

Enabling Digital Transformation by Automating the Well Trajectory Design

Haitham Al Tamimi¹, Carlos Alberto Moreno¹

¹Petroleum Development Oman

Abstract

Petroleum Development Oman (PDO) is in the process of transforming its well and urban planning by adopting digital technologies and Artificial Intelligence (AI) to improve organizational efficiency and maximize business value through faster quality decision. In 2020, PDO collaborated with a third-party contractor (White Space Energy) to provide a novel solution to an Industry wide problem – how to reduce the well planning cycle by effectively plan 100's of wells in a congested brownfield setting.

Business Transformation

This paper describes an innovative AI-assisted well planning method that is a game-changer for well planning in mature fields, providing efficiency in urban and well trajectory planning. It was applied in three of PDO's most congested fields with a targeted infill of 43m well spacing. The novel well planning method automatically designs and optimises well trajectories while considering surface, subsurface and well design constraints.

Existing traditional workflows in the industry are extremely manual, time consuming (multiple man-months of work), and sequential (close dependency between multi-disciplinary teams - geologists, well engineers, geomatics, concept engineers and reservoir engineers); particularly complex for fields with a congested subsurface - 500+ existing wells, and surface - limited options for new well pads. These conventional and sequential ways of working are therefore likely to leave value on the table because it is difficult to find new feasible well locations and trajectories and optimise the development in an efficient manner.

The implemented workflow includes an AI Model with a numerical cognitive engine. It has the potential to enable step change in improvements in time and value for brownfield well and urban planning for all future PDO developments.

Innovation

The innovative AI assisted workflow, one of the first industry efforts for an infill development of this size, evaluates, generates and optimises from thousands of potential drillable trajectories to an optimized set for the field development plan (based on ranked value drivers, in this case, competitive value, cost and UR).

The novel approach leads to a step change reduction of 40% in cycle time of the Data Analysis phase, for well and urban planning in a complex brownfield (500+ existing wells), to design 100-200 infill targets. The Value calculation in one of the three assets, reflected an additional amount of 5 million USD in the NPV of the project. It provides potential game-changing digital solutions to PDO and the industry, enabling improved performance, much shorter cycle times and robust, unbiased well plans.

In summary, this is a tangible example of real digital transformation of a complex problem into an integrated AI Solution. The new approach transformed the process flow from a sequential well planning and urban planning method to an iterative and fast AI solution – including all technical considerations while adding massive value represented in HC acceleration / early production.