

## APPENDIX C

## Port Hope Refinery

*History*

The refining of pitchblende ores was initially started on the present site at Port Hope in 1935. Until August 1952, the feed material consisted entirely of gravity concentrates produced at Port Radium, N.W.T. In May 1952 Port Radium output was augmented with the production of an acid leach precipitate and these two products constituted the sole feed to the refinery until June 1955 when the process was completely revised with the installation of an up-to-date solvent extraction process.

Originally the refinery at Port Hope was designed for the production of radium, with uranium as the by-product. However, in 1941, with the advent of new developments in atomic energy, uranium became the main product and radium production was reduced to secondary importance. In 1948 the extraction and production of radium from ores was discontinued, partly due to higher costs directly associated with lower grade feed materials and partly due to reduced markets brought about by the introduction of radioactive isotopes.

The main process for the production of uranium was a combination of metallurgical and wet chemical treatment which, with the exception of a few improvements and refinements, remained essentially the same from 1935 until the complete changeover in 1955. The end product was a uranium black oxide ( $U_3O_8$ ) grading approximately 96%. The entire production was shipped to the United States Atomic Energy Commission for further purification prior to entry to the various atomic energy installations.

Research carried on over several years had developed new and improved techniques for the extraction of uranium, using selective solvents. In addition to cheaper operation, the solvent process also produced an end product of sufficiently high purity that subsequent entry to nuclear operations could be made directly without further purification.

For reasons noted above, the decision was made to install a completely new solvent extraction process at Port Hope. In addition to producing a purer product at lower cost and higher recovery, the new installation also made it possible to increase production rates by a factor of five, which was roughly equivalent to the then expected increase in uranium production from newly developed areas in Canada.

The refinery conversion was completed in June 1955 and from that time production for the United States Atomic Energy Commission, with whom Eldorado has a refining contract, has been in the form of purified nuclear grade orange oxide ( $UO_3$ ).

The decision was made in 1956 that refining operations should be extended by diverting in sufficient quantity to meet Canadian needs some of the orange oxide produced by solvent extraction for the production of nuclear grade uranium metal. The production of metal also entailed the production of two intermediate products—uranium dioxide ( $UO_2$ ) or brown oxide and uranium tetrafluoride ( $UF_4$ ) or green salt.

Studies indicated that certain operating and economic advantages were to be obtained by using moving bed reactor type equipment rather than the conventional horizontal screw reactors then in use in U.S. establishments. To definitely establish the advantages indicated, pilot plant facilities were constructed and placed in operation at the end of 1957. Development work with the pilot scale moving bed reactors was successful and plans were completed to proceed with the design of production scale facilities which went on stream late in 1958.