

## Maximizing production from natural gas wells to obtain additional gas at no extra cost



### Problems and Areas of Application

- The production rates of gas are declining rapidly, while the formation pressure is declining at a slower rate.
- Although the reservoir still has remaining production potential, the production rate of the gas well is low or ultra-low.
- The gas well is experiencing loading with formation water, which is not the required type of water.
- The production rates of the gas well are below the justified Darcy level, even after the initial completion, workover, and other related activities.



### Cause of the Problem

Gas reservoir rock can become partially saturated with water condensate, which can block the passage of gas through that portion of the reservoir. This physical phenomenon occurs when vaporized condensate or steam passes through the fine pores and capillary channels of the rock towards producing gas wells, but then drops out and stays within those pores and channels due to their compatible sizes. The clogging of pores and capillary channels is one of the most common and unsolved problems in developing and exploiting gas reservoirs. It can take up a significant portion of the reservoir rock and become the primary reason for severe reduction in gas production rates and well loading with information water.

Various methods have been used to partially resolve this problem, but they tend to be expensive and provide limited resolution. As a result, the industry often resorts to super-expensive, temporary solutions such as sidetracks. However, these solutions only provide a short-term improvement in production rates before the same problem recurs around the sidetrack wellbore and gas production rates decline again.

In summary, the clogging of pores and capillary channels is a major challenge in gas production that has yet to be fully resolved. Despite partial solutions, the problem remains a significant obstacle for the industry.



### Solution Technology

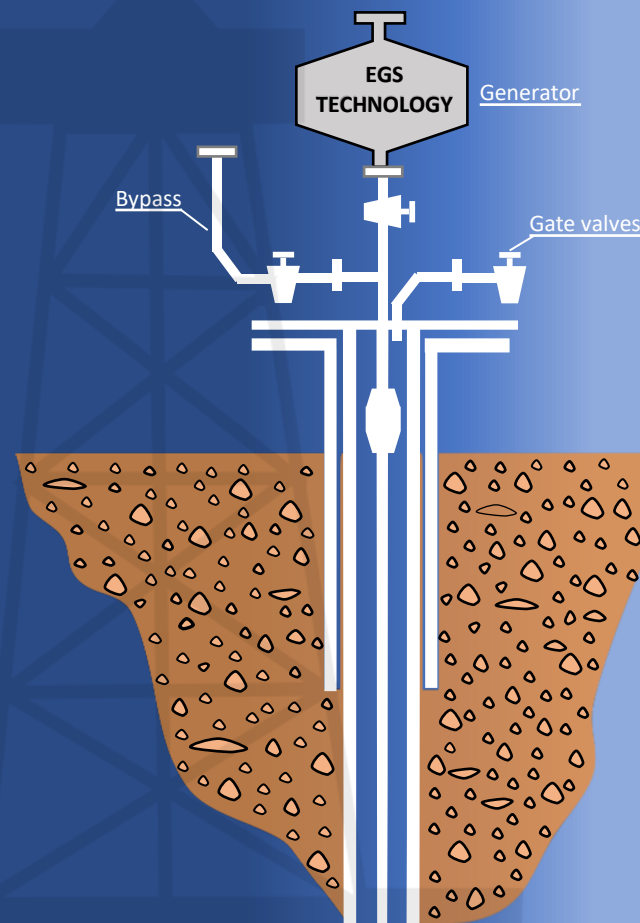
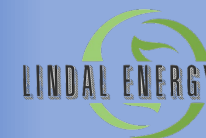
An innovative method based on the unique and proprietary EGS technology of cumulative wave application offers an efficient and low-cost solution to the problem of gas reservoir clogging. Properly applied, EGS can help achieve maximum production rates and full recovery of gas. EGS is applied while the well is in production, without any downtime. Waves are used to provide mass-transition of liquid phases through the capillary environment of the micro-porous reservoir in the direction of the well and further away from it.

As shown in the diagram, a wave generator (650 mm x 350 mm) is installed on the wellhead, and a bypass line is installed on one of the outlets to the turbine space. Once the reservoir rock begins to be freed from the retrograde condensate, an increase in gas production rate is observed. The wave treatment will continue until the gas production rate stabilizes. The wave treatment should be repeated and continued throughout the life cycle of the well.

The EGS technology is also applicable in cases where the reservoir is contaminated with drilling fluids, formation water, heavy fractions of hydrocarbons, formation solids brought in with the gas flow, and other similar substances. With EGS technology, gas production can be increased without additional costs, providing an ultimate resolution to the problem of reservoir clogging.

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## EGS - TECHNOLOGY



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