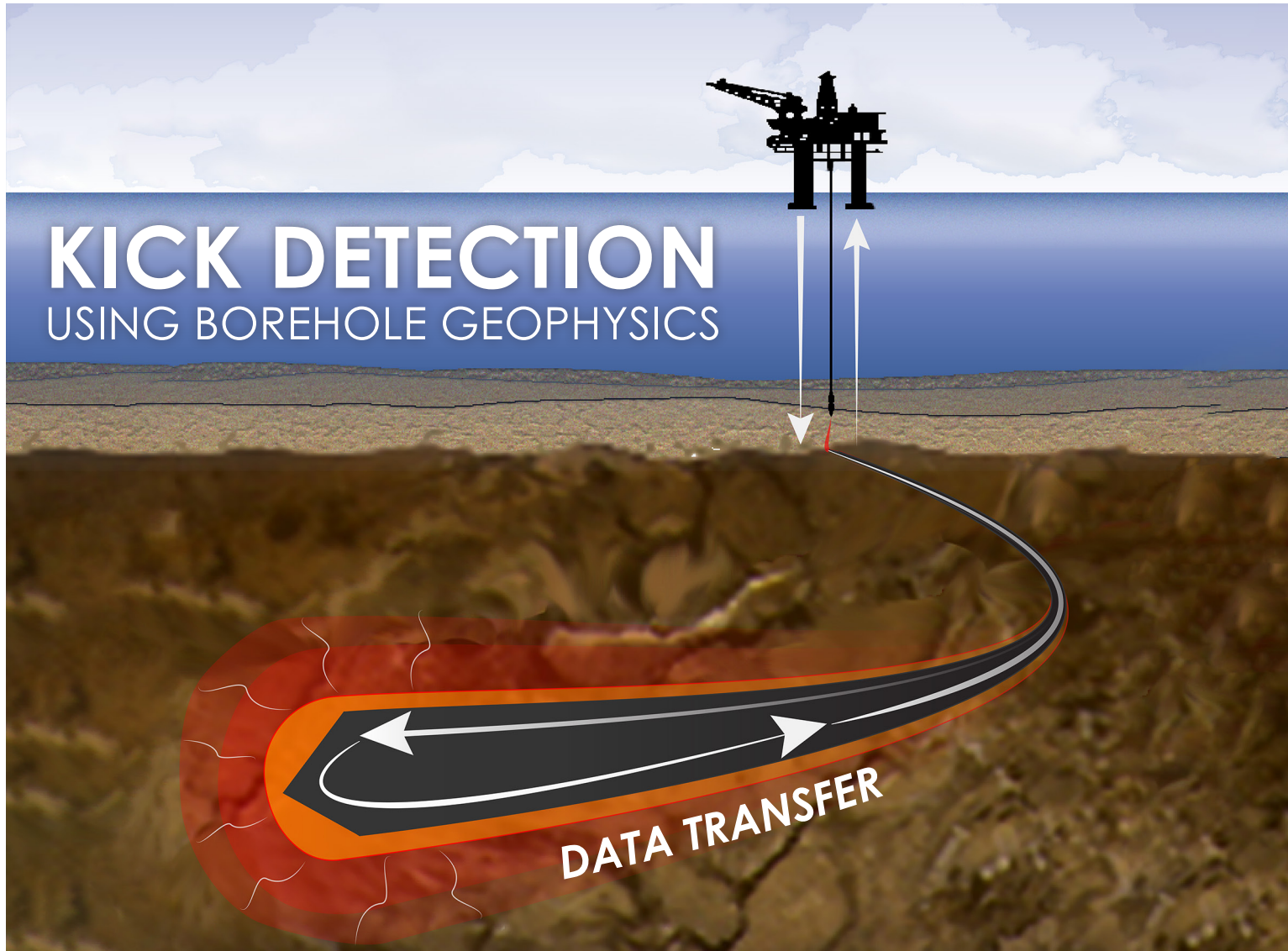


KICK DETECTION

USING BOREHOLE GEOPHYSICS



NETL

NATIONAL ENERGY TECHNOLOGY LABORATORY

BACKGROUND

Unexpected formation fluid influxes, also known as “kicks”, represent the onset of a loss of oil or gas well control. Kicks are dynamic events that, if left unabated, can increase in intensity until a complete loss of well control occurs. This condition is referred to as a “blowout,” where hydrocarbons are released into the water or soil. Depending on the size of the well, this can result in significant damage to human life, materials, and cause severe environmental damage. As a steward of our nation’s natural resources, NETL is searching for new ways to improve materials and processes to mitigate the environmental impact of fossil fuel extraction as we work toward the further development of renewable energy resources.

One of the keys to preventing blowouts is to suppress kicks immediately after they initiate, when they are at their weakest intensity. However, current kick detection methods do not alert the drilling crews quickly enough, allowing kicks to gain in intensity. This makes regaining well control more difficult for the driller. Therefore, developing an improved kick detection method that provides earlier and more certain detection is essential for reducing the frequency of well control losses, which will protect human and environmental health and reduce drilling costs.

PROJECT GOALS

Over the past several years, NETL has developed a kick detection method that uses downhole measurements to monitor the wellbore condition. If a kick occurs, it is reflected in the measurements. These sudden changes alert the drill crew faster than the kick fluid can travel, allowing the drillers to take necessary action to regain well control before the kick strengthens.

PROJECT DESCRIPTION

The initial phase of this project involved verifying that downhole measurements could detect a kick and provide sufficient data quickly enough for the driller to suppress a kick and regain well control. This phase of the project was completed using basic research on fluid flow, physical instruments and measurements, and data telemetry, as well as first-order modeling.

This project focuses on using more robust modeling approaches with laboratory-scale experimentation to determine the extent to which this project can perform as designed. NETL uses in-house physical instrumentation that provides measurements similar to the wellbore measurements employed by the new early detection method to provide definitive operational boundaries.

Research during the initial phase of this project determined that this method can provide a significant time advantage for the driller over conventional kick detection methods.

Patent application, U.S. 14/852,845, 9/14/2015

Please contact NETL Business Development for licensing information:

<https://www.netl.doe.gov/business/tech-transfer/available-technologies>

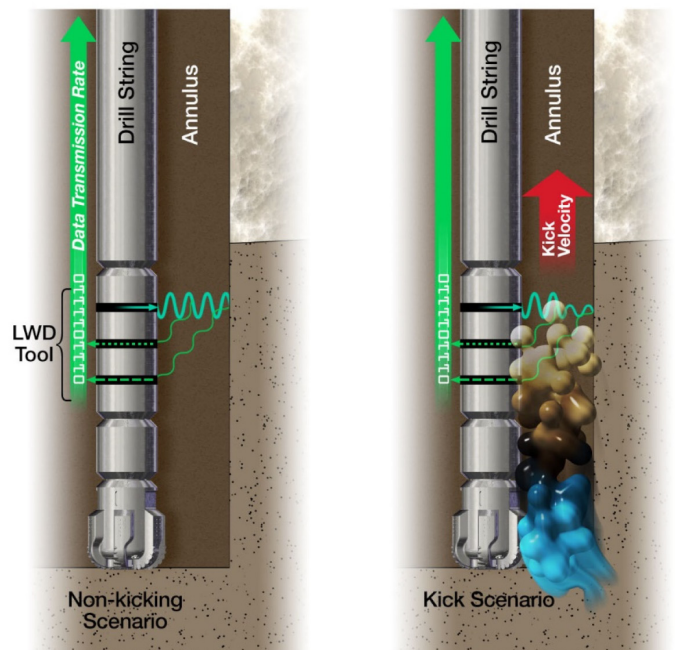
External news articles spotlighting kick technology:

- Instantly ‘See’ Drilling Kicks With MWD/LWD Data. *Hart’s E&P*, July 2017.
- Tech Talk — Real-time ‘kick’ monitoring can help prevent blowouts. *The Tribue*, June 2017.
- NETL’s Kick Technology named 2017 Shale Gas Innovation Contest’s Innovation R&D Winner. May 2017.
- NETL Takes New Kick-Detection Idea to Contest. *The State Journal*, April 2017.
- Early kick detection: Testing New Concepts. *Journal of Petroleum Technology*, August 2015.

For additional information, we invite you to visit:

<https://edx.netl.doe.gov/offshore>

Conceptual Model—Sensing Kick Conditions



Qualitative difference in annular interference
NOT TO SCALE

Kick detection conceptual model.

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