

CHOPS Experience in Argentina, Application in the Development of the Rio Colorado Shallow Heavy Oil Belt, Neuquén Basin

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The Cold Heavy Oil Production with Sands (CHOPS) has expanded in North America since first applications in early 90's. But, application in other countries is still slowly growing. First application of CHOPS in Argentina is presented; it revealed the real potential of a recently discovered (2004) heavy oil belt in Neuquén Basin edge. The success on applying CHOPS on the first pool onset the discovery of larger new pools, promoting its rapid application. Water flooding, resulted the highest NPV of the piloted EOR technique. WF and CHOPS combined resulted in recovery factor over 30% (from 7% RF conventional).

Play description: stratigraphic, Lower Cretaceous unconsolidated fluvial to shallow marine sandstones truncated by cenomanian unconformity; depth 550-700 mbgl, thickness 1-18m, composition litharenites and arkoses, phi 28-34%, K 1-5 D, Grain Size 60-300 mic. (best reservoirs 100-200 mic.), Vsh <1%. Poor reservoirs are very fine silty sands, not easy to identify on litho-log. Oil Characteristics: gravity 18 to 20° API, viscosity 300 to 700 cP dead oil (160-350 cP live oil), temperature 37°C (+-1.5°C variation in the trend). Water salinity ranges 18,000-75,000 ppm Eq.NaCl. Formation pressure 350-500 psi, representing 50% of the hydrostatic estimates from ground level. Dissolved gas is CH₄ and CO₂, with Rs lower than 10. Bubble-point pressure (180-280 psi) is slightly lower than original reservoir pressure.

Lack of analogs in the country resulted in high uncertainties for performance and recovery. Aerated-mud drilling, underbalance perforation and aggressive oil+sand completions were rapidly implemented. CHOPS effect was confirmed by case hole neutron logs showing 10 to 20% porosity enhancement and transient tests showing 3 to 13 Darcy. Sand inflow is stimulated with PTS swab tests. Sand cuts decline from 40% to 1% in days. Productivity increased from 5-10 to over 100 m³/d. Tracers travel time proved wormholes to extend hundreds of meters. Current focus is on the understanding of reservoir changes after production. The extent and geometry of affected reservoir zone need to be described to understand performance and further infill drilling.

Aggressive campaigns allowed achieving maturity in the first EOR pilots, converting them into basis for analogy for development expansion and case study for further heavy oil projects in the basin and the country. The play is producing 29 MBOPD and it has cumulated 25 MMBO since production commenced in late 2005.