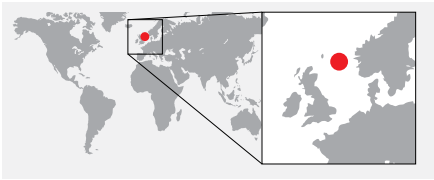
Case study: Fishing

Innovative engineering applied to retrieve faulty gas lift valve



Region: North Sea
Customer: Statoil
Field: Statfjord
Well type: Gas lift oil producer

Case benefits
- Consultative design and engineering service
- Innovative fishing tool and bespoke methodology
- Rapid recovery of failed equipment
- Simple technique that will suit a wide range of well configurations
- Reduced unproductive downtime

Key capabilities
- Recovery of jammed or damaged devices
- Tailored tool design
- Combination with high impact jars and accelerators
- Combination with hydraulic jar; no need to adjust jar while in operation

Typical applications
- Retrieval of downhole equipment from side pocket mandrels

Challenge

In May 2011, as part of a routine gas lift optimization intervention, the field operator was attempting to install a gas lift valve (GLV) in a side pocket mandrel (SPM) in a North Sea gas-lift production well. A pressure test conducted after the operation indicated that the valve had been incorrectly installed. There were also issues with well access, which led the operator to suspect that there might be a scaling problem in the well.

A brush system was used to clear debris and gain access, but this resulted in damage to the GLV. It became apparent that the valve fish neck was broken, which posed a serious challenge for recovering the valve. During a subsequent coiled tubing operation, the Archer SPACE™ ultrasonic imaging tool identified the GLV's position and confirmed that the valve could not be retrieved using conventional methods.

The challenge facing the field operator was to find a safe and reliable fishing method for extracting the GLV from the SPM.

Archer
The well company

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Solution

The operator invited proposals for the retrieval project from several companies. The objective was to ensure that the fishing tool selected would complete the required retrieval operation quickly, reliably and without making the situation in the well worse. Archer's specialists proposed the use of an inverted kickover tool that would push the GLV out of the SPM from below and collect the released valve in the tool carrier for safe retrieval (concept). The operator selected this as the most promising concept.

During development work on the retrieval method, the Archer team modified the concept to a two-stage solution. In the first stage, the inverted kickover tool would mechanically push from below until the GLV seals were above the communication port in the SPM (final solution, run 1). Then, a seal would be inserted below the port and hydraulic pressure would be used to free the GLV by increasing the pressure in the annulus (final solution, run 2). The GLV would then be retrieved in the carrier. Extensive onshore testing showed that this approach offered the highest probability of success.

The equipment was mobilized for the offshore operation in February 2012. Following a successful drift run, the carrier and the inverted kickover tool were run in hole. The GLV was pushed up as planned. Then the carrier and the inverted kickover tool, along with the packing stack arm, were run in hole to apply pressure and push the GLV out. When the engineers observed a pressure drop in the annulus, they parked the inverted kickover tool in the carrier and pulled out of hole.

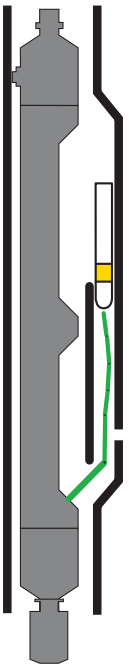
Results

This approach retrieved the broken GLV at the first attempt, only 21 hours after the drift run. A replacement GLV was successfully installed on subsequent slickline runs, which enabled the field operator to the bring the well back on-stream. The operator rated the performance of the new inverted kickover tool as "excellent" and noted that the success of the operation reflected the professionalism of the engineers who had conducted it.

Key factors in this successful operation were having dedicated onshore personnel involved in the planning phase; close cooperation with Statoil; an extensive onshore testing process; and thorough training of the offshore personnel who were to operate the tool.

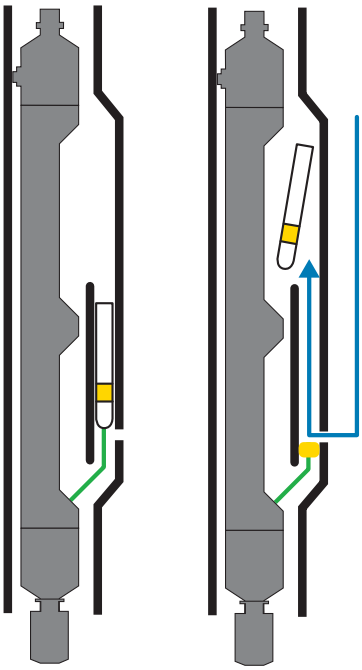
The operation at this North Sea field has proved the concept and applicability of the inverted kickover tool and underlined the importance of innovative engineering and pre-job testing when dealing with unusual well issues.

Concept



Mechanically push GLV out of side pocket from below

Final solution



Run 1
Mechanically push GLV up to establish annulus to tubing communication

Run 2
Release GLV from side pocket using annulus pressure

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