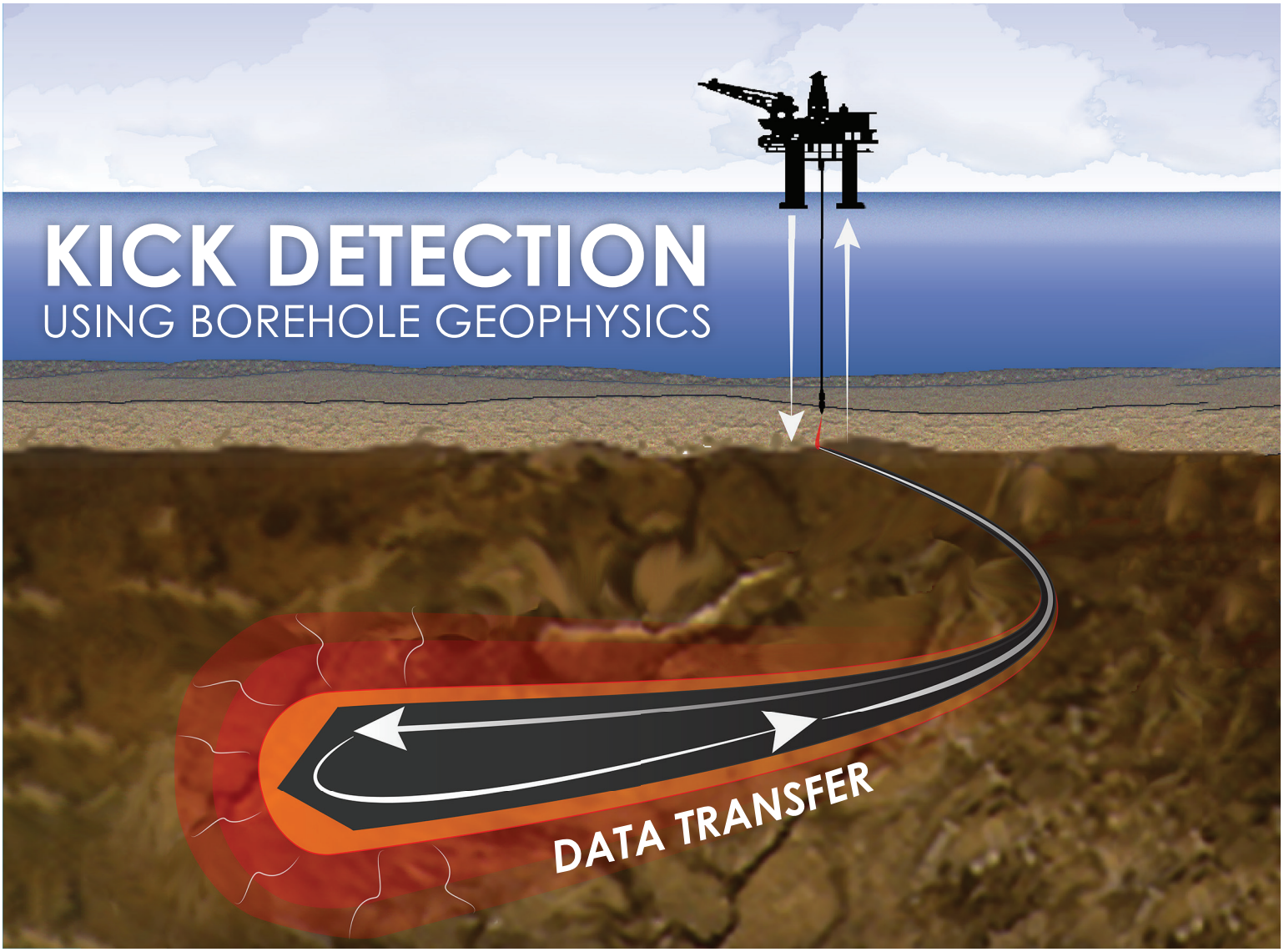


NETL

NATIONAL ENERGY TECHNOLOGY LABORATORY

BACKGROUND

Unexpected formation fluid influxes, also known as kicks, represent the onset of a loss of well control. Even relatively low-intensity kick events are responsible for substantial economic impacts to the oil and gas industry. Kicks are also dynamic events that, if left unabated, can increase in intensity until a complete loss of well control occurs—a condition also known as a blowout. Blowouts allow petroleum to be released, which can result in significant damage to human life, materials, and long-lasting environmental damage.

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 are uncertain and slow-developing processes that allow kicks to gain intensity, making regaining well control more difficult for the driller once they are detected. Thus, 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.

KICK DETECTION
USING BOREHOLE GEOPHYSICS

www.NETL.DOE.gov

PROJECT GOAL

The U.S. Department of Energy's National Energy Technology Laboratory (NETL) has developed a kick detection method that uses downhole measurements to provide data on the wellbore condition. If a kick has occurred, it will be reflected in the measurements, which are made available to the driller much faster than the kick fluid can travel, allowing the driller 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.

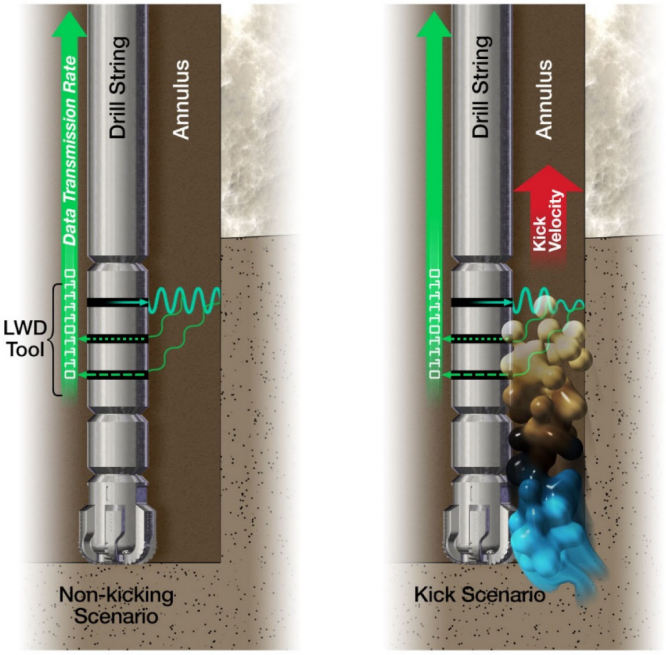
Patent application, U.S. 14/852,845, 9/14/2015
Please contact NETL Business Development for licensing information:

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.

Conceptual Model—Sensing Kick Conditions



Qualitative difference in annular interference
NOT TO SCALE

Kick detection conceptual model.

For additional information, we invite you to visit:

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

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