the United States by 1971. Five fields account for a total present output of more than 145,000 b/d. Swanson River, Middle Ground Shoal, Granite Point, McArthur River, Foreland, Dolly Varden, and Trading Bay collectively have estimated producible reserves in excess of 750 million bbl.

One of 15 geologic basins in the state, the Cook Inlet basin has an area of 9,500 sq mi lying approximately 45 percent offshore, 15 percent in tidal areas, and 40 percent onshore. The basin's Cenozoic stratigraphy generally is represented by a maximum thickness of 25,000± ft of nonmarine Tertiary rocks. Mesozoic limestone, marine clastic sedimentary rocks, and volcanic rocks unconformably underlie the Tertiary.

Major structure and fault systems trend north-northeast. Tectonism occurred throughout the Mesozoic and Cenozoic and continues into the Recent as in other areas of the circum-Pacific tectonic belt. Faulting and folding are most prominent in the northwestern part of the basin close to the Alaska Range—a range which includes dioritic and granitic mountains with numerous active volcanoes.

Oil has been found in the classic anticlines. Production is from sandstone and conglomerate beds of the Kenai Group including the middle Kenai and Hemlock Formations. Faulting and stratigraphic variations in part control accumulation and fluid properties. All reservoirs contain undersaturated oil close to bubble-point pressure requiring early secondary recovery efforts. Oil gravities range from 25° to 56°API. Average daily production per well is about 1,400 bbl.

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EXPLOSIVES FOR EXPLORATION INDUSTRY

A wide variety of explosive products has been developed for use in seismic prospecting. These products are designed specifically for the unique conditions encountered by this industry. A thorough understanding of field requirements, coupled with modern, efficient large-scale research organizations, is essential if a continuous flow of new and improved products is to continue. Conversely, the explosive user must be familiar with the many products available, including a basic knowledge of their properties, if he is to achieve maximum energy return. In addition, he must recognize any handling precautions necessary with these products and practice good safety awareness at all times.

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FOUR TYPES OF LAND SUBSIDENCE IN SOUTHERN SAN JOAQUIN VALLEY, CALIFORNIA

Four types of land subsidence have been observed in the southern San Joaquin Valley. These have distinct causes, and generally occur in different areas.

Subsidence caused by the decline of ground-water levels affects 400 sq mi on the valley floor at rates to 0.5 ft/yr. It results from the compaction of the water-bearing deposits as effective stresses are increased by pumping, and will continue as long as ground-water levels continue their downward trend. Subsidence due to the hydrocompaction of surficial deposits is occurring on the southern and western perimeter of the valley. Hydrocompaction results when moisture-deficient, susceptible deposits are wetted for the first time. Subsidence associated with the production of oil and gas has been observed in several fields. Also, tectonic adjustment results in the continuing northward tilt of the mountain block at the southern end of the valley.

The areal extent and rate of subsidence are determined principally by periodic releveling of surface bench marks. At selected locations in the valley, specially designed installations furnish a continuous record of compaction of the aquifer system due to artesian-head decline.

Importation and extensive use of surface water for irrigation should greatly modify the subsidence pattern in the next decade

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OFFSHORE EXPLORATION TECHNIQUES

(No abstract submitted)

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WORLDWIDE DEVELOPMENT OF GEOTHERMAL INDUSTRY

The total installed capacity of geothermal generating plants in the world today is approximately 630 megawatts (MW), distributed among the following five countries: Italy 340; New Zealand, 190; USA, 50; USSR, 30; and Japan, 20. Approximately half of this present capacity has been installed during the last 10 yr and the success of these installations is stimulating worldwide interest in geothermal energy. Exploration projects are now underway in Mexico, El Salvador, Chile, Turkey, Kenya, China (Taiwan), and the Philippines.

Although approximately 30 thermal areas have been drilled in the western United States during the past 10 yr, only two are undergoing active development. The Geysers field in northern California accounts for all the geothermal power production in the United States, and the Salton Sea field in southern California is being developed for the extraction of sodium and calcium chlorides from geothermal brines.

The principal incentives for development of geothermal power are: (a) lack of more conventional sources in the market area, and (b) competitive economic position of geothermal power even where other sources are available. Geothermal sources generate low-cost, base-load power even at capacities under 100 MW, making them particularly advantageous in market areas where power demands are still low. Low steam pressures make it necessary to use small generating units, *i.e.*, on the order of 25–50 MW, but total capacities of several hundred megawatts can be expected from a single steam field.

All the thermal areas now under investigation share a common regional geologic setting: the areas are located in orogenic zones, where late Tertiary or Quaternary volcanism has taken place. Tectonically the regions are characterized by vertical movements, both uplift and subsidence, which have taken place on normal faults. The geometry of fault-block movement appears to be an important factor in controlling the location of shallow igneous intrusions which are believed to be the source of heat for the high-temperature thermal systems now being exploited for power generation.