

Operators use solar power to find oil

Petro-Sonde uses solar energy and electromagnetic waves to provide data on subsurface properties.

by Pam Fesler

At first glance, information about the Petro-Sonde passive geophysical instrument might stir up thoughts of television commercials that promise their products can do it all—slice, dice, cut through lead pipe.

Operators who use Petro-Sonde and recommend it to others admit to being skeptical at the sight of a carryon-size suitcase that a geologist says can detect and analyze an electrical field at the earth's surface and provide information about lithologies to 40,000 ft.

Geophysics International (GI), Dallas, the creator of Petro-Sonde, is a company established in 1984 that set out to make a "fast, practical, economical method of subsurface exploration," it said. Petro-Sonde is the result of recent advances in the application of electro-telluric (ET) principles, GI said.

Electromagnetic waves

Petro-Sonde draws its primary energy from the sun. The interaction of solar energy striking and distorting the earth's ionosphere creates electromagnetic waves that pass into the earth.

These electromagnetic impulses travel vertically through the earth until they reach a change in conductivity

caused by a variation in lithological composition, porosity or mineral content, the company said.

A new electromagnetic pulse is generated at the conductivity contrast and radiates to the surface, where it is detected by Petro-Sonde. The frequency of the re-radiated signal is a function of the depth of the originating subsurface plane.

Petro-Sonde can be calibrated for this frequency and detects the field for any selected depth at the surface interface. The instrument then transmits the characteristics of the detected field to the GI geologist as an audible signal.

Signal responses are classified as very low, low, moderate and high. Data, which are generated and available in the field, are interpreted for relative resistivity characteristics and logged on the Pro/Log graph. Logging speeds range from 90 to 400 ft/hr within a selected interval, depending on the complexity of the geological environment and the resolution capabilities of the type of Petro-Sonde unit.

Surveys through various depth frequencies can provide data on the depth and thickness of lithologies and ore deposits. Readings at several surface stations allow lateral and three dimensional definition of the target interval. Distortions in the signal reveal the presence of materials with specific electrical properties, such as oil, gas, water, coal and metals.

David Holstein, vice president of World Oil Corp., Dallas, heard of the Petro-Sonde process "through a friend of a friend" in the fall of 1984, when the method was in its infancy.

Operating mainly in north Texas and Oklahoma, World Oil has used PetroSonde on 15 wells. The company plans to use it on others. "It (Petro-Sonde) called them all," Holstein said. When World Oil first started using PetroSonde, the instrument was calling the formation within two to five feet. Now it's finding the top of the formation within one to two feet, he said.

"I'm not saying it's perfect," Holstein said. "It's another geophysical tool, like seismic data logs. It's very useful when you have strat play and don't know when the permeability barrier stops."

He also said he likes Petro-Sonde's use in areas of north Texas that are traditionally home to formations with channel sand—Hunton, Skinner, Pennsylvanian. "It slithers around. Petro-Sonde is the only way we can pick a location."

Limitations of Petro-Sonde, according to Holstein, include inability to identify minor (non-commercial) oil reserves at deep depths. Also, some



Through the grapevine

Several operators in the Midcontinent area say the technology has worked for them.

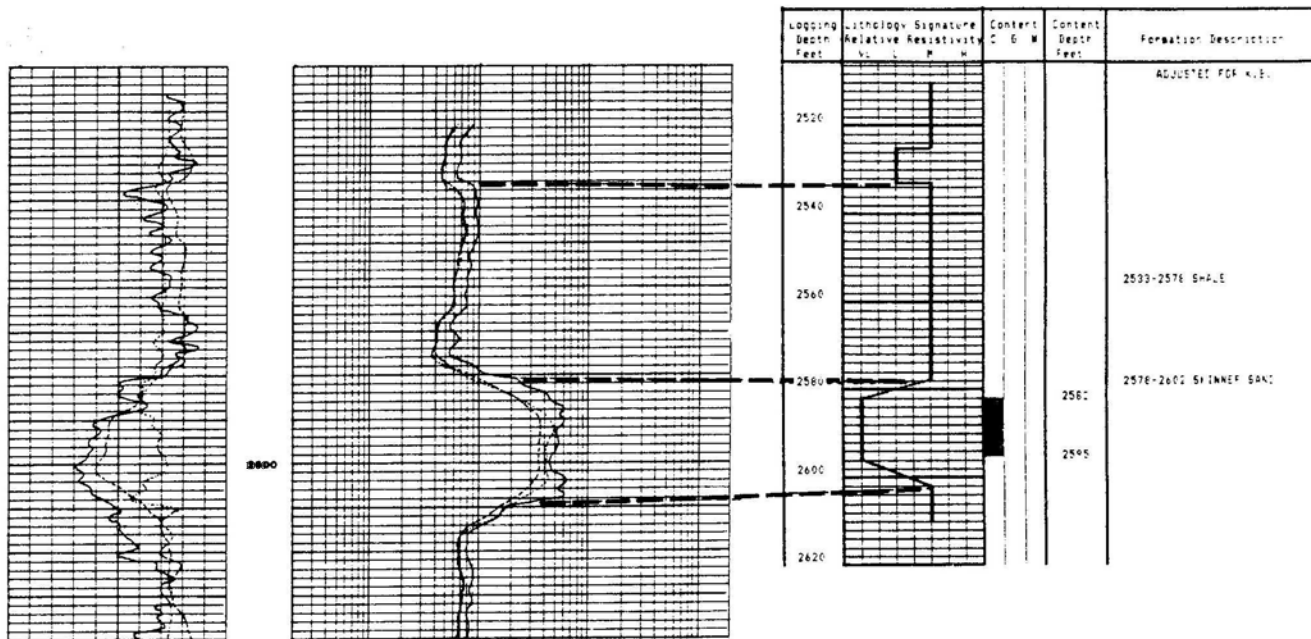
Petro-Sonde proponents Mark Roberts, left, president of Striker Drilling Co. and David Chernicky, consultant, were leery when first approached by Geophysics International, creator of Petro-Sonde. Now they like the technology for the Midcontinent area.



GEOPHYSICS & EXPLORATION

Dual Induction Log

Petro-Sonde Pro Log



Matching logs

Comparison of a dual induction log and the Petro-Sonde Pro/Log on the 2 Cupps, NW SW NE 11-19n-7e, Jennings Field, Creek County, Okla. The Pro/Log was generated before the well was drilled. Initial flow was 240 bo/d and 50 Mcfgd.

atmospheric conditions, determined by the geologist, prevent the electromagnetic pulses in the ionosphere from reaching and penetrating the earth's surface. Running water from melting snow is the only ground condition that keeps Petro-Sonde from collecting the electro-telluric waves, he said. Finally, Petro-Sonde cannot determine the permeability of a formation or the quantity of fluid in the reservoir.

Holstein said it is one of the most accurate geophysical tools in calling depth, thickness, type of fluid within the reservoir and relative porosity. "It's one of the best ways to pick a location when you have no idea of what's going on," Holstein said.

David Chernicky, consultant for Striker Drilling Co. Tulsa, said he likes Petro-Sonde for the Midcontinent area. "It's very applicable because of our formations" Chernicky said. He mentioned the Cherokee Formation in Oklahoma and Kansas as excellent for Petro-Sonde use.

Chernicky and Striker President Mark Roberts agreed they were leery when first approached by GI. They took a GI representative to Striker's Begley, Okla., producing area, and gave him no well or formation information.

"He told me how thick zones were in the producing wells within 5 to 10 ft. How thick the zone, if it was oil, gas or water," Roberts said.

Striker has used Petro-Sonde with good results in Creek County, Okla., and three other areas. Pending initial testing, the company plans to use it in a new prospect area. However, the big score for Striker came recently on the 2 Cupps, NW SW NE 11-19n-7e in Jennings Field, Creek County, Okla. It hit Skinner at 2584-62 ft and had an initial flow of 240 bo/d and 50 Mcfgd. Striker attributes the find to Petro-Sonde.

Chernicky, a geophysicist with experience at Amoco Production Co. and Marathon Oil Co., said Petro-Sonde's biggest asset is in determining stepouts,

especially from situations where there is little geological control, such as in lenticular sand reservoirs.

The biggest drawback to him is that Petro-Sonde relies solely on the operator's decisions.

As a regional prospecting tool, Chernicky said Petro-Sonde could be limited because "the output is so subjective and it can't be subject to replay at a later time. It's not practical or cost-effective for miles of data, but is for those areas with a minimum amount of well control that have already been narrowed down by conventional methods."

Roberts said he'll use Petro-Sonde in "meandering channels like Pennsylvanian. If you think there's something there, tell the (Petro-Sonde) operator and he can follow the channel."

Holstein said he favors use of the Petro-Sonde so much that he helped establish a contract for the system with the Chinese. Roberts has drilled or not drilled wells because of the Petro-Sonde output.