Intimate mixing in the column transfers the uranium and some impurities to the solvent phase, while the acid insolubles and the majority of impurities are retained in the aqueous phase. Upon reaching the bottom of the column the slurry has been almost completely stripped of uranim and is pumped to the acid recovery area for further processing. The solvent, which flows by gravity from the top of the column, is saturated with uranium containing minute quantities of impurities.

The next phase of the operation is termed "scrubbing". The uranium-bearing solvent from the first column is directed to the base of the second column and deionized scrub water is introduced at the top. By using a small controlled volume of water the impurities and some uranium are transferred to the aqueous phase, which is drawn from the bottom of the column and recycled back to the digestion circuit for re-entry to the first column. The solvent containing the uranium, now stripped of impurities, flows to the top of the third column.

In the third column the uranium is re-extracted to the aqueous phase by contact with large volumes of deionized water. The solvent, now stripped of uranium, is recycled back to storage and is again ready for extraction operations in the first column. The aqueous phase containing uranium as uranyl nitrate, in a highly purified form, is then pumped to the boildown and denitration area.

Continuous purification of the solvent, using a soda ash solution, is required to remove breakdown products.

Deionized water is produced by passing steam condensate through ion exchange resins.

Boildown and Denitration

The uranium-rich aqueous phase from the third column is pumped to a two-stage evaporation circuit where water is driven off and the concentration of uranium to a high density uranyl nitrate solution is effected.

The highly concentrated uranyl nitrate is then directed to denitration kettles in batch lots of approximately 200 gallons. Heat is applied to these kettles by means of electrical resistance coils, with the product under constant agitation. In the initial stages excess water is driven off and eventually the uranyl nitrate is converted to a uranium trioxide (orange oxide) by thermal decomposition. The complete denitration cycle requires approximately eight hours. The end product is a dense orange powder which is removed from the kettle by means of a pneumatic conveyor through a cyclone separator to a pulverizer, and thence to a packaging bin.

The entire orange oxide conveying system is serviced with dust collection equipment which returns all dust so collected to the storage bin.

Product Packaging

The uranium trioxide from the packaging bin is filled into 5-ton steel containers which are subsequently shipped to the United States Atomic Energy Commission. Oxide diverted for metal production is packaged in 25-gallon resined lined drums. During loading operations a continuous sample is obtained by means of an Auger type sampler located at the bin discharge. Containers are weighed after loading and pertinent data, including lot number, drum number and weights, are recorded.

The United States Atomic Energy Commission return empty containers to Port Hope for re-loading.

Analyses on orange oxide samples are carried out by both Eldorado and the United States Atomic Energy Commission. If agreement is not within specified limits, the National Bureau of Standards acts as umpire.