

# Pemex Well Exceeds Expectations by 162%

Case study: SXE superX emulsion maximizes acid penetration in Samaria well

## Challenge

Optimize production from a well with formation damage caused by excessive oil-base drilling fluid losses in a naturally fractured reservoir.

## Solution

Use SXE\* superX emulsion to maximize acid penetration and bypass the damaged zone in the critical matrix.

## Results

Achieved production 162% greater than expected from offsets and petrophysical analysis.

## Excessive fluid loss

Pemex's Samaria 6117 well in southern Mexico is in a naturally fractured reservoir with relatively high temperatures (137 degC [279 degF]). It was drilled to 4,618 m [15,150 ft] with oil-base mud as the drilling fluid.

Excessive drilling fluid losses were reported to be 70 m<sup>3</sup> [440 bbl] in the productive zones. This fluid loss could cause formation damage from solids bridging and emulsions due to fluid incompatibilities. Pemex expected oil production in this area to be 127 m<sup>3</sup> [800 bbl/d] based on offset well production and petrophysical property analysis.

### Well Properties

Perforated interval	4,515–4,545 m [14,810–14,910 ft]
Reservoir pressure	135 kg/cm <sup>2</sup> [1,920 psi]
Oil gravity	35 API
Temperature	137 degC [279 degF]
Porosity	8%
Permeability	30 mD
Water saturation	15%
Reservoir composition	97% limestone, 3% shale

## Matrix stimulation proposal

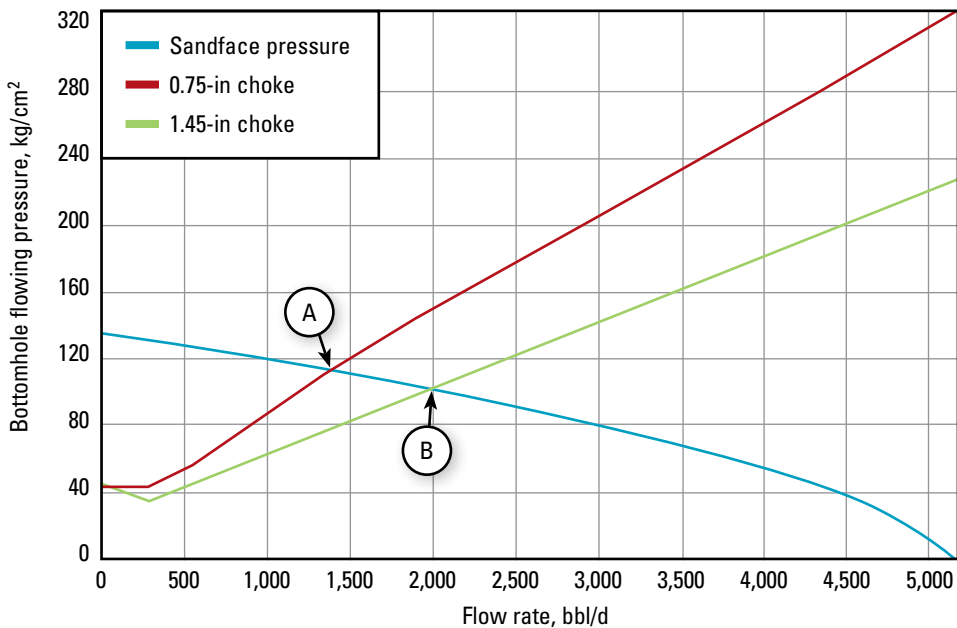
Schlumberger used the PowerSTIM\* well optimization service to generate a stimulation proposal that considered reservoir knowledge, fluid selection, treatment design, execution, and evaluation. The model predicted that the lost drilling fluid had invaded the critical matrix and plugged the fracture system, reducing well productivity. This prediction was supported by a laboratory compatibility test for the drilling cuttings, oil sample, and stimulation fluids.

The proposal outlined two stages:

1. Nonreactive fluid CLEAN SWEEP\* solvent systems for damage removal to disperse emulsions and clean drilling mud from the rock
2. Reactive fluids including
  - retarded SXE superX emulsion to achieve greater penetration into the formation and to bypass the damage
  - MSR\* 100 mud and silt remover (15%) to complement the retarded system
  - two SDA\* self-diverting acid slugs to improve fluid placement along the entire perforated interval

The SXE superX emulsion is a viscous, highly retarded, concentrated acid system (70% HCl, 30% oil), stabilized with an emulsifier. Because it can penetrate farther into the formation than any live acid, SXE emulsion was used for deep penetration. The dissolving power of the HCl-base SXE system, coupled with slower carbonate reaction time, creates deeper wormholes and makes the emulsion less corrosive to steel casing and tubing.

# Case study: SXE superX emulsion maximizes acid penetration in Samaria well



After an oil production increase 162% above its expectation for this well, Pemex will use the SXE treatment in wells with similar temperature conditions.

*Nodal analysis at the sandface. Point A indicates actual conditions with 3/4-in choke: flow of 1,312 bbl/d, water cut of 0%, reservoir pressure of 135 kg/cm<sup>2</sup>. Point B indicates initial conditions immediately after stimulation: 1.45-in choke, flow of 2,077 bbl/d, water cut of 0%, and reservoir pressure of 135 kg/cm<sup>2</sup>.*

## Production increase

The SXE stimulation treatment delivered a 162% production increase over expected production (334 m<sup>3</sup>/d versus 127 m<sup>3</sup>/d [2,100 bbl/d versus 800 bbl/d]) of oil. Pemex will use this treatment in wells with similar temperature conditions.

[www.slb.com/stimulation](http://www.slb.com/stimulation)