buildup is 900+ ft thick and is primarily a bank deposit composed of mud-baffling organisms.

Four cored wells in a section from the front to the back of the buildup were chosen for detailed study. Fusulinid-age dating of the cores shows a major unconformity dividing the Millican buildup. Primarily, the buildup is of early Missourian age except for its pinnacle which is of early Virgilian age. Eight limestone facies were also recognized across the buildup. Labeled according to their distinctive components, they are: (1) crinoidal, (2) foraminiferal, (3) bryozoan, (4) mollusk-phylloid algal, (5) peloidal, (6) foraminiferal-fusulinid, (7) high energy (intraclastic and/or oolitic), and (8) blue-green algal. From the facies distribution across the buildup, a depositional model can be formed.

Porosity development within the Millican buildup is also facies controlled. Virtually no primary porosity exists, and the majority of secondary porosity generation occurs in rocks that are almost entirely composed of phylloid algae and mollusks. This understanding of the facies, environments, and diagenesis across the Millican buildup should be an important tool in exploring for similar and more subtle traps.

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Late Abstract

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Perspectives on World-Class Carbonate Petroleum Reservoirs

A synthesis of geologic attributes and reservoir properties is provided for 41 carbonate petroleum fields. From throughout the world, 55 scientists developed detailed case studies of carbonate reservoirs ranging in age from Ordovician to Miocene and in size from 1.7×10^3 to 32.0×10^9 bbl initial oil in place (IOIP).

The objective was to focus on the detailed depositional and diagenetic history of a significant number of carbonate reservoirs, and secondarily to characterize their petrophysical evolution and reservoir volumetrics. An attempt was made to develop a complete "anatomy" of each field, which includes among many other attributes: regional paleosetting, tectonics, entrapping facies, source rocks, reservoir dimensions, and fluid data.

Using a chronological arrangement, broad trends through time become evident. A progression of reservoir types occurs through the Phanerozoic, from peritidal and subaerially exposed facies in Paleozoic examples, through a long-term sequence of shallow-shelf sands and reefs, to relatively deep-marine facies in the Cretaceous and Tertiary. These last range from periplatform debris flows to deep-shelf pelagic chalks and deep-basinal mixed lithofacies that have been diagenetically altered, mainly to dolomite. No trends are seen, however, in the occurrence of pinnacle or other reefs through the Phanerozoic.

Many of the largest fields occur in Tertiary mobile belts and other regions affected by Tertiary tectonics, principally in carbonates of Cretaceous to Miocene age. Furthermore, at least nine of the largest fields owe their reservoir productivity largely to fracturing, and at least ten smaller fields involve some fracturing.

In contrast, the great number and diversity of reservoirs of shallow-epeiric, platform, peritidal, and sabkha origins are also evident, with reserves between 70 and 700×10^6 bbl IOIP. Shallow reef-mound, atoll, or pinnacle reef fields of large magnitude, all in carbonates of phototropic, warm-water, marine origin, are common over structures, particulary those related to subjacent salt diapirs. Non-salt-supported shallow shelves and reefs have smaller fields of less than 200×10^6 bbl IOIP.

Future requirements include much more knowledge about (1) the extent, diversity, and recognition of deep-marine carbonates; (2) the frequency, size, orientation, and contribution to reservoir productivity of fractures; and (3) a large information base, generated by postmortem studies of the vast number of reservoirs which are destined to become candidates for supplemental recovery methods.