



EOB PROJECTS: WHEN, HOW AND WHY?

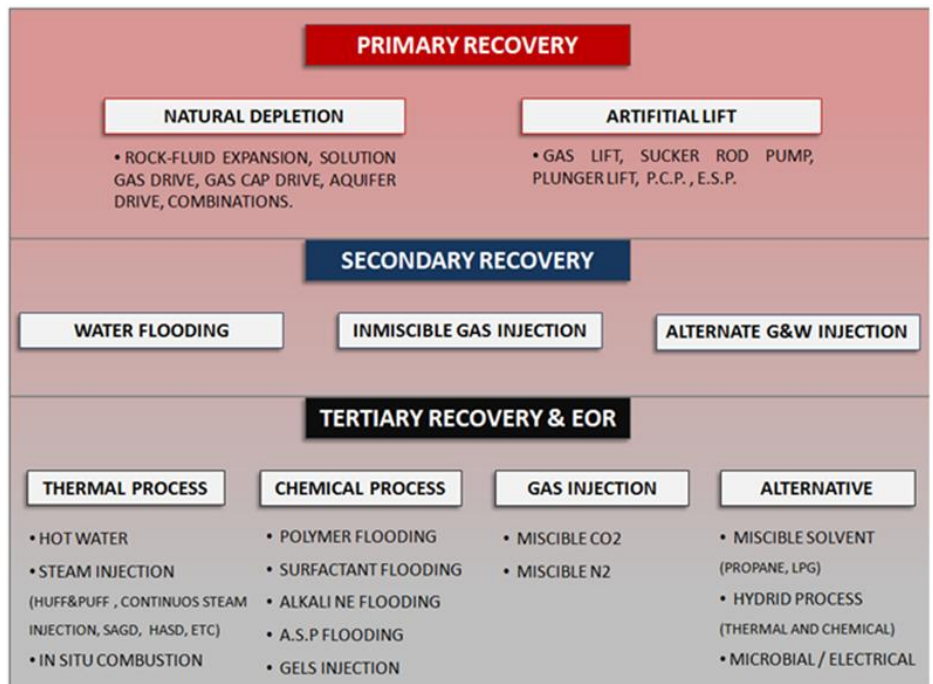
HYDROCARBONS RECOVERY

The hydrocarbons recovery during the reservoirs productive life can be classified mainly into three phases: Primary Production, Secondary Production and in some cases the so-called Tertiary Production. Primary recovery involves the production of hydrocarbons from the bottom of the well to the surface taking advantage of the reservoir natural energy reservoir or using artificial lifting methods such as Gas Lift, Mechanical Pumping, Progressive Cavity Pumping (PCP) and / or Electro Submersible Pumping (ESP). Subsequently, the secondary recovery involves maintaining the energy of the reservoir by injecting fluids such as water and / or gas into the aquifers and gas caps, respectively. Consequently, there is a wide range of technologies that allow the recovery of residual oil as well as hydrocarbons under certain specific conditions. It is precisely at this point that Tertiary Recovery and **Enhanced Oil Recovery (EOR)** appears.

There are several parameters that can directly change the reservoir exploitation plan towards tertiary recovery or EOR. Such parameters are mainly the Wettability, Reservoir Depth, Density and / or Viscosity which make unavoidable the decision to implement Enhanced Oil Recovery Projects.

HYDROCARBONS RECOVERY PROCESS CLASSIFICATION

Depending on the characteristics of the reservoir and the fluid type contained, various Enhanced Recovery methods can be applied. These processes are generally categorized into Thermal Processes which allow heat to be incorporated into the reservoirs to reduce the viscosity of heavy oils under different schemes (Huff and Puff, Continuous Steam Injection, SAGD, HASD, etc); Gas Injection Processes, which involve the injection of nitrogen and carbon dioxide (CO₂) in a miscible or immiscible forms; Chemical Processes, encompassing the injection of water with chemical additives to improve sweeping efficiency in piston-type displacement, such is the case of Polymer Injection and / or ASP projects, where it aims at reducing interfacial tension to improve the process efficiency. Finally, the hybridization of these processes and the incorporation of nanotechnology in EOR projects is being successfully evaluated.





EOR PROJECT MANAGEMENT

At Nakasawa Mining and Energy Ltd, we specialize in Thermal Processes starting with a Consulting team for the Reservoir Conditions Analysis, Validation of the Exploitation Plan, Opportunities Portfolio Optimization, Thermal Completions Design, Planning of Activities and Economic Evaluation of Scenarios, then the Design and Engineering team with vast experience and high quality standards will design their Portable or Modular Steam Generation Systems depending on clients needs (25 MMBTU, 30 MMBTU, 60 MMBTU and 100 MBTU) and finally we have a highly qualified staff in Operations for the management of your Steam Injection projects within our Operation and Production segment.

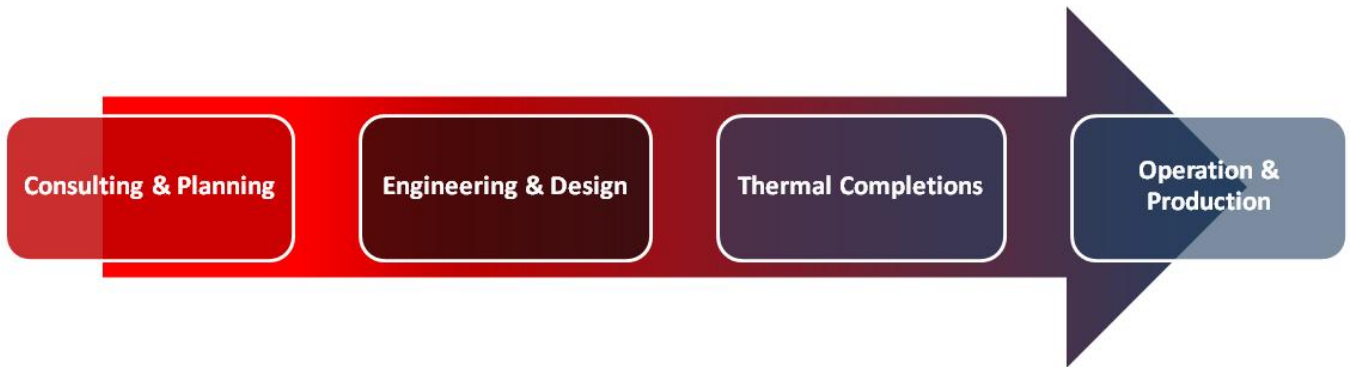


Figure N°1. Thermal EOR Project Management at Nakasawa.