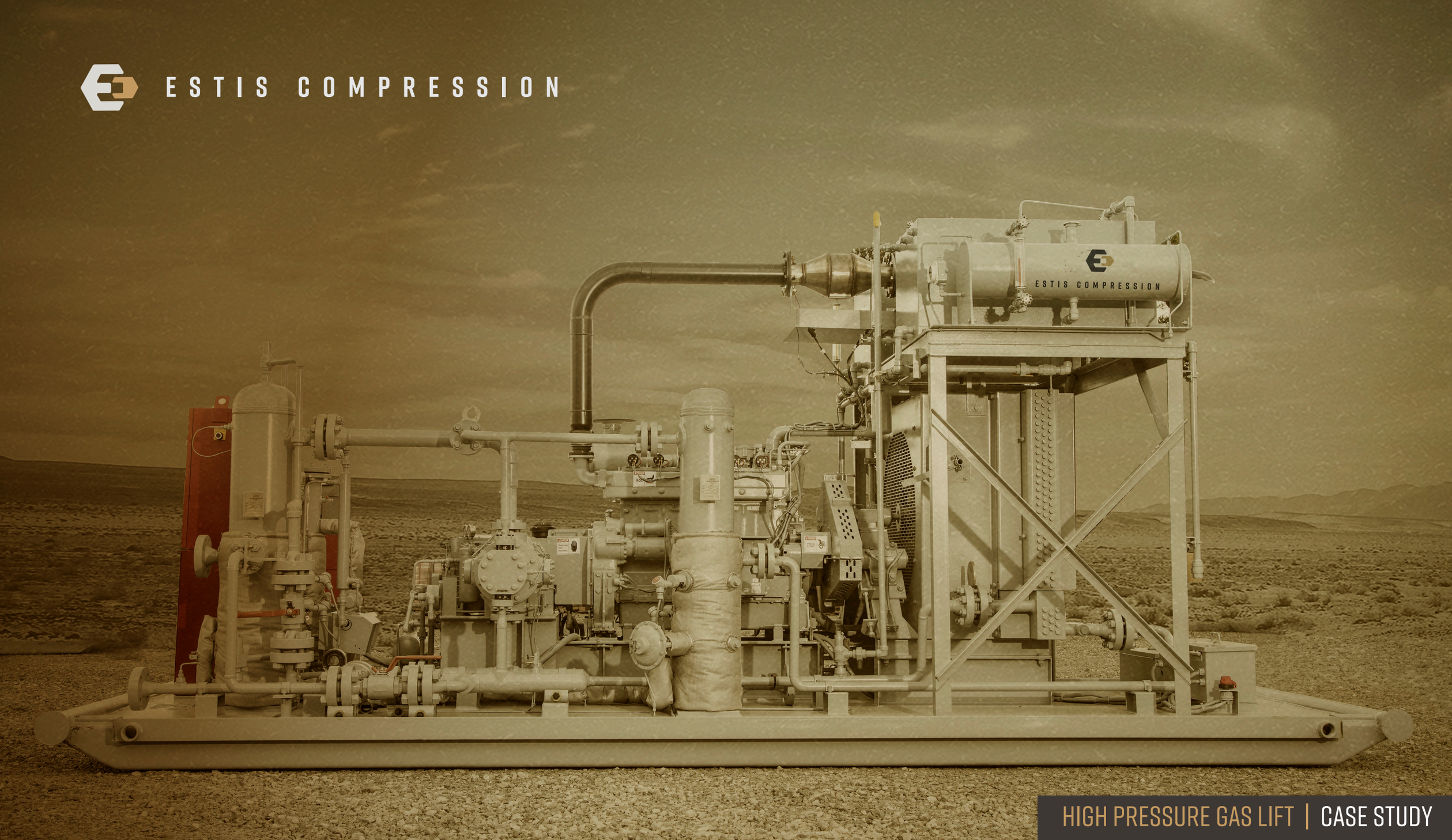
ESTIS COMPRESSION



HIGH PRESSURE GAS LIFT | CASE STUDY

HPGL AS AN ALTERNATIVE TO ESP IN THE PERMIAN BASIN

SM ENERGY CASE STUDY AT A GLANCE

1. OBJECTIVE: COMPARE HPGL PERFORMANCE WITH ESP
2. METHODOLOGY: 8 WELLS ON ONE PAD, FEATURING HPGL
3. HPGL WELL EXCEEDED PRODUCTION FOR FIRST 24 DAYS
4. CUMULATIVE PRODUCTION LEVELED TO SIMILAR FIRST 100 DAYS
5. HPGL & ESP YIELDED SIMILAR CUMULATIVE PRODUCTION FOR FIRST 100 DAYS

WHAT WAS OUR WORKING HYPOTHESIS FOR THIS STUDY?

After studying hundreds of HPGL applications across a variety of onshore and offshore wells, our team was confident that this configuration would deliver at least parity artificial lift performance—with the potential to fractionalize maintenance cost and downtime across the producing life of the well. It's evident that this would be especially true when the conventional configurations would be at particular risk, including when:

1. **Producing in especially sandy formations**
2. **Working with horizontal doglegs or wellbore deviation**
3. **Experiencing GOR ratio increases over the life of the well**
4. **Dealing with high initial production rates**
5. **Noticing steep production declines**

The affordability of HPGL compression, and the initiation of its widespread propagation, seem fortuitous at a time when the industry is pushing to break even at lower commodity prices.

HIGH PRESSURE GAS LIFT (HPGL) DELIVERS STRONG ARTIFICIAL LIFT PERFORMANCE WITHOUT THE NEED FOR WELL INTERVENTION. BUT IS IT REALLY AS EFFECTIVE AS EVERYDAY ESP GAS LIFT CONFIGURATIONS? WE PARTNERED WITH III-YEAR-OLD OPERATING COMPANY SM ENERGY TO FIND OUT.

WHAT IS HIGH-PRESSURE GAS LIFT?

Conventional gas lift systems include failure-prone Electric Submersible Pumps (ESPs) and the installation of small, cylindrical gas lift valves into the tubing string. Gas is injected into the casing or tubing; pressure triggers a release of gas into the wellbore. The sizing and calibration of gas lift valves can be tricky. And, most importantly, affixed using a series of carefully spaced mandrels, these critical components require time-consuming downhole intervention if a problem arises. Complication or failure of these valves can have a significant negative impact on production economics.

The High-Pressure Gas Lift (HPGL) methodology has no downhole components—no ESP and no gas lift valves. Rather, a high-pressure compressor is placed on the well pad that simply injects gas down the wellbore directly. This lightens the density of the fluid column and lowers the producing bottom hole pressure by injecting gas deep into the well. Hydrocarbon flow returns up the tubing-casing annulus without the need for valves of any kind. This arrangement keeps all gas lift components on the surface, while still addressing liquid loading, slugging and other production challenges.

Long-time proponents of this artificial lift technique have been using this setup for decades, because of its ability to:

1. **Reduce all-in system costs when compared with conventional ESP**
2. **Inject lower in the wellbore for a higher production rate**
3. **Eliminate gas lift valves and, hence, the inevitable intervention required**

This methodology has long been used offshore as way to optimize well production. But until recent years, this gas lift configuration has not been widely adopted by operators onshore because the required compression technology was not economical.

IN RECENT YEARS, THE COST AND PERFORMANCE OF WELL SITE COMPRESSION EQUIPMENT HAS EVOLVED. NOW IT'S GAINING TRACTION QUICKLY AS THE PRESSURE TO MAXIMIZE RETURN ON ASSET OWNERSHIP INCREASES.

WHAT WAS OUR TEST WELL AND EQUIPMENT SETUP?

The scope of our study involved eight of SM Energy's wells on a single pad near Big Spring, Texas. High-Pressure Gas Lift was installed on one of these wells, while the others served as a control group featuring conventional ESPs. The wells were sized in anticipation of daily production between 4,000 and 4,500 BLPD based on comparative well data.

THE WELL FEATURING HPGL HAD THE FOLLOWING SPECIFICATIONS:

1. VERTICAL DEPTH OF 8,150 FEET
2. TREATED LATERAL LENGTH OF 10,000 FEET
3. 5½" OD, 20# P-110 PRODUCTION CASING
4. SMART SEPARATORS FEATURING SENSORS

WHAT WERE THE RESULTS?

THE PRODUCTION DATA SHOWED THAT THE HPGL WELL WAS ABSOLUTELY COMPETITIVE WITH THE STANDARD ESP SETUP FROM A PRODUCTION STANDPOINT—WITHOUT ANY OF THE MOVING DOWNHOLE PIECES AND ZERO NEED FOR FUTURE WELL INTERVENTION.

In addition, the well on which the Estis Compression HPGL system was installed also showed:

1. **Ability to land the intake injection depth 600 feet lower than with ESPs**
2. **Kick-off production averaging 1,600 BLPD higher than the ESP wells**
3. **The highest oil cut of any well on the pad**
4. **Higher production for the first 24 days, leveling out to similar cumulative production for 100 days**

Not only was there an effective, positive effect on production from an artificial lift perspective; the new HPGL flow configuration added additional throughput. The flow-reversed production actually increased the cross-sectional hydrocarbon flow by a multiple of 2.88x. In fact, this reversed flow was the equivalent of having installed 4 $^{1}/_{2}$" tubing rather than 2 $^{3}/_{8}$" tubing. The production data also show that annular flow also minimized the pressure drop caused by hydraulic frictional forces.

WHAT DID THESE RESULTS INDICATE?

THE SM ENERGY TEST WELL SERVES AS SOLID DOCUMENTATION THAT HPGL SYSTEMS CAN DELIVER PARITY PERFORMANCE WHEN COMPARED TO CONVENTIONAL ESPS AND GAS LIFT VALVES—BUT WITH SUPERIOR ECONOMICS.

And the results highlight that this technology pairs nicely with Permian Basin wells, which can feature long laterals, exhibit varying levels of maturity and produce millions of pounds of sand that will gum up conventional pumps and valves.

HOW CAN YOU LEARN MORE?

For technical, methodological, analytical and equipment details, please refer to the Society of Petroleum Engineers paper SPE-195180-MS, Single Point High Pressure Gas Lift Replaces ESP in Permian Basin Pilot Test by Branden Pronk (SM Energy), et al. The paper was presented at the SPE Oklahoma City Oil and Gas Symposium in April of 2019.

ESTIS COMPRESSION

Call Estis Compression at 903.736.9007 and see if High-Pressure Gas Lift is right for your application, or visit **estiscompression.com** for more information.