Next-Generation Modeling for Long-Term Development Planning: Case Study

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Abstract

In conventional modeling, the flow from the reservoir to the wellbore is decoupled from the flow in the surface pipelines and the facilities. This approach is sufficient during history matching; however, it is less accurate for future performance predictions where precise hydraulic calculation is necessary to assess the pipelines and facilities design.

This paper studied an offshore green field where production from six different reservoirs in which several single and multilateral horizontal wells are drilled and connected to offshore wellhead towers being connected by pipelines to an infield super complex. Because surface facilities are shared by all reservoirs and the field is being developed as a gas self-sufficient field wherein the processed gas from the first stage of separation, after removing the fuel, must be re-injected, it has been recognized that conventional modeling is not appropriate for defining the long-term development plans (LTDP) in addition to identifying major development and operation risks related to the subject field.

To take into account the impact of the surface facilities on the predicted field performance, a next-generation modeling approach was used to fully integrate the subsurface models with the surface model. Additionally, as the five-spot water injection pattern is the development scheme for one of the primary reservoirs, streamlines simulation using the integrated multi-reservoirs model was performed to define the performance of the different injection patterns and to rationally optimize use of the surface injection facilities.

The subject multi-reservoir model was also used as a tool for risk mitigation plans for potential major gas production; different approaches were proposed and assessed in an attempt to define the possible plans for using the excess produced gas without negatively impacting the field's oil recovery.