INTEGRATED VIDEO CALIPER
SAFETY VALVE FAILURE DIAGNOSIS IN HIGH TEMPERATURE WELL

EV's Integrated Video Caliper (IVC) tool identifies failed safety valve and evaluates seal bore condition

EVALUATION OF CRITCAL COMPLETION COMPONENTS

Evaluating and maintaining the integrity of a well is an integral part of the well life cycle from construction to abandonment. The condition of safety critical components, such as safety valves, is of paramount importance to the successful and secure operation of a well.

In this case, the customer had an issue when a safety valve failed to close in a high temperature, offshore gas well in North Africa. When the initial intervention to reinstate the safety valve failed, further investigative work was required to fully understand the problem.

INTEGRATED LOGGING SOLUTIONS FOR WELL DIAGNOSIS

Having previously used multi-finger caliper tools to evaluate the condition of completion components, the customer immediately recognised the value offered by EV's IVC tool and understood its impact in achieving their objective. Deployed on electric line, a 40-arm multi-finger caliper was combined with full colour, surface read-out sideview and downview cameras providing both qualitative and quantitative data in a single run.

The sideview image in Fig 1 shows the damaged spring assembly which prevented the flapper valve from closing as expected. Prior to the camera being run, a number of possible reasons were under consideration. Visual clarification eliminated any uncertainty.
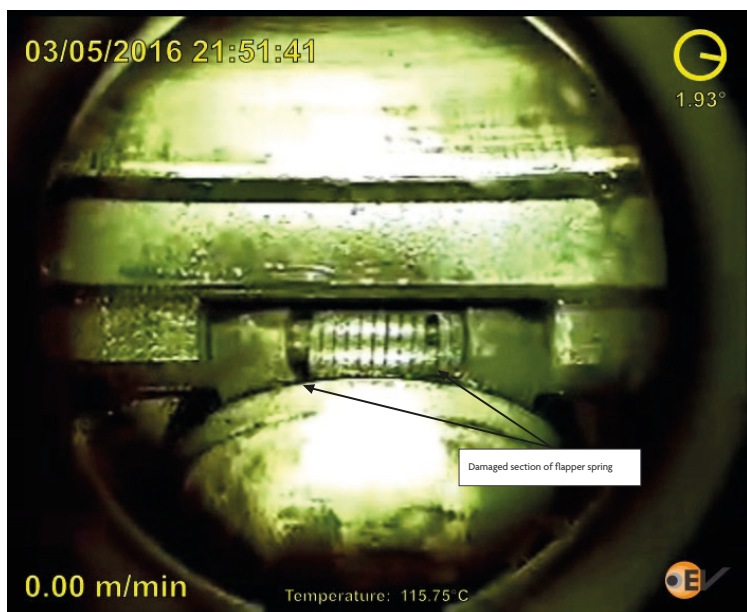

Figure 1: Damaged Flapper Valve Spring

THE CHALLENGE

When the safety valve in a high temperature, offshore, gas producer failed to close, the customer issued a reinstating programme. However, when this failed due to unexpected pressure leak offs at the lower seal bore, the well was isolated until further information could be gathered and a comprehensive way forward determined.

THE SOLUTION

To optimise offshore operations and minimise the associated costs, EV's Optis™ IVC40 allowed a 40-arm multi-finger caliper to be deployed, on e-line, in a single run along with full colour, high definition sideview and downview cameras. This unique combination provided visual confirmation of the condition of the SCSSV internals as well as quantitative dimensional data across the seal bores and tubing directly above.

THE RESULTS

EV's high definition, colour sideview camera clearly identified damage to the safety valve spring and hence the reason why the flapper did not close. The camera also revealed scratch marks on the lower seal bore. These images along with quantitative data from the multi-finger caliper provided valuable information about the internal condition of the safety valve so that future interventions could be planned.

STITCHING IT ALL TOGETHER: ELIMINATING GUESS WORK AND MINIMISING RISK

The service does not stop there. A full integrated video and multi-finger caliper interpretation was provided where further sideview images were integrated into the analysis. Fig 2 provides a graphical display of the various components in the safety valve assembly and their measured and expected nominal inner diameter. Fig 3 shows a visual image of the internal condition of the lower seal bore alongside quantitative caliper data. While the mean inner diameter on the multi-finger caliper data is close to nominal, the sideview camera image clearly shows thin scratches on the inner pipe wall.

Multi-finger caliper measurements are widely accepted in the industry as the primary means of evaluating the internal condition of pipe or completion component walls. This example highlights the challenges that stand-alone mechanical measurements frequently encounter, and the importance of complementary measurements to minimize potentially catastrophic consequences.

Figure 2: Dimensional data from MFC40 showing internal profile of safety valve assembly
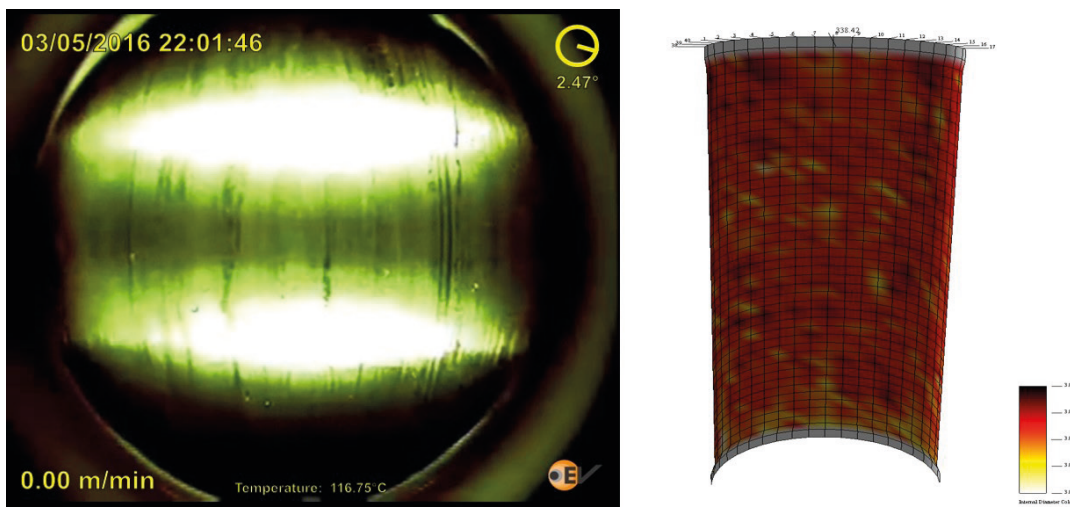

Figure 3: Sideview image showing scratches in lower seal bore (left) and cross section of multi-finger caliper data across the lower seal bore (right)