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HYDRAULIC FRACTURING—NEW DEVELOPMENTS

Several factors should be considered in determining if a stimulation treatment should be conducted. These are existing wellbore damage, formation-flow capacity, required stimulation, remaining reserves, and economics.

The objectives in hydraulic fracturing are twofold: (1) the stimulation of the formation by increasing the effective wellbore radius, and (2) the bypass of formation damage.

Once it is decided to use hydraulic fracturing, there are many factors to consider in designing the treatment. These are related to the formation characteristics, fluid type to be used in the treatment, proppant type, treatment size, and economics.

New developments in the last few years have proved successful in stimulating zones that previously were considered uneconomical or marginal. These new developments are in the area of fluids, methods of attaining greater conductivity in fractures with greater fracture lengths, and in shutting off nonproductive zones.

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RECOGNITION OF DELTAIC ENVIRONMENTS FROM SMALL SAMPLES

No abstract available.

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PALEONTOLOGIC EVIDENCE FOR MID-MIOCENE REFRIGERATION FROM SUBSURFACE MARINE SHALE, LOUISIANA GULF COAST

The Harang facies, a regional diachronic middle Miocene shale in Louisiana, has characteristics which can be interpreted as indications of deep-water or cold-water deposition. It occurs in a seaward-thickening subsurface wedge or dark-gray to brown or black marine shales and clays with interbedded sandstones, and with a distinctive foraminiferal biofacies. The biofacies is characterized by an abundant and diversified benthonic foraminiferal fauna including huge arenaceous forms, and a small percentage of planktonic Foraminifera. *Globorotalia fohsi, G. mayeri, G. menardii,* and other planktonic species are sinistrally coiled. The change from random to predominantly sinistral coiling coincides approximately with the inception of Harang deposition (± 12–14 m. y. ago). The faunal assemblages indicate a muddy-water outer neritic to bathyal environment, and suggest a cool water mass. The apparent anomaly of a cold-water fauna in this stratigraphic position in this area might be explained by upwelling, paleogeographic changes, and/or significant Miocene refrigeration.

During the time span that includes Harang deposition, continental glaciation in Antarctica, cold-water invertebrate faunas, cool-climate floras, and other evidences of cool climate in many parts of the world indicate mid-Miocene refrigeration. Although some conflicting evidence also exists, we conclude that the distinctive characteristics of the Harang biofacies are related to a cool water mass which was part of a worldwide cooling phenomenon.

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WHAT HAS DEEP-SEA DRILLING PROJECT FOUND OUT ABOUT DEEP OCEANS?

The drilling vessel *Glomar Challenger* is completing 6 years of drilling at more than 300 sites in the Atlantic, Pacific, and Indian Oceans, as well as the Gulf of Mexico, Caribbean Sea, Labrador Sea, Mediterranean Sea, Bering Sea, Red Sea, and Antarctic waters. Significant achievements from drilling in the deep-marine environment have been accomplished in the fields of global tectonics, micropaleontology, paleo-oceanography, chemistry of interstitial water, diagenesis, mineralogy, and sedimentology.

The oldest sediment recovered from any ocean basin is only Late Jurassic. This fact coupled with the systematic geographic distribution of the ages, constitutes powerful support for the concept of sea-floor spreading and continental drift. In addition to horizontal tectonics, the drilling has revealed areas of uplift and subsidence.

Increased core recovery allowed the study of paleoenvironments on an ocean-wide basis. A major period of stagnation occurred in the Early and Late Cretaceous in the North Atlantic and Caribbean resulting in the deposition of carbonaceous sediments. Circulation was renewed in the Late Cretaceous and aerobic conditions prevailed to the present. Bottom water circulation became increasingly vigorous causing hiatuses in sedimentation of up to 70 million years in the Cretaceous-Paleogene section. Recently completed voyages into Antarctic waters traced glaciation on Antarctica to early Miocene.

Another important application of drilling is the identification of seismic reflectors in the deep ocean sediments. The nature of these reflectors is varied but commonly includes chert, limestone layers, ash layers, basalts, unconformities, and rarely, what is believed to be a clathrate or gas hydrates.

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MAPPING HYDROCARBON CONCENTRATION AND PERMEABILITY IMPROVES EXPLOITATION OF OIL AND GAS

Commercial oil and gas production requires the presence of hydrocarbons and the ability of the reservoir to give them up.

Property value is related to the magnitude of hydrocarbon concentration and reservoir permeability. Of course, other factors, such as the relative position of a possible critical water-saturation level, well depth, and the efficiency of exploration and reservoir development, also are important.

To look for hydrocarbons, it is logical to map hydrocarbon concentration and project trends. To predict production rates from proposed wells, it is logical to map permeability from existing well data and project permeability trends. These mapping parameters are derived easily from well-log data. Such maps may bear little resemblance to isopach and structure maps of the same reservoir.

Hydrocarbon concentration and permeability mapping are vastly superior to those obtained by conventional structural and isopach mapping techniques in some places.

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ENVIRONMENTAL MANAGEMENT IN MISSISSIPPI DELTA SYSTEM

The deltaic lowlands of the Louisiana coastal zone are exceptionally high in biologic productivity. Natural beauty and a rich cultural heritage further identify the coastal lowlands as a nationally important resource. As