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## Delivering the Largest Oil Increment in the World—Innovation, Solutions and Rewards

Ali Al-Ghamdi, Fahad Al-Bani, and Roberto Tello Kragjcek, SPE, Saudi Aramco

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### Abstract

The Khurais project, located in the Central region of Saudi Arabia near the capital Riyadh, is the largest onshore oil development project in Saudi Arabia. Due to the large number of wells, one of the success measures of this project revolves around its expeditious completion and accelerated learning process. Specific innovative solutions were deployed to improve the well delivery performance, as well as to address the peculiar drilling challenges of the Khurais field. The combined impact of these innovations was a significant reduction in drilling time and cost.

This paper describes how novel solutions were implemented to deliver the Khurais increment and reviews the engineering and operational processes used by the operator to successfully complete this project.

The application of cutting edge technologies, like rotary steerables system (RSS), real time drilling data transmission, geosteering, systematic bit selection and re-design, performance monitoring through technical limit process, non-damaging fluids, on-site dedicated mud plant for effective oil-based mud (OBM) management and logistics, have contributed in achieving this success.

With the focus on continuous improvement, a collaborative effort was implemented to analyze and assess the drilling challenges, how best to address them, and to apply the lessons learned throughout the duration of the project. This collaboration included managers, service companies, rig contractors, drilling engineers and rig foremen working together at the Khurais field operation site.

This major performance improvement could only be achieved through continuous drilling programs and practices that are properly planned, engineered and managed without sacrifice to operational safety and prudent operational practices.

Many factors contributed to further improvements in drilling performance, such as continuity of drilling team members and equipment, application and in-house development of new technology, continuous revision of all operations through streamlining of practices, continuous tracking of drilling efficiency through the database, performance management (reduce rig downtime, reduce drilling trouble and benchmarking), team approach partnership and team accountability and ownership.

### Introduction

The Khurais field is located in a remote area in the Central part of Saudi Arabia, approximately 200 km from the capital Riyadh, and 300 km from the Eastern port city of Dammam. Two rows of oil producing wells are drilled in the middle of the field, and two rows of power water injector wells are drilled close to the field boundaries.

An average of 12 rigs worked simultaneously throughout the duration of the project to drill and complete the required increment wells. These wells are comprised of Horizontal Producers (PHZ), Trilateral Horizontal Producers, Horizontal Power Water Injectors (PWI), Horizontal Power Water Injectors with pilot holes and a number of evaluation wells (EV). The wells were drilled to an average measured depth of 13,000 ft, with an average of 6,000 ft of open hole section across the reservoir, **Fig. 1**. The lateral section was drilled with steerable mud motors or rotary steerable point-the-bit technology, depending on the length of the section and the wellbore friction effect.