

Recognition of the turbidite nature of many petroleum-producing sands worldwide makes it imperative to understand both the facies types encountered and the trap types to be anticipated in future exploration and development work. Several facies models have been proposed, most of which are not readily usable with the data generally available in subsurface work. The facies analysis presented examines large-scale controls, such as climate, provenance, basin geometry, and tectonics, and then considers the various large to small-scale facies and sand-body geometries that result. Use of wire-line log pattern, dipmeter, and core descriptive data as criteria is emphasized. The newly recognized meander channel facies is shown to be important in prograded muddy slope areas. The concept of a "facies" as referring to a mappable assemblage of beds of varying natures and origins is favored, in contrast to the practice of assigning a separate facies designation to each single successive bed, with resulting uncertainty as to overall significance.

The author's trap-type classification, which includes canyon-dependent, fan-dependent, anticline-dependent, fault-dependent, and uplift topography-dependent traps, is used in conjunction with the facies analysis to predict the trap types most likely to be encountered in the various facies and basin settings. The trap classification itself is developed as a predictive tool rather than as a pigeonholing exercise.

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Wellsite Geochemical Analysis in Frontier Exploration—Logistics, Benefits, and Examples

In the past 10 years, organic geochemistry has become an increasingly significant factor in petroleum exploration. In frontier exploration areas, the need for geochemical data during drilling operations, rather than months after a well is finished, is now well appreciated. Real-time geochemical data have proven to be an important additional parameter in exploration and well completion decisions.

Wellsite geochemistry mandates unique operational, technical, and data interpretation requirements. However, the timely nature of data availability during drilling operations as well as the ability for field geochemists to work closely with other well-site personnel greatly enhances exploration efficiency. Sample procurement, preparation, and selection can be much more accurately realized by personnel familiar with local geology and a specific drilling operation. Furthermore, sample contamination by drilling fluid additives is more easily prevented, detected, and isolated from fresh samples at the wellsite.

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Location of Burns and Faults at Hanna Underground Coal Gasification Area by Use of High-Resolution Seismic Survey

In November 1980, a high-resolution seismic survey was conducted at the Hanna underground coal gasification area. The objectives of the survey were to locate and characterize the burn cavity at the Hanna II, phases 2 and 3 gasification site, and to locate shallow geologic faults. Seismic data acquisition and processing parameters were specifically designed to emphasize reflections at the shallow, 200 to 500 ft (60 to 160 m) depths. A three-dimensional grid of data was obtained over the burn zone. Processing included time-varying filters, deconvolution,

trace compositing, and two-dimensional, areal stacking of the data in order to identify anomalies. An anomaly was clearly discernible resulting from the rubble-collapse void in the burn zone. The anomaly was studied in detail and compared to synthetic models. The fault system was found to be a graben complex with antithetic faults. The fault system contains folded beds. A series of anomalies was discovered on the northeast end of one of the seismic lines. These reflections have been identified as underground mine adits from the old Hanna No. 1 coal mine.

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Abstracts

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Complex Subsurface Analysis Using Interactive Modeling and Simulation Techniques

Many offshore producing regions (and some onshore regions, such as Prudhoe Bay) are complicated by dual nemeses: intersecting non-vertical faults and directional well bores. Fault occurrences are observed in well bores or on seismic lines. When many fault occurrences are present, it often is difficult to determine which fault cuts are associated with which faults. An interactive contouring system allows the user to try various ways of connecting fault occurrences to form (intersecting) fault surfaces in (subsurface) space.

Once the faults have been modeled, the next task is to model (reconstruct, contour) subsurface formations as they interact with the various faults. This task is difficult enough when there are many formations and many faults. The task is even more difficult when directional wells are involved, since isopachs needed for reconstruction (i.e., stacking) are hard to determine.

A multi-surface multi-fault contouring system is being used to perform these complex subsurface analyses. A case study from offshore Gulf Coast illustrates its use.

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Dipmeter Advisor Expert System

The dipmeter services offered by Schlumberger consist of measurements made in a well bore to determine the inclinations, or dip, of the bedding layers penetrated by the well. The measurements are represented on a log in the form of arrow plots, which indicate the magnitude and direction of the dip as a function of depth. Information about the underground structure and stratigraphy can be derived from arrow plot patterns on the dipmeter log in conjunction with other types of data from the borehole as well as some general knowledge of the geological area. Traditionally, interpretation of dipmeter data has been made by a human expert who identifies and decodes the arrow plot patterns.

The Dipmeter Advisor system is an application of artificial intelligence and expert system techniques to dipmeter log inter-