

### Chapter 1 : Tomorrow Webinar Apr 17 - 10am PST: Exploring advanced scripting techniques - Micro Focus

*OOW Exploring Advanced SQL Techniques Using Analytic Functions from Zohar Elkayam I had around people on Sunday morning at am. I got some great reviews and a personal invitation to submit this presentation to some of the biggest user group events in the world.*

Deciding where to drill may be as much of an art as it is a science. The primary search for hydrocarbons frequently begins with observation of surface terrain. Location of faults at the surface are very important because they indicated where potential structural traps may lie beneath the surface in reservoir rocks. The observation of anticlines, another type of structural trap, also indicate potential traps at depth. Naturally existing crude oil seeps blacken the ground and spread rainbow films on streams. Such direct evidence is useful, but most such places have long ago been identified and explored. So the modern exploration geologist a person who explores for petroleum must rely on other techniques. There are three primary methodologies used to find hydrocarbons in the subsurface: Geophysical, Remote Sensing, and Wildcatting. Each technique records a different set of characteristics which can be used to locate hydrocarbons beneath the surface of the earth. Seismic surveys use vibration induced by an explosive charge or sound generating equipment to provide a picture of subterranean rock formations at depth, often as deep as 30, feet below ground level BGL. On land, the sound waves are generated by small explosive charges embedded in the ground or by vibrator trucks, sometimes referred to as thumpers which shake the ground with hydraulically driven metal pads. The echoes are detected by electronic devices called geophones which receive the reflected sound waves and the data are recorded on magnetic tape which is printed to produce a two-dimensional graphic illustrating the subsurface geology. Offshore surveys are conducted in a slightly different manner. Boats tow cables containing hydrophones in the water, which is similar to geophones on land. Sound waves use to be created by dynamite, but this method killed a variety of sea life. The most acceptable method today is to generate sound waves using pulses of compressed air which creates large bubbles that burst beneath the water surface creating sound. The sound waves travel down to the sea floor, penetrate the rocks beneath, and return to the surface where they are intercepted by the hydrophones. Processing and illustration is the same as the dry land method. In this type of survey, sound waves are sent into the earth where they are reflected by the different layers of rock. The time taken for them to return to the surface is measured as a function of time. This measurement reveals how deep the reflecting layers are; the greater the time interval, the deeper the rock layer. Moreover, this technique also can determine what type of rock is present because different rocks transmit sound waves differently. The most sophisticated seismic surveys are three-dimensional 3-D. The recorded data is processed by computer and the results are a detailed, 3-D picture of the formations and structures below the surface. But drilling a well can cost multiple millions of dollars, so time and money spent on accurate seismic surveys can be a good investment since it helps locate prospects and minimize dry holes. In general, seismic surveys can be carried out without disturbing people or damaging the environment, whether they are being conducted on land or water. It is a primary tool used by exploration geologists to locate [hydrocarbon] prospects. There are a number of other geophysical techniques such as magnetometers and gravimeters, and geochemical prospecting, a relatively new technique. Sedimentary rocks generally have low magnetic properties compared to other rock types. Mapping these differences reveals large masses of dense subsurface rock which allows geologists to have a better idea of the structures below ground. Geochemical prospecting uses sensitive instruments to detect minute quantities of gases that seep upward from petroleum deposits. This is a relatively new technique, but is one that is gaining wider acceptance. Increasing use of satellite imagery is being made because it shows large areas on the surface of the earth. Even though the photographs are taken from several hundred miles up in space, they are able to show features only a few feet in size. And satellite imagery not only indicates what the human eye can see, but they can also reveal subtle variations in soil moisture, mineral and vegetation distribution, and soil type, all of which are import pieces to the exploration puzzle. Once an area is selected and the satellite imagery obtained, the exploration geologist utilizes mapping techniques to produce a geologic map a map that indicates geological structures by using conventional symbols for the area.

The series of lines and arrows indicate the type of structure that exists at the surface. For example, , taken in November by a NASA satellite orbiting over miles out in space, shows the surface topography very clearly for an area in Southeastern Oklahoma known as the Ouachita Mountains. These mountains are comprised of folded and faulted Paleozoic strata which are buried beneath younger sediments toward the south. These mountains are made of a combination of structures called anticlines, synclines, and faults, all of which form various types of hydrocarbon traps. Some of this imagery is flown with an aircraft while some of it is onboard satellites or the US Space Shuttle. It produces an image much like a photograph that also shows earth structure at the surface. This figure is an area in South America that has never been explored. Until this SLAR image was made, there were no accurate maps of the region because the area is usually covered by clouds. But now, there are new opportunities based on this image. These types of maps allow geologists to determine where hydrocarbons might be located. Remember in Chapter 4, we discussed various types of structural traps. Anticlines are ideal structural traps while synclines do not tend to trap hydrocarbons. Thus both Figures and above show anticlines that will aid in the development of new prospects. It is drilled in an effort to locate undiscovered accumulation of hydrocarbons. About 1 in 10 wildcat wells strike oil or gas, but only one in perhaps 50 locate economically significant amounts. Many wildcat wells are drilled on a hunch, intuition, or a small amount of geology. Many times they are based on photography and experience in a particular area. Wildcat wells are generally drilled at a smaller diameter than normal because this saves money the average onshore well at present costs about 10 MM dollars to drill. One of the earliest exploration tools was referred to as Creekology, discussed earlier. But recent technological advances have lead to computer-enhanced capabilities using laptops that has had a major affect on the petroleum industry. New seismic techniques, for example, have created more mobile, less expensive, and easier to operate exploration tools that has created a wealth of information designed specifically for hydrocarbon exploration. Field equipment is smaller, lighter, more accurate and reliable and provides far greater detailed data. But the basic tool needed for the search for hydrocarbons still remains a knowledge of the Earth and earth processes of formation, lithology, and structure. But even with all of this, wildcat wells are still drilled, but their success rate is substantially lower than a well spudded in to begin a new well using all of the geological tools available. London, Wiley, pp. Shell Corporation, Houston, TX.

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