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Production Optimization by Real-Time Modeling and Alarming: The Sendji Field-Case

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Abstract

Digital technologies can improve oil production and reduce operating costs. In this prospect, TOTAL launched a corporate program called “Field Monitoring” to capitalize affiliate previous experiences. For gas-lifted wells, it resulted in the development of the “Well Performance Monitoring” (WPM) tool which was implemented in December 2006 at the Sendji field located offshore Congo.

This paper presents the main workflows, functionalities and added value of WPM.

Besides multi-real-time data trends, the application offers colour-coded multi-alarm visualization versus time. These alarms are ranked in terms of “priority” and aggregated at each well, platform, field and asset level, allowing well engineers to track down under-performing wells.

Alarms priority can be linked either to well integrity issues or production losses. These real-time estimated losses are computed using network and well modeling softwares; they highlight deviation from optimum operating set points.

WPM makes easier the regular optimization of gas-lift optimization by feeding models inputs with user-validated real-time data.

A major challenge of right-time production optimization is to sustain updated models; two workflows address this issue: automatic modeling of production well tests and real-time modeling of the actual behavior of the production system. When a significant difference occurs between modeling and reality, a specific alarm is triggered.

The present paper shows various examples of enhanced well performance diagnosis and the corresponding production gains. Also, a good support from onsite teams was achieved thanks to key technical solutions such as user-friendly interface, possible individual tuning of each alarm, handling of

unstable or unmatched wells. Finally, WPM enables to compute KPI's that allow the evaluation of potential well interventions.

This tool will be deployed at corporate level, and extended to ESP lifted wells, gas injectors or producers and to subsea wells in deep offshore environment. The general alarming, interface features and data architecture will be applied to surface equipment monitoring and optimization.

Introduction

It is now well known that the optimization of field production is not obtained by the optimization of each individual producer well. It implies the integration of the whole production chain, from reservoir, near-well bore, wellbore, production network up to process facilities and export constraints. To ease the optimization of the whole production system, transverse teams called “Well Performance” have been put in place officially in TOTAL subsidiaries since 2003. These teams encompass representatives of reservoir, drilling and completion, and field operation. Among different subsidiaries, they have implemented specific tools to share data, valorize real-time data, perform diagnosis and optimize production.

An integration of these experiences at a corporate level was decided and in November 2005, a pilot project was kicked-off to set-up a Well Performance Monitoring tool (WPM). The Beta version was installed in December 2006 and a complete v1.0 in March 2007. It is based on the integration of digital technologies such as real-time data historian, web based data visualization tools, specific deployments for alarming and commercial well and network flow models.

This enables a fast loop “acquisition > transfer > processing > sharing > optimization/decision > acting”, and an improved management and optimization of the entire production system.

Besides a short description of Sendji field and of the application architecture, the paper mainly focuses on efficient data visualization tools which are integrated in the application, and on the alarming principles and workflows which are implemented.

Finally, they are illustrated with various examples of well performance diagnosis and production gains.

Presentation of the Sendji field

The Sendji field is a mature oil field located offshore Congo. Five drilling platforms (SEF0 to SEF4) are producing currently 54 active oil producers. All oil wells are produced by