an electrical submersible pumping (ESP) system located in a deviated section of the 5-in. production liner, had exposed the casing above the ESP to production fluid. Over time this exposure had caused corrosion and wear, resulting in casing integrity issues that had to be addressed in order for the well to remain online. However, none of the conventional solutions—such as casing patches, straddles, or full recompletion—were economically viable options for the mature producer.

The dilemma: higher cost or higher risk

Isolating the casing from below by setting a small ESP packer in the 5-in. liner above the ESP would be a less costly option, but it also came with added risk. This is because, in order to accommodate a penetrator for the ESP cable while also maintaining an optimal flow area, the conventional interface configuration in smaller size packers is eccentric, or off-center, making it difficult to keep the packers balanced in the wellbore during deployment and retrieval. The packers tend to tilt when pushed or pulled via the off-center tubing, increasing their risk of hanging up in the well and requiring a costly fishing operation.

The solution: an industry-first design

Presented with one option that was too costly and another that came with greater risk, the customer and completions and artificial lift experts from Baker Hughes, a GE company (BHGE) collaborated on a new approach. The resulting solution was the industry's first-ever 5-in. concentric ESP packer.

Equipped with an API 14310 V3-rated seal element to ensure liquid-tight protection, the patented Octopus™ retrievable slimhole ESP packer (SH ESP packer) interface features three ⅜-in. bores situated around a concentric tubing conduit, allowing the packer to accommodate the ESP power cable while significantly reducing the risk of tool hang-ups.

The ESP’s cable was split into three phases and each phase was encapsulated in 316L stainless steel and sealed with metal-to-metal compression fittings. The ESP cable bores were protected from flow by a debris sleeve inside the packer. Prior to mobilizing the

Challenges

- Aging offshore well with casing integrity issues
- Well required ESP to produce economically
- ESP was installed in a deviated section of the slim, 5 in.-ID production liner
- Cost-prohibitive casing remediation and recompletion options
- Hang-up risks associated with deploying an eccentric feedthrough ESP packer

Results

- Re-established well integrity by isolating the damaged casing
- Enabled continued, economic production from aging well
- Reduced ESP workover costs by an estimated 50%
- Increased packer deployment reliability via a concentric through-bore design
- Executed flawless installation of the industry’s first 5-in. concentric ESP packer
equipment, penetrator installation tests were performed in a controlled manufacturing environment to help ensure quick, trouble-free operations at the well site.

**Fast, reliable deployment**

After the existing ESP was retrieved from the well, the new ESP and Octopus SH ESP packer assembly was run in hole and into the deviated 5-in. liner with ease. If an eccentric ESP packer had become stuck in this deviated liner section, it could have cost the customer an estimated $200,000 USD in fishing costs.

The Octopus SH ESP packer’s concentric design ensured the tools remained centered in the wellbore during deployment, enabling the new ESP to be reliably installed to target depth with the Octopus ESP packer above it.

**Liquid-tight sealing**

At depth, the packer was quickly set via hydraulic pressure to isolate the damaged casing. The Octopus SH ESP packer’s bidirectional slips anchored it firmly in place and an internal locking device was actuated to maintain its tight seal. After a pressure test confirmed the seal, the ESP was turned on and the well began producing again.

**Significant savings**

In addition to saving the customer an estimated six days rig time and $800,000 USD in equipment and workover costs—half of the estimated cost of a conventional recompletion job—the new Octopus SH ESP packer also enabled reliable installation of the new ESP at the same depth as the previous ESP for optimal lifting efficiency.

This job marked the installation of the industry’s first 5-in. concentric ESP packer, and is a testament of the successful collaboration between the customer and BHGE experts.

Based on the OPEX savings, the customer plans to use the Octopus SH ESP packer in future applications, and requested the development of a 4½-in. version to enable deployment in additional wells in their field.