A successful method was developed to treat the Port Radium ore and permit re-treatment of stored tailings. This method was pilot plant tested in Ottawa in 1949 and on a large scale at Port Radium in 1950. The full-scale plant was built and operated successfully from 1952 to 1960. The development of the Port Radium leaching process was pioneer work since none of the leaching processes known at that time was suitable for economic recovery of uranium at this northern location. The plant was the first modern uranium leaching mill to commence operation and the process was used as a pattern for other Canadian plants.

The process involves leaching the ground ore with sulphuric acid under carefully controlled conditions of pulp density, acidity and oxidizing level. At Port Radium the leached pulp was filtered and washed in two stages and the uranium-bearing filtrate was treated with a special aluminum powder to precipitate uranous phosphate and arsenate. This precipitate was filtered and dried for shipment to Port Hope.

Development work continued after the plant was in operation. By 1953 a period of great expansion had taken place in uranium mining and development and the radioactivity division of the mines branch had become occupied with the testing of ores from private companies. Eldorado therefore found it advantageous to form its own research and development division. Personnel for the new division was obtained from the Mines Branch and from the staff at Port Hope. The functions of this division were to develop new processes and assist in improving efficiency, product quality, "trouble shooting", and by providing supporting laboratory and pilot plant work.

As far as the Port Radium plant was concerned, the improvements in efficiency are reflected in Fig. 1. The development of a solvent extraction process for recovery of uranium from solutions was one of the major improvements. A more complete description of the Port Radium plant is given elsewhere in this brief.

Beaverlodge

In 1948 to 1950 Eldorado was developing the Ace-Fay ore bodies at Beaverlodge Lake, Saskatchewan, and metallurgical development work was started on Beaverlodge type ores. The mill would be required to treat customs ores as well as Eldorado ores. Many of the ores in the district contained large amounts of acid-consuming minerals and consequently direct acid leaching would be difficult when a mixture of Eldorado and customs ore were to be treated.

The mines branch laboratories had developed an alkaline leach process which involved leaching the ore with a solution of sodium carbonates and precipitation of uranium by sodium hydroxide. After the uranium precipitate was removed by filtration, the barren solution was treated with flue gas to restore the carbonate content and then returned to leach fresh ore. This was the first "cyclic" carbonate leach process. Sodium permanganate was used as an oxidizing agent.

The chemical costs of the permanganate oxidation were high, hence alternative process steps were developed involving oxidation by pressurized air and high temperatures. This system was laboratory tested at the University of British Columbia and later on a larger scale by Eldorado. The plant was designed and built in 1952-53 and operation commenced at Beaverlodge in May 1953. The Beaverlodge plant capacity was enlarged from 500 to 750 tons per day in 1954 and to 2,000 tons per day in 1957. The latter expansion was made in order to treat the new Verna orebody.

Development work has continued since 1953 to improve the efficiency and costs at the Beaverlodge mill. A variation in the leaching method was developed