

Real-Time Optimization of an Integrated Gas System

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Abstract

This paper describes the large-scale trial of Real-Time Optimization (RTO) that Shell Malaysia E&P has conducted on the Integrated Gas Production System in Sarawak, implementing models for real-time monitoring and optimization of wells and facilities on a gas production network spanning more than 100 wells on more than 40 platforms across a number of different Production Sharing Contracts (PSCs). We highlight how Digital Oil Field (DOF) practices enable field-based data to be turned into information, support decision making, and lead to actions that ensure production is optimized continuously.

The technology described in this paper is applied to achieve consistent gas supply to meet demand, maximizing revenue on producing assets, and enabling improved and timely operational decisions - striking a balance between short-term revenue and long-term value. It demonstrates Shell's ability to manage and continuously optimize complex, integrated, multiple-objective, closed-loop systems such as gas production assets. The pursued benefits are increased condensate production at current or improved expected Ultimate Recovery, whilst maintaining a stable gas supply, fulfilling quality constraints and contractual LNG nominations.

The optimization is data-driven and covers more than 1,000 variables and features multiple, mutually dependent objectives and constraints. The solution has proven significantly better than prior physical model-based solutions, which are capable of delivering optimized field settings, but with inherently unstable results, and not fast enough for application in a real-time decision making environment. This is one of the first successful attempts to optimize, in real-time, a production environment of this size and complexity, including a complicated set of commercial and contractual constraints.

Additionally, this approach replaces the traditional, daily or monthly optimization by a continuous one. The system generates optimal set-points for the control variables which are executed by the operators. Closed loop control is possible with remotely operated chokes which would allow the optimization of the entire gas system to be fully automated and minute-by-minute.

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