

## **Surveillance: Minding our P's and Q's - Production, Pressure, Quantity and Quality (Steam)**

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### **ABSTRACT**

In a thermal field, surveillance is key. A considerable amount of time is spent working across disciplines to monitor field performance. Lost Hills is one of the shallowest steam floods in the world, with the average depth of a Tulare well at 250' MD. Every week the Reservoir Management Team (RMT) consisting of an engineering tech, geologist, operations engineer, reservoir engineer, and team lead reviews pre-selected patterns which include: steam injectors, producers, and temperature observation wells. The RMT relies on a plethora of surveys collected by knowledgeable field personnel. These surveys include steam injection, temperature (at the well head, flowline, and within the reservoir), steam ID, and steam separator surveys. These surveys, combined with Petrophysical data from openhole logs, side wall and conventional core and a 3-D model, all aid in the interpretation of the reservoir, and are critical to understanding steam flood performance and ensuring safety, efficiency and profitability. Managing steam, monitoring pressure and understanding steam chest growth help maintain safe operations, ensure compliance with State permits and regulations, and control costs. Steam is one of the largest operating expenses in a thermal field, approximately 30-50% of the total operating cost. Heat management is essential to keeping costs low. Knowing where steam quality is the highest and lowest can help explain why some areas have higher production. Monitoring steam generators, injection wells, temperature observation wells, and producers helps the team understand both subsurface and surface operational efficiency. Confidence in the geology and reservoir geometry can help explain steam chest development. This can also be seen at the producers with the help of flowline, casing, and reservoir temperatures. Annual steam ID logs identify depletion and de-saturation within the productive interval. Lost Hills has a vast network of Temperature Observation wells within patterns. The surveys are used to ensure that heat from injectors is contained within the targeted interval and to track growth of the steam chest. Anomalies may indicate heat loss to thief zones or problems with the injector and facilitate appropriate intervention. Each week well notes are captured and action items are assigned to team members to ensure that work is completed. The RMT has a goal to evaluate each pattern in detail twice a year. Documenting well performance, proposed and completed work, downtime, lessons learned, and general observations creates a robust history for each well. This process promotes knowledge sharing so future petrotech staff will have the necessary information to maintain and grow the field. Surveillance sessions are opportunities to find work-over candidates and identify replacement and new wells. Surveillance is crucial to thermal operations to ensure project safety, efficiency and profitability. The interactions, discussions, and knowledge shared each week empower each team member to see the reservoir through the eyes of their team, not just with their own discipline.