



Sockeye Field Platform Gail Offshore CA

2009 - 2014



BACKGROUND

- Operator - Venoco
- Field - Sockeye
- Asset - Gail Platform
- Location - Offshore CA, USA
- Trap Type - Structural
- Pay Zone - Lower Topanga Sand
- Formation Age - Middle Miocene
- Depth to Crest - 5,600ft
- Mean Permeability - 0.1 to 6,500mD
- BHT - 71°C (160°F)

Field was discovered in 1983, sanctioned in 1990, and produced first oil in 1993.

Sockeye Field is located in the Santa Barbara Channel, Offshore California. The Sockeye Field reservoir is a broad NW-SE trending double-plunging anticline. It produces from five reservoirs; Monterey formation, Upper Topanga Sands, Lower Topanga Sands, Middle Sespe and Lower Sespe. The field was discovered in 1970 with Platform Gail set in 739-ft of water in 1987. The Upper Topanga contains sour oil while the Lower Topanga contains light, sweet oil.

The Lower Topanga is 5' to 50' in thickness, high permeability sandstone with continuity across the field being fairly good.



>1,200% +
ROI*



>82,000
barrel incremental
Over 3 years



7%
drop in water cut



< 3 months
payback

* Incremental revenue
over pilot cost

CUSTOMER CHALLENGE

Identify an alternative, cost-effective EOR technology to increase oil production and recoverable reserves

Implement EOR technology with zero CAPEX outlay

Implement EOR technology with a minimal offshore footprint

PILOT INJECTION PROCEDURE

- 108 barrels treatment using 100 barrels injection water and 8 barrels of Titan OOR nutrients
- Displace into formation with 120 barrels injection water (200% displacement volume)
- Shut in Well for 7 days (incubation period)
- Collect flowback samples as per Titan OOR sampling guidelines and collection daily cuts and well tests

TITAN OOR APPROACH

The application of the Titan OOR Process® generally consists of the following steps:



Initial field screening



Well sampling and laboratory analysis



Pilot injection application

The application of the Titan OOR Pilot process for the Sockeye field consisted of the following steps:

Step 1 – Field Screening of Reservoir Characteristics and Well Specific Data - Completed

Step 2 – Target Well Sampling & Laboratory Analysis - Completed

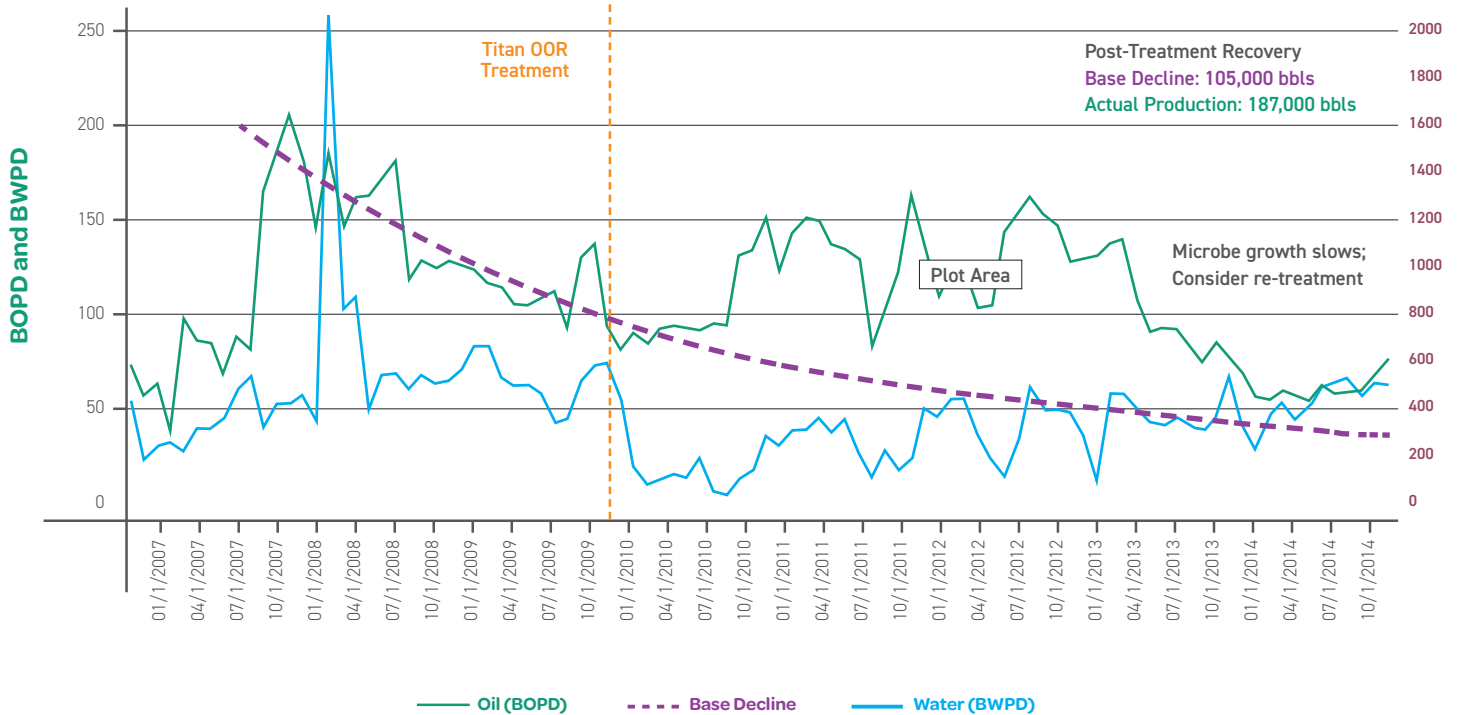
Step 3 – Single Well Pilot Test (In-situ Microbial Response Analysis – ISMRA®) – Completed

The In-Situ Microbial Response Analysis (ISMRA®) or Pilot Test is designed specifically to replicate the laboratory results in the reservoir. Produced water samples were taken pre OOR nutrient injection and just after Well flow back. A significant production response is often observed; however, the most important aspect to this step is the microbial response observed in the laboratory from samples taken upon return to production.

Step 4 – Treatment with fully formulated Titan OOR nutrient package

Step 5 – Follow-up treatments in five Upper Topanga offset wells

E-19 PRODUCTION HISTORY SOCKEYE FIELD, OFFSHORE CA



OBSERVATIONS

- Significant incremental oil gain
- Lowered water cut following treatment
- No change to oil quality
- No change to separation efficacy (same oil-in-water content)

WHAT OUR CUSTOMERS SAY

"With waterflood estimated ultimate recovery (EUR) of the Lower Topanga equal to or greater than 34% of OOIP, E-19 response from the Titan OOR treatment in 2010 was very encouraging. The peak of 100 BOPD above the base decline clearly showed the Titan OOR Process can recover reserves that the waterflood alone does not."

"The Venoco technical staff strongly advocated expanding the Titan OOR Process at Sockeye and applying it in other fields. However the company choose to change it's focus to bigger targets. While the results at E-19 and other wells were very good, management was looking for a big impact with investors, and pivoted to fractured shale reservoirs. Specifically, the Monterey shale formation onshore California. Ultimately that effort failed, due in part to the fact that the Monterey onshore was interbedded without the high fracture density seen offshore. After drilling and testing many onshore prospects, the lack of success put the company in financial distress. All Venoco assets were sold after."

– Bob Zahner, Venoco Senior Reservoir Engineer