

# "OCCIDENTAL'S NEW EXPLOSIVE TECHNOLOGY IN OIL SHALE"

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## ABSTRACT

Occidental Oil Shale Inc. has spent the last eight years at its Logan Wash. mine near DeBeque, Colorado, developing its modified in-situ oil shale process for obtaining oil from oil shale. Modified in-situ technology involves large underground chambers, or retorts, which are formed by mining out a minimal volume of rock to allow explosive expansion of the surrounding rock into tile mined void volumes. The resulting rubblized retort volume must contain a fairly uniform particle size distribution and void distribution to permit maximum oil recovery during subsequent in-situ processing operations. The more uniform the rubblized volume of particles, the more oil recovery obtained during processing. The processing involves first igniting the top of the retort and then. injecting air into the top of the retort to drive the combustion front downward through the entire rubblized volume. The oil is continuously collected at the bottom of the retort during the processing.

Currently, Occidental in partnership with Tenneco Oil Company is using its modified in-situ technology for the Cathedral Bluffs or C.B. oil shale commercial venture near Rio Blanco, Colorado, which is planned to begin oil production by the mid-1980's. At its peak in 1990, C.B. will comprise an underground mining operation consisting of 60,000 tons per day hoisted rock with an ultimate in-situ oil production rate of 55,000 barrels per day. Extensive construction has already been completed at C.B. in the form of surface facilities and the sinking of three shafts which are down to about 1500 feet of the required 1800 it. Ultimately, there wild. be on the order of seven shafts, of which five will be about 34 feet inside diameter. At full production at C.B. 120 retorts must be constructed per year or 2.3 retorts per week. Each retort requites about 400 tons of explosive for a total of 920 tons per week. Additionally, production mining requires about 200 tons per week for a total. explosive usage at C.B. of 1120 tons per week.

Occidental's first successfully rubblized commercially-sized retort chamber, Retort 6 has constructed using newly developed commercial blasting technology in March 1978 using a total explosive weight of about 250 tons. Retort 6 was constructed under a cooperative agreement with the Department of Energy. The explosive was distributed throughout six million cubic feet of total retort volume in 414 blastholes emanating from three different horizontal void mining levels. The blastholes were tied into an extensive millisecond delay blasting sequence designed to provide an uniform void fraction distribution in the final rubble volume. A high degree of reliability was built into the overall initiation system to ensure a successful detonation. The Retort 6 blast design and rubblizing results are

presented in this paper, as well as a summary of the rock fragmentation program conducted prior to the retort blast. A description is also presented of Retorts 7 and 8 also being constructed under a cooperative agreement with D.O.E. and scheduled to be blasted in early 1981. The Retorts 7 and 8 blast design and rock fragmentation program conducted prior to these retorts are described. The total rock fragmentation program consisted of an extensive series of blasting tests that were conducted to design and demonstrate the Retorts 6, 7 and 8 rubble plans. The testing included a comprehensive series of operational tests designed to identify and eliminate blasting uncertainties associated with such large-scale explosives operations.