Uranium Leaching (Figs. 3 & 4)

The sulphide flotation concentrate is thickened and filtered and the filter cake is washed to remove the alkaline mill solution which consumes acid. The repulped concentrate is pumped to the acid leaching circuit (Fig. 3) where it is leached with weak sulphuric acid in rubber-lined Pachuca tanks. Sodium chlorate is added to provide oxidizing conditions.

The Pachuca discharge pulp is filtered in two stages and the clear solution is agitated with magnesia to separate the contained uranium as a crude precipitate which is settled and sent to the main carbonate leaching circuit.

The acid leaching section is small compared to the main leaching circuit since only a small percentage of the original ore is acid leached.

The sodium carbonate leaching circuit (Fig. 4) handles most of the ore. The chemical basis for this process is that air oxidation of the ore slurry at elevated temperatures renders the uranium in the ore soluble in solutions of sodium carbonate-bicarbonate.

Two types of leaching vessels are used. About 25% of the ore is treated in two banks of autoclaves at 235°F. and a pressure of 85 pounds per square inch. The autoclaves are cylindrical vessels 8 ft. in diameter and 25 ft. long. The tanks are equipped with mechanical agitation to provide dispersion of pulp and air. The remaining ore pulp is leached in Pachuca tanks at lower temperatures (170°F.) and at atmospheric pressure.

Twenty-five Pachuca tanks, each of 9,000 cu. ft. volume, are installed and these are arranged in four rows of six tanks each. Each tank is agitated by a central airlift and additional air is blown in to promote oxidation of uranium minerals in the pulp. Flue gas is injected in the first tank of each row in order to maintain the necessary bicarbonate content in the leach solutions. The concentration of bicarbonate affects the leaching rate. Heating of the pulp in Pachucas and autoclaves is done by steam coils.

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