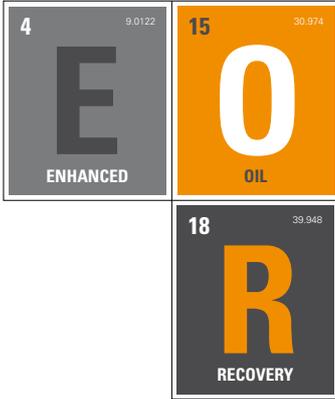


IMPROVING FIELD REDEVELOPMENT PLANS WITH **SGS CHEMICAL FOR SERVICES**

HORIZON





# IMPROVING OIL FIELD VALUE THROUGH ASSESSMENT AND FIELD ANALYSES

SGS Horizon has entered the world of EOR by successfully attracting experts from oil majors. SGS Horizon offers consultancy services and help oil companies determine the optimal field redevelopment plan based on a focused evaluation of the asset. The evaluation considers subsurface- crude, aquifer and reservoir properties, petrology and mineralogy, as well as surface-facilities assessment, water sources and logistics. Based on the enhanced production profile, the CAPEX and OPEX required and the regulatory and tax regime, economics are generated for the various options to determine the optimal redevelopment business case. If desired, SGS Horizon can generate plans to progress the redevelopment, including (chemical) injection tests, pilots and early production systems. We can provide an end-to-end assessment, including laboratory and field testing for your convenience.

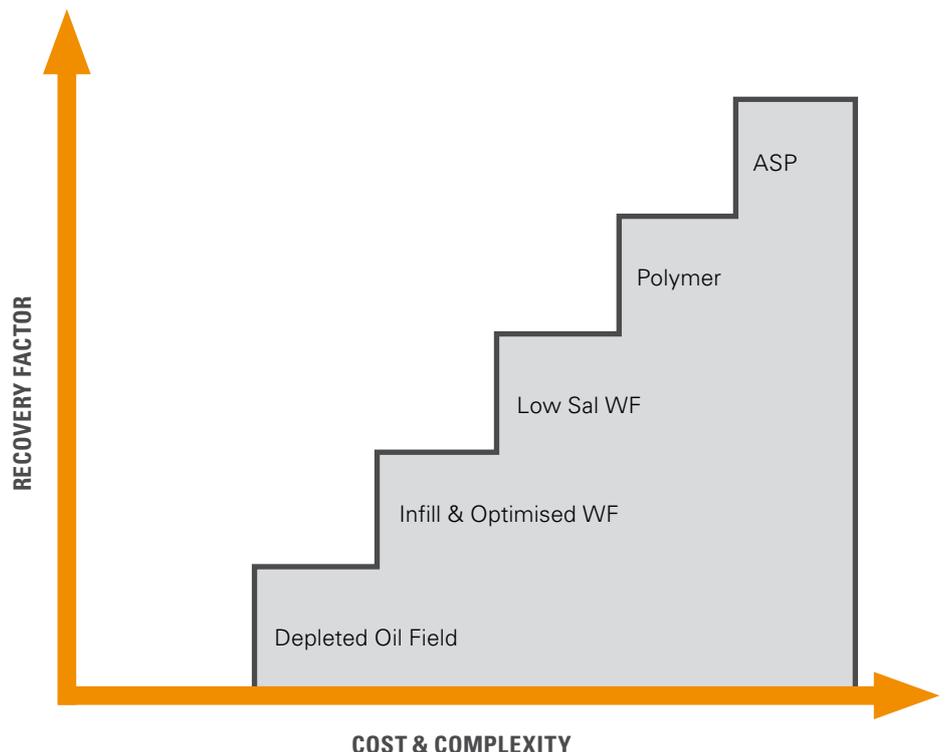
## INCREASING OIL FIELD VALUE

Once an oil field is under primary or water flood production, it is still possible to improve its return on investment. A family of technologies is available to increase ultimate recovery, sometimes doubling the oil recovered. These technologies include water flooding, well known and extensively applied. The other processes are less well known, yet can profitably increase field life and oil recovery. This technology family includes, in addition to waterflood, additional processes to increase oil recovery: low saline flooding, and in general, enhanced oil recovery (EOR) methods. EOR processes include thermal, miscible and chemical. Polymer flooding and ASP (alkaline surfactant polymer) flooding are examples of chemical EOR, and good candidates for fields that have been under waterflood. Each of these 3 methods, while increasingly more complex and capital intensive, offer the potential to generate

incremental oil above both primary and waterflood. While it is not necessary to apply the processes sequentially, a phased development- converting an existing waterflood to a low saline flood, and then to polymer and ASP, may offer an attractive option, limiting risk and capex exposure while providing profitable returns.

## CHOOSING THE RIGHT PROCESS

Choosing the right and optimal process to yield the highest return with minimum investment, requires evaluating each technology in the staircase to produce profitable incremental oil. In addition, the evaluation must include whether a phased or an aggressive development approach generates the greater return. Choosing the right process also requires in depth expertise in these development technologies, technical and economic know-how associated with applying these processes to optimally increase recovery.



## THE TECHNOLOGIES

### LOW SAL - POLYMER - ASP

Briefly, low sal is a technique which reduces the attraction of the oil to the rock and increases injectivity without causing fractures. Polymer flooding increases the viscosity of the water facilitating a piston-like sweep of the oil to a producer. And ASP partly dissolves the oil, like a detergent, allowing the process to completely clean the reservoir of oil. The first step to any redevelopment is to determine the current remaining oil- the target oil which will become incremental production. This can be done in a number of ways, including logging, core analysis, and a single well tracer test. The next step is to generate the optimal chemicals and chemical mix (saline water, polymer, ASP) which result in mobilising oil formerly trapped in the reservoir. By matching the chemicals to the reservoir temperature, pressure, crude and brine compositions with laboratory testing on field crude, a surfactant is formulated. which works best at the expected salinity of the injection water and temperature. Similarly, other experiments include the selection of polymer type and concentration.

Once determined, the recipe is tested, either in a low cost single well tracer test or pilot/early production system. Reservoir simulation and field development planning are performed in parallel to determine investments and returns associated with the chemical formulations and operational process.

### HOW WE HELP

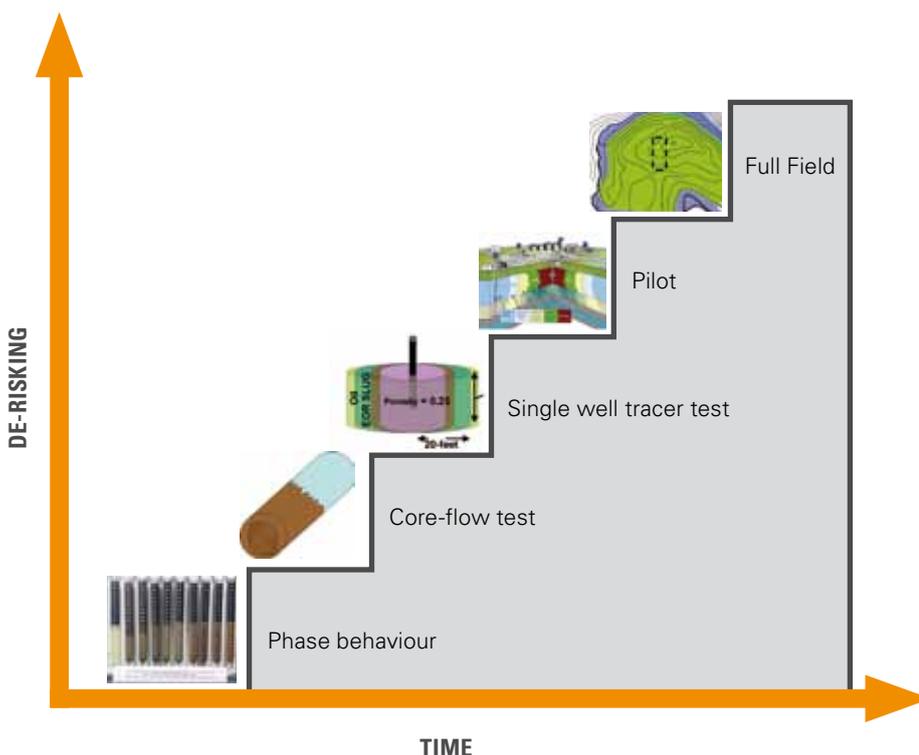
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### WHY SGS?

SGS is the world's leading inspection, verification, testing and certification company. Recognised as the global benchmark for quality and integrity, we employ over 64 000 people and operate a network of more than 1 250 offices and laboratories around the world. We are constantly looking beyond customers' and society's expectations in order to deliver market leading services wherever they are needed.

We provide innovative services and solutions for every part of the oil, gas and chemicals industry. Our global network of offices and laboratories and our dedicated team allow us to respond to your needs, when and where they occur. Our reputation for independence, excellence and innovation have established us as the market leaders in providing services that improve efficiency, reduce risk and deliver competitive advantage for you.

Founded in 2001, we became part of the SGS Group in April 2008. As part of SGS's Oil, Gas & Chemicals business, SGS Horizon provides integrated solutions throughout the field life cycle, covering all subsurface, well and engineering aspects from exploration through development and production to abandonment.



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