



# Ecologically improving Gas and Oil Well production with Nitrogen “fracking”

Cryoquip’s Advanced Diesel Fired Vaporizer (Model ADFV) has been providing high pressure nitrogen gas for injection into Natural Gas and Oil wells to enhance and stimulate well production for nearly a decade. It is subject to a continuous program of research and development to ensure the design is aligned with the fast pace changing demands on these systems, resulting in today’s lighter, more efficient, compact, automatically controlled and more reliable ADFV model.

All oil and natural gas wells drilled today eventually become marginal producing wells when most of the readily available hydrocarbons have been extracted. In order to extract more oil or gas from these existing wells, some type of rejuvenation or enhancement is required to increase the flow of hydrocarbons into the well bore so that they can be easily extracted, preventing the need to drill another well. Hydrocarbons are entrained in the pore spaces in the underground formation strata which comprise sand, shale and rock. Enhancement is achieved by ‘fracturing the strata’, commonly known as “fracking” to release more product.

The difference between Cryoquip’s ADFV Nitrogen fracking unit compared to the other types known as *hydraulic* fracking is that Nitrogen is 100% environmentally friendly.



No hydrocarbon mixes are used, no acid or chemicals, no polluted water, just *green inert nitrogen*.

This method of fracturing pressurizes the well with very high pressure inert Nitrogen, between 10,000 and 15,000

psig which is high enough to crack even the toughest strata. Fracturing makes new flow paths and increases the size of existing flow paths, allowing increased flow of hydrocarbons into the well, thus increasing overall production. In hard rock the pressurization with nitrogen gas creates a series of narrow cracks which serve as flow channels into the well. In softer high permeability rock pressurization creates short, wide fractures that extend short distances into the strata.

To meet the needs of the oil and gas industry, for high pressure, high flow rate Nitrogen gas, Cryoquip developed a portable, compact, independently powered, light weight, truck/trailer mounted direct fired vaporizer featuring a hydraulically driven fan, high efficiency heat transfer coil, high voltage spark ignition system, and fully automated discharge temperature controls. The Advanced Diesel Fired Vaporizer (ADFV) series was developed nearly a decade ago, to provide an environmentally friendly fracking process, and today many units are in operation and integrated on fully self contained mobile Nitrogen “gas fracking” rigs around the world.

The Advanced Diesel Fired Vaporizer Series is continuously being developed to increase individual capacities up to 2 million SCFH (53,000 Nm<sup>3</sup>/hr) of Nitrogen flow, and increase operating pressure to 20,000 psig (1380 bar) to improve performance. The vaporizer comprises a strategic arrangement of combustion chambers, capable of multi-stage automatic firing to enhance the overall range of temperature control and maximize fuel efficiency. A multi-bladed fan provides air to the vaporizer for combustion and system cooling. A unique design high voltage spark ignition system coupled with a standing pilot ensures automatic instantaneous firing. The control system ensures just the required amount of heat into a specially designed, robust vaporizer heat exchanger which efficiently absorbs the heat into the Nitrogen stream. The design minimizes overall weight and ensures compact dimensions, without compromise to overall reliability and