IPTC 12255

Good Practices in Progressing a Smart Well Portfolio

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Abstract

Although smart wells have gained acceptance in the industry[1-3], the integrated workflow needed to progress a portfolio of smart well opportunities requires systematic attention. In some cases, smart wells fail to materialize not because technologies are not ready but because of lack of participation and integration of relevant disciplines in a timely fashion.

This paper summarizes the good practices used by one operator to progress a portfolio of smart well opportunities in a number of major projects. The smart well workflow is divided into six phases: Identify, Assess, Select, Define, Execute and Operate. The objectives, technical considerations, contribution from various disciplines, key success factors and good practices of these phases are defined and detailed.

A key to successfully progressing smart well opportunities in a project is to identify and work the interfaces between the relevant disciplines. In the first three phases, the project team identifies the opportunities and assesses the feasibility of various smart well options. The optimum smart well solution is then selected through quantification of both the risks and benefits of these options using a multi-disciplinary approach. Quite often smart wells are advocated by one discipline without sufficient buy-in from other disciplines. This often leads to a weak business case and failure to adopt smart wells by the project team. In the Define Phase, attention should be placed on ensuring that smart wells components are compatible with other components in the well, subsea and surface systems. In the Execute Phase, a rigorous QA/QC program is key to successful installation. In the Operate Phase, a Collaborative Work Environment is recommended to bring data, information and people from different locations together to facilitate timely decision making to optimize the value of the asset.

Introduction

In this paper, a smart well is defined as one that consists of both downhole sensing and flow control. Typical downhole sensing devices include permanent pressure and temperature gauges, flowmeter, and distributed temperature sensing (DTS). Other devices include cableless communication and downhole geophones for detecting microseism. Typical downhole controls include interval control valves (ICV) and auto gas-lift valves. Interval control valves can be on/off, multi-positioned, or infinitely variable. They may be actuated by hydraulic or electrical control lines or both. The degree of smartness should be fit-for-purpose and defined in the early stages of a project.

A smart field[4-6] usually consists of one or more of the following: smart wells, smart facilities, and an aerial reservoir surveillance program, e.g. 4D seismic. A field becomes smart when information from these technologies can be assessed, evaluated and analyzed by relevant disciplines to make timely decisions to optimize the productivity and recovery of the field. While this paper focuses on smart wells, how smart wells fit into the overall smart field implementation will be discussed.

Smart Well Portfolio

At present Shell is progressing smart wells in a number of major projects involving subsea, offshore and land. The delivery of these projects can be divided into six different phases: Identify, Assess, Select, Define, Execute and Operate. Usually a multi-disciplinary project team is set up in the Operating Unit, Technology Center or co-located in both to progress a major project. To ensure technical robustness and facilitate cross-project learnings, a good practice is to implement a technical assurance program to provide peer assist and peer review in all phases of these projects. The technical assurance team usually consists of senior members of various disciplines. They review the progress of the project team at various tollgates and