



DEVELOPMENT PLANNING AND PRODUCTION OPTIMIZATION IN THE OIL AND GAS INDUSTRY

Cassandra M. McZeal

ExxonMobil Upstream Research Company

Technical Software Development

cmmczea@upstream.xomcorp.com

Over the past five years, ExxonMobil has been successful in applying advanced optimization technology to the difficult planning and scheduling problems of large, capital-intensive development projects. The decision process spans the entire production network: reservoirs, fields, wells, platforms, pipelines, surface facilities, and market options. Combining optimization technology with an integrated business model often leads to innovative and higher-value solutions. An integrated business model with optimization capabilities complements the traditional methods that use a case-base approach with multiple rigorous physics models for development planning. Current development planning optimization models have identified opportunities that have added significant value to project economics and capital efficiency.

The optimization technology used in ExxonMobil's development planning models determines the optimal solution to an economic-based objective function subject to constraints specifying physical and economic models defined over a planning horizon. Since value is also driven by economic factors such as the tax and royalty regimes that may significantly vary from field to field, these must also be considered simultaneously in the development planning process. The use of both discrete and continuous variables over a non-convex nonlinear domain yields models in the most difficult class of optimization problems: the mixed integer nonlinear programming (MINLP) class. Development of proprietary modelling and solution procedures was necessary to solve the resulting large and difficult optimization problems.