Efficient reservoir development requires a good understanding of reservoir and production systems, especially in a low oil price market scenario where established fields are the most likely places to find additional oil and gas production. Improving the performance of existing wells that are already producing or suspended is a cost-effective way to offset natural decline, extend field life and improve hydrocarbon recovery. The following are some of the Reservoir Characterization/Engineering and Production Optimization studies available:

**Reservoir Engineering and Characterization:**

- **Advanced Pressure Transient Analysis - PTA:**
  Perform modern PTA on old and/or new test data to establish reservoir properties (pressure, permeability, skin, boundaries, heterogeneities and productivities). These properties can be used to: calibrate simulation models, evaluate completion efficiencies and recommend potential stimulations or optimization practices. PTA also allows early production forecasting prior to building complex reservoir simulation models.

- **Advanced Rate Transient Analysis - RTA:**
  With RTA you put all that flowing pressure and production data to work. There is no need for shutting-in production to establish reservoir properties. RTA allows validation of driving mechanisms and contains multiple independent techniques to estimate volumes of hydrocarbons in-place and the expected ultimate recoveries. These can be used to calibrate simulation models and reserves evaluations. RTA also allows early production forecasting prior to building complex reservoir simulation models.

- **Material Balance Analysis - MBA:**
  MBA helps to quickly and easily establish volumes of hydrocarbons in-place and distribution of driving mechanisms to calibrate simulation models, which is a prerequisite for reliable reservoir simulation studies. Similarly and based on relative permeability curves, MBA can be used for early production forecasting prior to building complex reservoir simulation models. MBA allows to perform production allocation when wells/reservoirs produce from multiple layers/zones at the same time and also allows to estimate movement and location of fluid contacts, gas-oil and oil-water contacts.
**Production Analysis and Optimization:**

- **Reservoir Surveillance Permanent Downhole Gauges-PDG:** Multiple wells completed with PDG or with Electrical Submersible Pumps - ESP equipped with downhole gauges (smart wells)? It is time to put all that flowing pressure and production data to work. Let's collect, store, visualize and analyze all these data in one common database that allows you to monitor in real time the performance of each well, for continuous production optimization and enhanced reservoir characterization and management. PDG are a remarkable source of information, such as build-ups, which are free data that can be easily and quickly analyzed. PDG allows identification of production performance issues with artificial lift systems (ESP, Gas Lift, PCP), changes in reservoir properties (Perm & Skin) with time and well spacing or interference.

- **Production Analysis and Optimization:**
  Extract maximum value out of your field’s production and well performance data with workflows that include various sets of specialized engineering analysis designed to easily and quickly understand reservoir behavior and its properties, identify wells with anomalous behavior (high water cuts and high gas-oil ratios), over/under performance, and also to recognize areas of opportunities by performing ratio analyses, grid/bubble maps, time motion analyses, vintage and Waterflood pattern analyses, associated production forecasting and heterogeneity indexes.

- **Wellbore Modeling and Nodal Analysis:**
  Wellbore modeling and nodal analysis can assist production and reservoir engineering to predict tubing and pipeline hydraulics with accuracy and speed, to perform sensitivity calculations enabling existing well designs to be optimized and to assess the effects of future potential optimization in system’s parameters. When all the previous analyses are integrated with geology and well data, it makes possible the identification of optimization opportunities, such as: suspension/shut-off of intervals/zones with high water cuts and high gas-oil ratios (gas/water shut-off) and liquid loading in gas wells.

**Enhanced Oil Recovery-EOR:**

- **Enhanced Oil Recovery Screening and Visualization - EOR:**
  EOR screening and visualization helps to quickly and easily identify, prioritize and categorize appropriate EOR methods for a given set of reservoir properties and fluids. It also allows to quantify the economic impact and incremental production due to the application of EOR processes.