The Belridge Giant Oil Field: 100 Years of History and a Look to the Future*

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Abstract

April 2011 marks the 100th anniversary of the well that discovered the Belridge giant oil field in the San Joaquin Valley of California. During the 100 years the field has produced 1.6 billion of the approximately 6 billion barrels of the estimated original oil-in-place. The field is 45 miles WNW of Bakersfield and covers an area roughly 15 miles long and up to 2.5 miles wide. It has three totally separate and distinctly different producing zones:

- shallow Pleistocene fluviodeltaic sands producing heavy oil via steamflood;
- Miocene deepwater diatomite layers producing light oil via hydraulic fractures and with water injection pressure maintenance;
- deep Oligocene to lower Miocene marine sandstones producing gas and light oil via primary gas expansion.

Each zone was developed and reached maximum production rate at different times and using different completion strategies. The produced oil is sold at the field and pipelined to refineries in northern and southern California for processing.

Although down from its peak of 175,000 BOE per day in 1986, the field currently produces 77,400 BO and 37 MMCFG per day which makes it one of the largest onshore fields in the USA. Since discovery, over 15,000 wells have been drilled; today 5,900 producers and 2,100 injectors are still active. In each of the past few years, about 600 new wells have been drilled and completed. Even though production is in decline, the field has significant remaining oil in place and remains a very attractive target for continued development of known resources as well as for exploration below current production and around the periphery of the field. In recent years 3-D earth models coupled with an emphasis on optimizing the placement and retention of injected water and steam have helped improve recovery. Over 300 horizontal wells have been drilled in the fluviodeltaic sands and the diatomite.

In the 1930s the field had the deepest well drilled in North America. In the 1990s the field had the closest well spacing of any field in the world: vertical
and horizontal wells drilled 38 ft (11.5 m) apart and completed with sand-propped fracs. At the start of the 21st century the field is gearing up for many more years of activity with installation of a microseismic array, distributed temperature sensing in water injection wells, regular InSAR surveys, as well as ongoing interpretation of a 3D seismic survey covering the entire field for targets below the current producing zones.
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Abstract
April 2011 marks the 100th anniversary of the first oil well documented at the Belridge field in San Joaquin Valley, California. Since the 1930s the field has been completed more than 6 billion barrels of the estimated oil-in-place. The field is 40 miles (64 km) long and covers an area of 15,000 acres (60 km²) with about 20,000 active wells. The field has a very diverse geology and a long history of active exploration, development, and production. The field is one of several giant oil fields along the western edge of the San Joaquin Valley, which is located on the western edge of the San Andreas fault zone. The Belridge field is one of several giant oil fields along the western edge of the San Joaquin Valley.

Geologic Setting
Hydrocarbon Systems

Depositional Environments
Reservoir Parameters

Early Days

Current Operations

Diatomite

New Techniques

The Belridge giant field still has many hundreds of millions of barrels available for recovery although production from the sub-Monterey to North Belridge and the Tulare beds stands. A well designed to produce the subsurface reservoirs, however, will be a multistage project. The subsurface reservoirs will require long-term planning and development, as well as ongoing interpretation of the 3-D seismic survey covering the entire field for targets below current production and around the periphery of the field. In recent years, about 600 new wells have been drilled and completed. Even though production is in decline, the field continues to be a very attractive target for continued development of known and undiscovered resources as well as for exploration below current production and around the periphery of the field. The Belridge giant field still has many hundreds of millions of barrels available for recovery although production from the sub-Monterey to North Belridge and the Tulare beds stands. A well designed to produce the subsurface reservoirs, however, will be a multistage project. The subsurface reservoirs will require long-term planning and development, as well as ongoing interpretation of the 3-D seismic survey covering the entire field for targets below current production and around the periphery of the field. In recent years, about 600 new wells have been drilled and completed. Even though production is in decline, the field continues to be a very attractive target for continued development of known and undiscovered resources as well as for exploration below current production and around the periphery of the field.