The STIMPAC® frac-pack and gravel-pack service is a sand control design, execution, and evaluation service. It combines fracturing moderate- to high-permeability formations with controlling the production of proppant and formation sand. This is done by placing an annular gravel pack in the wellbore across the perforated interval.

Frac packing combines fracturing and gravel packing. Frac packs, or STIMPAC® treatments, prevent sand production and create wide, highly conductive fractures connecting the reservoir to the wellbore. The process involves pumping proppant into the formation at rates and pressures that exceed the fracture pressure of the formation. The goal is to bypass any near-wellbore damage remaining from the drilling and perforation phases.

The decision to frac pack is based on factors such as reservoir quality, the existence of near-wellbore damage from drilling and perforating, rock mechanics data supporting fracture containment within the zone of interest, and production and recovery objectives. When properly designed and executed, STIMPAC treatments result in better reservoir connectivity and lower skin, compared with conventional gravel packs. As a result, this technique is generally chosen over gravel packing unless technical or economical constraints dictate otherwise.

The STIMPAC service involves three main steps:

- **Rock mechanics analysis**
- **Gravel and screen selection**
- **Tip screenout (TSO) fracturing treatment design and execution.**

**Rock mechanics analysis**

Rock mechanics data are needed to optimize fracture geometry by achieving TSO. The data can be obtained through core analysis or derived from log data with the help of a proprietary dynamic-to-static rock properties conversion algorithm, which uses equations based on core analyses of a wide variety of formation types. Young’s modulus and Poisson’s ratio are critical parameters for determining formation stress and fracture length and width.

Inflow is not limited to the cross-sectional area of the propped fracture and the perforations aligned with or connected to the fracture wings. Computer simulations indicate that unaligned perforations contribute almost 50% of the inflow from high-permeability formations, underscoring the importance of the external pack created by TSO.
**Gravel and screen selection**
Gravel and screens used for frac packs must be properly sized. Specialized software is used to analyze formation particle-size distribution and aid gravel and screen sizing and selection.

**TSO fracturing treatment design and execution**
The TSO technique is used to achieve good fracture conductivity in high-permeability reservoirs. TSO is achieved when slurry dehydration causes the proppant to pack off at the tip of the fracture, stopping further extension of the fracture. When additional slurry is pumped, the fracture width increases in proportion to the net pressure as the proppant packs toward the wellbore.

Stimulating high-permeability reservoirs requires fracturing-fluid systems that leak off early in the treatment. TSO is achieved when dehydration of the slurry causes the proppant to pack off at the fracture tip, halting further propagation of the fracture. As additional slurry is pumped, bi-wing fractures inflate and proppant packs toward the wellbore. A TSO treatment ensures wider fractures and improves conductivity by promoting grain-to-grain contact in the proppant pack. This technique also generates enough formation displacement to create an annular opening between the cement and the formation that becomes packed with proppant. This external pack connects all the perforations and further reduces the near-wellbore pressure drop, or skin effect.

TSO design involves an understanding of the rock mechanics, proper fluid selection, and data analysis to calibrate the treatment. Fluid design is optimized for the specific characteristics of the reservoir. During the prefracturing stages of a STIMPAC treatment, fluids are circulated and pumped into the formation, producing a cooling effect. Fracturing fluid gel and breaker concentrations are based on the bottomhole cool-down temperature. A lower gel concentration can be used, reducing the efficiency of the fluid and increasing the ability to achieve a TSO. In addition, the breaker concentration can be increased without sacrificing fluid integrity, resulting in maximum retained permeability and wider, more conductive fractures. This approach to fluid design is the Schlumberger CoolFRAC® service.

The DataFRAC® fracture data determination service, which consists of closure and calibration tests, is used together with fracturing design and evaluation software to determine the closure pressure and fluid leakoff coefficient, both critical to optimizing the treatment design for the desired high-conductivity fractures. These parameters are specific to individual formations and often to individual wells.

The STIMPAC fracture bypasses near-wellbore damage and interconnects multiple layers.