

Development of Advanced Field Optimisation Techniques in Karachaganak Integrated Asset Model

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Integrated Asset Modelling is the approach whereby the entire asset from reservoir to final delivery point is modelled as a whole, rather than standalone. Today this approach is considered a vital part of the oil industry with many important decisions such as field development decisions depending on it. Karachaganak has been producing since 1984 and has undergone several stages of field development and it currently producing at its liquid production plateau and is constrained by both its gas and water handling capacities. With the reservoir pressure declining, the well GORs and WCTs have been increasing and to maintain plateau production additional gas and water handling facilities are being considered to allow higher GOR or WCT wells to flow, which are currently shut in or choked.

Different field development strategies are being explored using the Karachaganak IAM, which is comprised of a reservoir simulator, a GAP surface network model and process simulator that have been coupled in RESOLVE.

This paper covers the implementation of advanced field management logic to guide network optimisation for production forecasts to ensure all field constraints (physical and legal) are honoured whilst maximising both liquid and gas production. Existing script-based logic was converted to transparent and open workflows using RESOLVE VisualWorkflows, enabling engineers to read, modify and expand logic without prior coding experience, greatly improving the model sustainability, flexibility and longevity.

Conclusions:

- Integration allows for more reliable and robust forecasts to be run
- Using RESOLVE as an integration and optimisation platform allows the complex field management rules to be met while optimising oil and gas production
- The conversion of existing VisualBasics scripts to VisualWorkflows allows for a more transparent and sustainable solution formulation
- The robust Integrated Production Model is now used to evaluate large investment projects and facilitates rational economic decisions to be made.