

## Oilfield Startup Acceptance & Reliability Program Monitors Reciprocating Compressors

### RESULTS:

- Vibration ODS analysis flags improperly installed compressor unit; avoids premature failure.
- Infrared analysis spots rotating machinery hot spots; indicates necessary maintenance.
- Machinery health manager software enables smart overview of entire asset conditions.



### APPLICATION

Oilfield by-product gas compression and redistribution.

### CUSTOMER

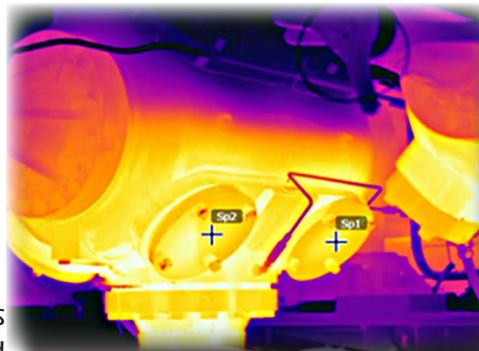
Midstream oil-gas production company with network of six gas processing plants in the Bakken region with gas gathering pipelines at well-heads, compressor stations, and redistribution pipelines.

### CHALLENGE

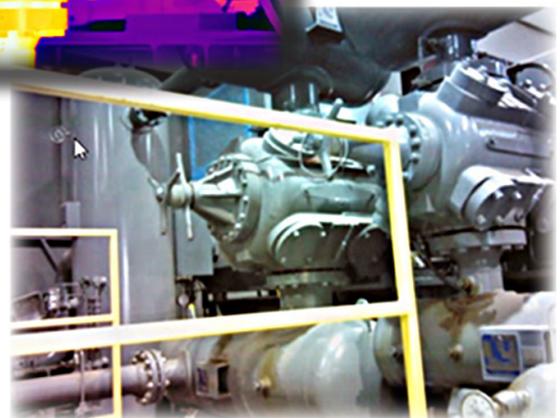
Bakken oil production typically removes entrained gas which is either flared or captured. Captured gas is rich and contains significant liquids. Other challenges in the Bakken include temperature extremes from winter to summer, impacting materials and production methods as well as the accelerated pace of drilling and infrastructure buildout outpacing the ability to properly work out issues prior to startup.

Captured gas from each well site is gathered into a network of small gas pipelines and compressor stations. The gathering system consists of many miles of pipe and 150 reciprocating compressors located in remote, unmanned stations. These compressors move the gas miles away to a district gas plant where natural gas liquids (NGL) are removed for two purposes: sale of the liquids, and drying the gas in preparation for transport through larger, interstate pipelines to large produc-

**The \$100K pilot project conducted over a period of six weeks resulted in documented savings of \$800K.**



*Infrared image (at left) of selected area of compressor component (at center below) reveals areas of high temperature, friction, or wear issues and potential for malfunction leading to unplanned downtime or catastrophic system failure.*



*(Continued on back side.)*

# NATURAL GAS PROCESSING

(Continued from front side.)

tion facilities that provide natural gas, ethylene, and various petrochemicals. Shortly after startup, however, the compressor equipment was experiencing early failures from vibration and overheating, resulting in production losses, safety risk, and high maintenance costs.

## ODS Analysis Flags Issues

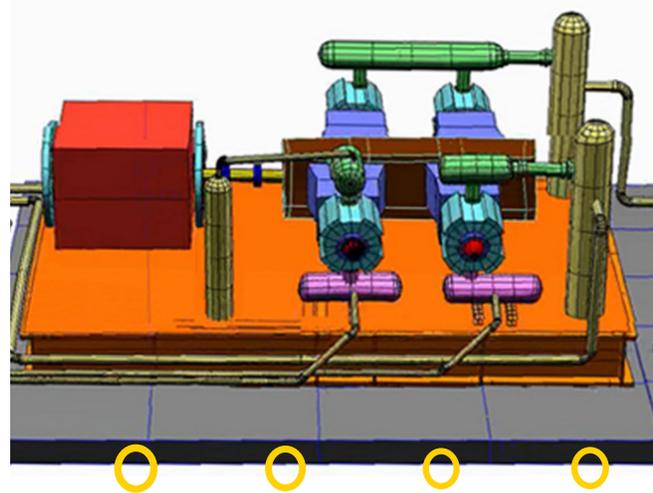
Initially, during the acceptance phase, on one compressor unit, the Novaspect team used advanced diagnostics including **operating deflection shape (ODS) analysis**. This vibration test discovered significant negative structural anomalies that were traced to improperly installed external shims on the compressor skid. Immediate corrective action was recommended to avoid catastrophic failure.

As part of a comprehensive solution, Novaspect Reliability Field Services established a route-based data collection pilot program using **Emerson CSI 2140 Machinery Health Analyzers**. Additionally, FLIR infrared (IR) thermography was used on valves and electrical equipment, with future capability for oil analysis and electrical signature analysis. The entire package was integrated with **AMS Machinery Health Manager** software to build a predictive maintenance data base, case histories, and interactive reporting. Other future options may include continuous, remote monitoring of the compressors.

## RESULTS

- **Pilot Program** included 96 individual compressor assets in seven locations. Of these, 25% had issues of varying degrees of urgency: 3 "high-high"; 7 "high"; 14 "early warning"; 2 "repaired". Some typical mechanical issues included: bearings, rotor bars, fan blades, pump imbalance, excessive vibration, belt tension.
- **Return On Investment (ROI)** The \$100K pilot project conducted over a period of six weeks resulted in documented savings of \$800K. This success led to the further commitment of a \$1.2M Reliability Service Agreement for upscaling these results across the entire company fleet of assets totaling approximately \$2B.

**To discuss how Novaspect can solve your challenging application, contact us today.**



CAD drawing of the compressor unit (shown above; photo below) shows individual components that were modeled using the operating deflection shape (ODS) analysis. In the course of testing, the analysis determined that metal shims (located at yellow circles; detail photo shown far below) were added to the base of the unit with center beams of the structure left unsupported. This negatively affected the vibration and stability of the entire system. The corrective remedy required lifting the unit and jack-hammering out the concrete base.



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**novaspect**

**Novaspect Inc.**  
1124 Tower Road | Schaumburg, IL 60173  
PH: 847.956.8020 | FX: 847.885.8200  
Contact Us: [www.novaspect.com](http://www.novaspect.com)

