# Evaluation of Different Fiber Optic Cables For Near-Surface Reflection Seismic

Anton Egorov[1], Pavel Golikov[2], Andrey Bakulin[2], Konstantin Tertyshnikov[3], Roman Pevzner[3]

[1]Aramco Research Center - Moscow, Aramco Innovations LLC
[2]EXPEC Advanced Research Center, Saudi Aramco;
[3]Curtin University

## Abstract

The aim of this work is to analyze the applicability of Distributed Acoustic Sensor (DAS) systems for near-surface seismic investigations and compare the 2D surface seismic data acquired with DAS systems to more traditional geophone data.

We use a 2D near-surface reflection field seismic dataset obtained in parallel with several straight and shaped buried fiber optic cables and surface geophones. We apply some basic processing to the acquired data. We assign the geometry to the data, apply a set of preprocessing procedures (amplitude corrections, bandpass filtering), and compute the brute seismic stacks. We also analyze the seismic gathers in different domains (two-dimensional Fourier transform and frequency-velocity domains) to highlight the properties of the datasets acquired with fiber optic cables of different shapes and different geophone components.

Our analysis shows that some of the fiber-optic cables provide the image quality comparable to that of the vertical component geophone data. Out of the cables participating in the test, the 60-degree helical cable provides the best seismic image. The same reflections can be identified on the image obtained with this cable and the vertical-component geophone image. It is important to note that the cables of similar shapes can provide vastly different signal-to-noise ratios. One of the most prominent advantages of the DAS acquisition system is the small receiver spacing which facilitates the seismic data processing and allows for easier removal of coherent noise, such as surface waves. It remains to be seen how the deployment of the fiber optic cables (for example, burial depth) influences the quality of the data.

We conclude that the fiber optic systems with shaped cables are capable of providing the near-surface seismic reflection images with the quality comparable to geophone images.