UNITED NUCLEAR - HOMESTAKE PARTNERS

URANIUM MILLING OPERATIONS

GRANTS, NEW MEXICO

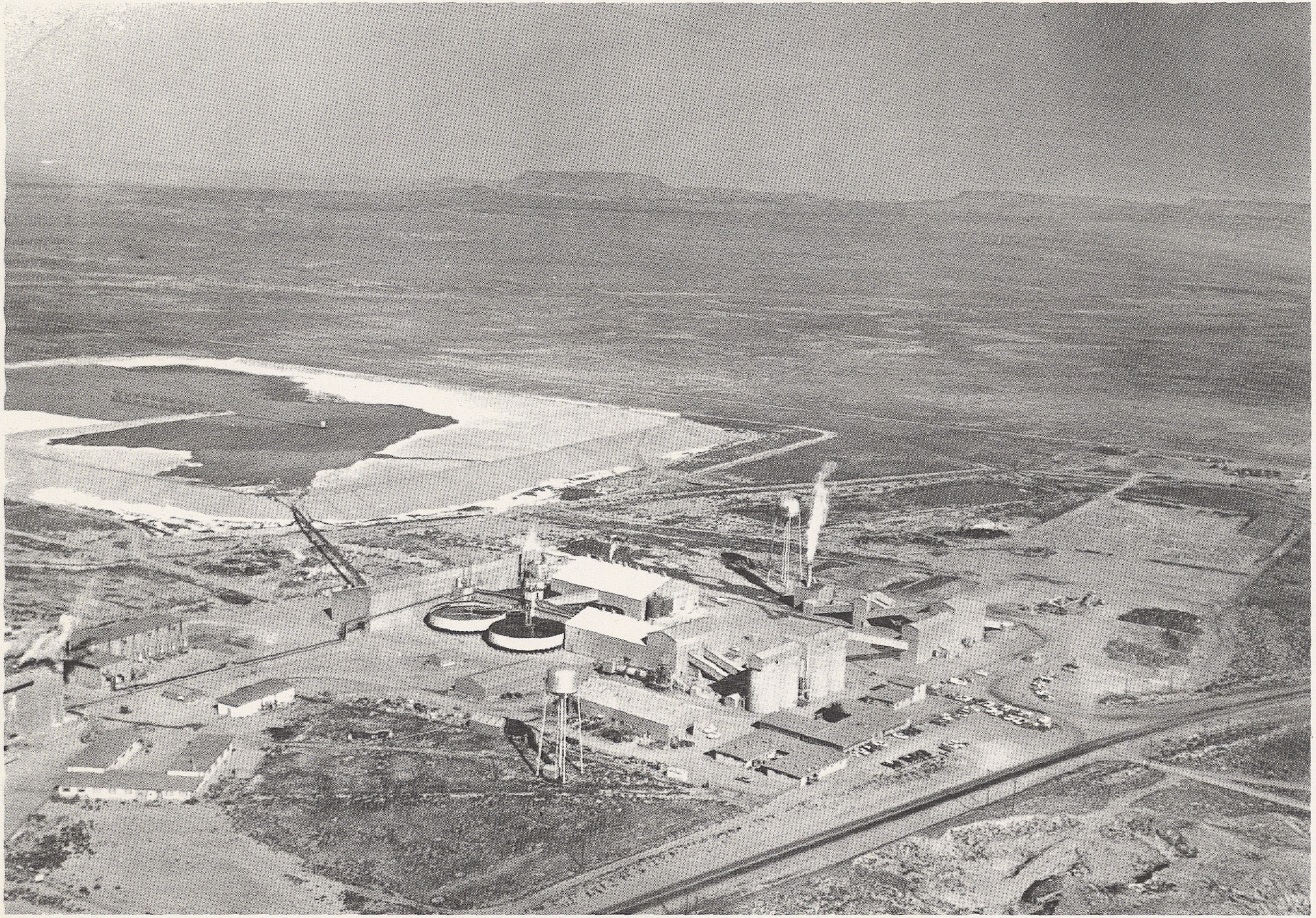

Figure 2

URANIUM ORE MINING AND MILLING

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Homestake Mining Company and United Nuclear Corporation are partners in a major uranium mining and milling venture in New Mexico formerly called Homestake-Sapin Partners and recently renamed United Nuclear - Homestake Partners. The Partnership has been a major producer of uranium since 1958 when a contract was signed in 1957 with the U. S. Atomic Energy Commission. Since that time it and another partnership, Homestake - New Mexico Partners (closed November 1961) have delivered approximately 27,000,000 pounds of U_3O_8 to the Commission plus approximately 628,000 pounds of U_3O_8 to the commercial market. The Partnership currently operates six mines, a trucking division and a 3,500 ton per day alkaline leach mill. Recently the partners announced a revised Partnership agreement that provides for distribution to the partners of uranium concentrate produced in excess of the requirement needed to fulfill existing AEC contracts and for the partners to share in the available mill capacity for their individual accounts. These new arrangements will insure a basis for the long-term operation of these mining and processing facilities at a time when substantial future growth is anticipated for the uranium industry.

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CURRENT MILLING OPERATIONS

During the ten years since operations were begun at the United Nuclear - Homestake Partners uranium mill, the processing flowsheet has undergone gradual changes until the present flowsheet has been evolved.

ORE PREPARATION

Ore Receiving. Ore for processing is received from various mines in the district which are 10 to 52 miles distant from the mill. The ore is delivered in truck loads of 22 to 28 tons. Control of the ore is by consecutive lot numbers; and ore lots, which vary from 200 to 1,500 tons, usually consist of the ore received from one mine in one day.

As each truck arrives at the mill, it is weighed; and the ore is assigned to a lot. The ore is then dumped in a specified area on the ore pad, and the empty truck is weighed. A sample from the dump pile of each truck load of ore is taken for a moisture determination which is used to calculate the dry tons of ore in each lot.

Crushing. The concrete portion of the ore pad contains a sub-grade hopper that is covered with a grizzly. The grizzly has 16-inch square openings through which the ore must pass. The ore hopper discharges onto an apron feeder which has a variable speed drive and is controlled by the crusher operator. The apron feeder discharges through an anchor chain curtain, over a stationary grizzly, and onto a 42-inch conveyor belt. The crusher feed belt discharges the ore onto a vibrating grizzly which allows the minus two-inch fraction of the ore to by-pass the crusher. The crusher is a twin rotor Universal Impact Breaker.

The crusher discharge and the vibrating grizzly undersize are combined and elevated by means of conveyor belts to two, 6 by 12-foot vibrating screens which are covered with a 1/2-inch by 4-inch slotted screen. The screen oversize falls onto a return belt for recycle to the crusher, and the screen undersize drops onto a conveyor and is transferred to the sampling plant.

Drying. Ores that contain more than 8 to 9% moisture require drying. This is accomplished in a 10-foot diameter by 80-foot, co-currently fired, rotary dryer. The feed to the dryer is the vibrating grizzly undersize and the crusher discharge. The dryer discharges the ore, at 5% moisture, onto a conveyor belt which returns the ore to the vibrating screens. Draft for the dryer is supplied by two, 45W Rotoclone dust collectors. The dryer burner has a capacity of 70 million Btu per hour, and it can be fired with either natural gas or fuel oil.

Sampling. The sampling plant consists of four stages of Geary-Jennings, reciprocating samplers that cut all of the ore stream part of the time. The first stage sampler operates on the entire crushing plant output and discharges the sample into a small surge bin. The surge bin contains a load sensing device which controls the speed of the belts feeding the remaining samplers to insure a steady stream of falling ore for each sampler. A roll crusher inserted in the sample line between the second and third samplers reduces the particle size from 1/2 to 1/4-inch.

The final sample is collected in a drum in a quantity equivalent to one pound of sample for each four tons of ore. The sample is dried and split down to a 100-pound lot sample. The lot sample is then prepared for assay using a procedure approved by the Atomic Energy Commission.

Fine Ore Bins. The ore bins are 35 feet inside diameter by 50 feet tall, and contain a live load of 4,800 tons of ore. Since each lot of ore must retain its identity until the ore reaches the ore bins, there is very little blending of the ore prior to milling. A conveyor belt transports the ore from the sample plant to the top of the fine ore bins, and a belt tripper is used to discharge the ore into any one of four ore bins or into a truck hopper for return to the ore pad.

<u>Grinding</u>. The feed to the grinding circuits is withdrawn from the fine ore bins by means of two belt feeders under each bin. One feeder is manually controlled and the other feeder is automatically controlled. The feeders discharge onto a collecting belt for transfer to the ball mill feed belt or onto a belt feeding the ore roasting circuit. The ball mill feed belts contain weigh sections which supply the load signals for the Con-O-Weigh weightometers. The weightometers in turn vary the speed of the automatic feeders to maintain a constant feed to the ball mills. Two ore bins supply the feed for each grinding circuit.

The grinding circuit consists of two, 10-foot diameter by 66-inch, Hardinge conical ball mills. The mills operate in closed circuit with a 72-inch WEMCO spiral classifier. At a feed rate of 73 tons per hour, a grind of 5% plus 48 mesh and 35% minus 200 mesh is produced. The ball charge in each mill is approximately 22 tons, and the ball make-up consists of equal weights of 2 and 2-1/2-inch forged steel balls. Each ball mill is driven by a 400 hp, 4,160-volt, wound rotor motor directly geared to the ball mill. The ball mills operate at 20 rpm or 83% of critical speed. Grinding is conducted at 65% solids in a sodium carbonate and bicarbonate mill solution containing 37 grams Na_2CO_3 per liter and 7 grams $NaHCO_3$ per liter. The classifiers overflow at 20% solids.

<u>Roasting</u>. The leaching characteristics of certain ores can be improved by subjecting these ores to a low-temperature roast. These ores are placed in one ore

bin and fed to the roasting circuit at a rate of 20 to 25 tons per hour. The roasting is accomplished in an 8-foot diameter by 80-foot rotary kiln. The temperature of the ore is raised slowly to 600° F at a rate of 15 to 20° F per minute. The ore is then cooled and sent to the grinding circuit.

The roasting kiln is equipped with angle lifters to provide for efficient contact of the ore with the hot air. A 20-foot brick-lined section at the discharge end of the kiln provides for combustion of the burner gas, and the burners fire directly into the kiln. Exhaust is provided by a 36W Rotoclone dust collector. The roaster discharges onto a drag conveyor which elevates the hot ore to the feed chute of a Baker type cooler. The cooler is 8 feet in diameter by 55 feet long, and operates in a concrete basin partially filled with mill solution. Mill solution is also sprayed over the cooler to insure adequate cooling. The cooled ore discharges at 225° F onto a high-temperature belt which transfers the ore to the ball mill feed circuit.

Thickening. The classifier overflow from each grinding circuit is pumped with a six-inch Wilfley slurry pump to a 20-inch Krebs cyclone. The cyclone overflow is discharged into the feed launder of a 100-foot diameter thickener, and the cyclone sands by-pass the thickener. A polyacrylamide flocculent is mixed with the thickener feed to aid in settling and clarification. The thickened slurry is removed from the thickener with a Dorrco diaphragm pump at 40% solids. The thickener underflow and the cyclone sands are recombined in the leach circuit preheat tank at 52-54% solids. The overflow from the thickeners flow by gravity to a mill solution storage tank for recycle to the grinding and roasting circuits.

LEACHING

The extraction of the uranium from the ore is accomplished in a two-stage circuit consisting of a 4.5-hour leach at 65 psig pressure and 200° F followed by a 18-hour leach at atmospheric pressure and 185° F. Leaching is accomplished in an aerated solution containing 37 grams Na_2CO_3 per liter and 7 grams $NaHCO_3$ per liter. The extraction obtained from pressure leaching varies from 85 to 95% depending on the type and grade of the ore. The atmospheric portion of the leach increases the extraction 7 to 10% for ores that produce a pressure leach extraction of only 85%. The grade of the ore averages 0.21% U_3O_8 and the leach residue averages .011% U_3O_8.

The chemistry of the alkaline leaching system involves the oxidation of any tetravalent uranium to the hexavalent state using the oxygen available in the air. The hexavalent uranium dissolves in the presence of carbonate alkalinity to form a uranyl tricarbonate complex ion according to the following reaction.

$$2UO_2 + O_2 + 6Na_2CO_3 + 2H_2O \longrightarrow 2Na_4UO_2(CO_3)_3 + 4\ NaOH$$

The uranium will not dissolve in a sodium carbonate solution because the hydroxide alkalinity formed with the complex ion causes the ion to decompose. In a solution containing sodium bicarbonate, the hydroxide alkalinity is neutralized immediately; and the reaction proceeds as follows:

$$2UO_2 + O_2 + 6Na_2CO_3 + 4Na_2HCO_3 \longrightarrow 2NA_4UO_2(CO_3)_3 + 4Na_2CO_3 + 2H_2O$$

Pressure Leaching.. Pressure leaching is accomplished in two separate circuits each containing eight autoclaves. Each circuit can be operated as a series of eight autoclaves, but is normally divided into two circuits of four autoclaves. The first unit in each leaching circuit is a preheat tank in which the thickener underflow and the cyclone sands are recombined and heated to 150° F. A two stage centrifugal pumping system is used to pump the preheated slurry into a splitter tank where the slurry is divided into two streams for feed to the autoclaves.

The autoclaves are 12-foot diameter by 16-foot high, domed, pressure tanks equipped with a top-mounted "Lightnin" mixer. Each tank has two, turbine type, 42-inch diameter impellers mounted on a 14-foot, 4-inch diameter shaft. Oxidation air is fed into the bottom of the autoclaves through a 30-inch bubble-cap diffuser. Pressure in an autoclave circuit is maintained by an automatic bleed-off valve on the pipe header connected to each autoclave. Heat for leaching is supplied by three sets of 2-inch steam coils in the first autoclave in each circuit of four. The remaining autoclaves have only one steam coil which is used to hold operating temperature if necessary. Temperature and pressure in the autoclave circuit are maintained by automatic controls. In the event that an autoclave is removed from service, the circuit is arranged into a series of seven autoclaves; and the tonnage is reduced to maintain a constant retention time.

The flow through the autoclaves is by gravity, and the feed to each autoclave enters at the slurry surface and discharges from the bottom through an internal riser. A six-inch drop between autoclaves provides the head for flow through the six-inch piping in the circuit. The operating volume of each autoclave is approximately 11,000 gallons. The discharge from the last autoclave in each circuit of four flows into a letdown tank. The level in the letdown tank is maintained by a capacitance type probe and level controller. From the letdown tank, the leached slurry discharges through a concentric tube heat exchanger that cools the slurry from 200° F to 180° F. The pressure of the system provides the energy to push the partially leached slurry through the letdown control valve, the heat exchanger, and 900 feet of pipe to the atmospheric leach circuit.

Atmospheric Leaching. The atmospheric leaching circuit consists of nine Pachuca tanks 19 feet in diameter by 38 feet deep. The slurry from the pressure leach circuit is added to the top of the first Pachuca tank; from which it flows by gravity through the tanks and into an elevated pump sump.

Four, ten-inch air lifts provide agitation for each Pachuca; and heat for the circuit is provided through steam jackets on the air lift pipes. Additional air for oxidation is supplied through five, 3/4-inch pipes suspended from the top of each tank. The air enters the slurry approximately three feet from the bottom of the tank.

LIQUID-SOLIDS SEPARATION

Filtration. The removal of the soluble uranium values from the leach circuit discharge is accomplished with three stages of countercurrent filtration. Each filter stage contains five, 650 square-foot and two, 570 square-foot, rotary drum vacuum filters. The filters are 11-1/2 feet in diameter, and are equipped with polypropylene grids. A heavy duty nylon filter cloth is used to cover the filters, and 14-gauge stainless steel wire is wound on the filters to retain the filter cloth.

The discharge from the secondary leaching circuit is pumped to the filter feed tank by means of four-inch Wilfley pumps and 800 feet of pipeline. The feed to the first stage of filters is pumped from the filter feed tank through a pipe-loop by means of a five-inch Wilfley slurry pump. The pipe-loop feeds each filter and then discharges into the bottom of a head tank which provides feed pressure. Excess feed overflows the head tank and returns to the filter feed tank. Each of the first stage filter tubs has a level controller which operates a valve on the feed line. A dilute solution of flocculent is pumped into the filter feed line on the discharge side of the pump. The filter feed and flocculent are mixed by flow through the piping and the feed valves and in a small mixing chamber on each filter tub. The feed to each first stage filter enters at the center of the tub.

The first stage filter cake is washed with a hot filtrate solution from the third stage of filters. The filtrate is sent to clarification, and the first stage filter cake discharges into repulpers for repulping with third stage filtrate. The repulped slurry flows by gravity through an agitated sump and into the second stage of filters. Flocculent is added to the repulper solution to aid in second stage filtration.

The second and third stage of filters are operated in much the same manner as the first stage; except that recarbonated barren solution from the precipitation circuit is used as a filter wash and in the repulpers on the second stage and tailings pond solution or water is used as a wash on the third stage. The wash solution for each stage of filters is maintained at 150° F. The second stage filtrate is sent to the mill solution circuit, and the third stage filtrate is used as wash and repulper solution on the first stage of filters. The filter cake from the third stage of filters is repulped and slurried for tailings disposal. The loss of soluble uranium in the tailings slurry averages 0.8% of the uranium in the mill feed.

Clarification. The filtrate produced by the first stage of filters is the pregnant solution for the precipitation circuit, but the solution must be clarified before precipitation to remove slimes that have penetrated the filter cloths. The clarification is conducted in a thickener in which the major portion of the contaminants settle.

Tailings Disposal. The filter cake from the third stage of filters is repulped with recycle solution from the tailings pond and transferred through launders to a tailings slurry tank which overflows into a launder and over a Geary-Jennings, reciprocating sample cutter. The tailings sampler operates continuously and discharges into a small Wilfley pump for transfer to a second sampler. The second sampler operates intermittently and is used to obtain the final tailings sample.

The tailings disposal area is a 110-acre pond enclosed within an artificial dike originally constructed from the clay in the pond area to a height of 10 feet. Dike construction is now accomplished by pumping the tailings slurry at 40% solids through three, truck-mounted, 10-inch cyclones. The cyclones deposit the sands on the dike, and the slimes and tailings solution flow into the pond. The present dike is approaching 80 feet in height. The disposal of tailings is handled by two, eight-inch Hydroseal pumps in series and a cyclone truck. One set of pumps and cyclones services each half of the pond. The pumping capacity is 950 gpm of tailings slurry when pumping through 4,000 feet of nine-inch pipeline and three cyclones.

The slimes in the cyclone overflow settle in the tailings pond, and the tailings solution is recovered through two centrally located decant towers. The recovered solution flows underground into a pump basin and is returned to the mill by means of a 900 gpm pump and 2,500 feet of eight-inch pipeline. Tailings recycle solution is used in the filter building for wash on the third stage of filters and for repulping of the final tails. A waste heat recovery circuit is used to preheat the tailings pond wash water. Four, tube-and-shell heat exchangers in the powerhouse cool the diesel engine jacket water from 180° F to 150° F and preheat the tailings pond wash water from 80° F to 130° F. Raw water is added to the tailings slurry to make up for evaporation and tie-up in the tailings pond.

PRODUCT RECOVERY

Precipitation. The uranium exists in the pregnant solution as the complex, uranyl tricarbonate ion which is stable at a pH lower than 11.0. When the pH is raised to above 12.0 with caustic soda, the complex ion decomposes to form sodium carbonate and sodium diuranate. The latter salt, a yellow precipitate, is commonly called yellowcake.

$$2NA_4UO_2(CO_3)_3 + 6NaOH \longrightarrow Na_2U_2O_7 + 6Na_2CO_3 + 3H_2O$$

Precipitation is conducted in a two-stage circuit in which the pregnant solution is mixed with recycled yellowcake to increase the soluble uranium content and then mixed with caustic soda to precipitate the uranium as yellowcake.

The pregnant solution for precipitation is pumped from a storage tank through a concentric tube heat exchanger to heat the solution from 125° F to 150° F. The heat is obtained by cooling the pressure leach discharge from 200° F to 180° F. The temperature of the preheated solution is raised to 180° F in a tube-and-shell heat exchanger before flowing into the first of two yellowcake dissolving tanks.

The technique of recycling yellowcake to a redissolving tank was developed to achieve a more complete precipitation of the uranium in the original pregnant solution. The dissolving tanks operate with a yellowcake recycle equivalent to 500% of the uranium in the incoming pregnant solution. In five hours of contact with the pregnant solution, a portion of the yellowcake dissolves; and the soluble grade of the solution increases from approximately 3.5 grams of U_3O_8 per liter to approximately 7.5 grams of U_3O_8 per liter. The precipitation efficiency of the circuit varies with the level of soluble uranium in the feed. Based on the grade of the incoming pregnant solution, the precipitation efficiency will vary from 92 to 94% on straight pregnant solution to better than 98% with a 100% increase in the soluble uranium in the pregnant solution. Undissolved yellowcake in circulation does not appreciably effect the precipitation.

The precipitation circuit consists of eight agitated tanks which have a retention time of six hours. A solution of 50% caustic soda is metered into the first tank to effect the precipitation of the yellowcake. The caustic may also be added to the pipeline feeding the tank to change the characteristics of the precipitate and the efficiency of precipitation, which are affected by the point of addition. A sufficient quantity of caustic is added to the circuit to neutralize the sodium bicarbonate in the pregnant solution and to maintain an excess of 5.5 grams of NaOH per liter of barren solution.

The yellowcake slurry from the precipitation circuit flows into a 40-foot diameter by 12-foot deep thickener which is equipped with a 12-foot diameter by 8-foot deep feed well. The thickener is insulated with a floating two-inch Styrofoam lid and two inches of Fiberglass insulation on the sides. Because the thickener operates at 170 to 180° F, the insulation is necessary to prevent evaporation and heat loss which create thermal currents that hinder settling. The thickener underflow is pumped at 35-40% solids to the vanadium removal section or to the yellowcake dissolving tank for recycle. The thickener overflow is pumped through three filter presses for final clarification and then to caustic barren storage.

<u>Recarbonation</u>. The caustic barren solution produced in the precipitation circuit contains sodium carbonate and a small quantity of sodium hydroxide. To reuse the barren solution, the caustic must be converted to sodium carbonate and sodium bicarbonate. This conversion is accomplished in two packed towers in which the caustic barren solution is contacted with boiler flue gas. The CO_2 in the flue gas neutralizes the sodium hydroxide and converts some of the carbonate to bicarbonate. The recarbonated barren solution with two grams of $NaHCO_3$ per liter is sent to the filter building for use as wash on the second stage of filters.

Vanadium Removal. The primary precipitation of yellowcake produces a product which, when washed and dried, will assay 75 to 77% U_3O_8, 5 to 6% V_2O_5, and 2 to 2.5% CO_3. Although the uranium content is satisfactory, both the vanadium and carbonate content of the precipitate exceed contract specifications. Removal of the excess vanadium and carbonate is required before the yellowcake is acceptable to the Atomic Energy Commission.

The removal of the vanadium and, quite incidentally, the carbonate from the yellowcake is accomplished by roasting followed by water leaching. The yellowcake thickener underflow is pumped to a disc filter to dewater the slurry, and the filter cake is agitated with a small quantity of sodium carbonate before being fed to the yellowcake roaster.

Yellowcake roasting is accomplished in an 8-foot 6-inch diameter, six-hearth, Pacific furnace. The feed to the furnace is dried on the top hearth and reaches 1,600° F by the time it leaves the fourth hearth. The fifth and sixth hearths hold the yellowcake at temperature. The calcined yellowcake discharges into a water cooled screw conveyor which cools the calcine to approximately 200° F before discharging into a ball mill conveyor. Water is used to dissolve the vanadium and carbonate contaminants in the yellowcake. The leached yellowcake slurry is collected in a 16-foot diameter by 10-foot deep thickener, and the thickener overflow containing the vanadium is filtered and sent to vanadium storage. The vanadium solution containing 8% V_2O_5 is presently sold to a nearby vanadium producer.

Product Handling. Vanadium solution in the secondary yellowcake thickener underflow is removed on two, eight-foot diameter by eight-foot long, vacuum, drum filters. The first filter cake is repulped with water and then filtered on the second filter. Water is used as a wash on each filter, but most of the washing is accomplished in the dewatering action of the filters.

The filter cake from the second yellowcake filter discharges into the extruder mechanism of a Proctor-Schwartz steam dryer and is forced through the extruder screen as 3/16-inch diameter noodles.

The yellowcake dryer is heated with steam, and the yellowcake is dried by circulation of hot air through a slotted stainless steel belt passing continuously through the dryer. The dried yellowcake, containing less than one percent moisture, is reduced to minus 1/8 inch in a modified roll crusher and then carried to drum loading by means of a screw conveyor.

Yellowcake is packaged in 55-gallon, open head drums at three drum loading stations. The screw conveyor discharges into the first drum until the drum and the feed chute are filled. The screw then carries the material to the next drum. A vibrator under the first loading station is used to settle the contents of each drum. After the drums are sampled and weighed, the head is sealed in place and the drum is cleaned and placed in storage for shipment. Each drum contains a maximum of 1,000 pounds and 40 drums of yellowcake comprise a lot. The average lot of yellowcake assays 85.5% U_3O_8, 0.4% V_2O_5, and 0.4% CO_3; and a normal lot of yellowcake contains 34,000 pounds of U_3O_8.

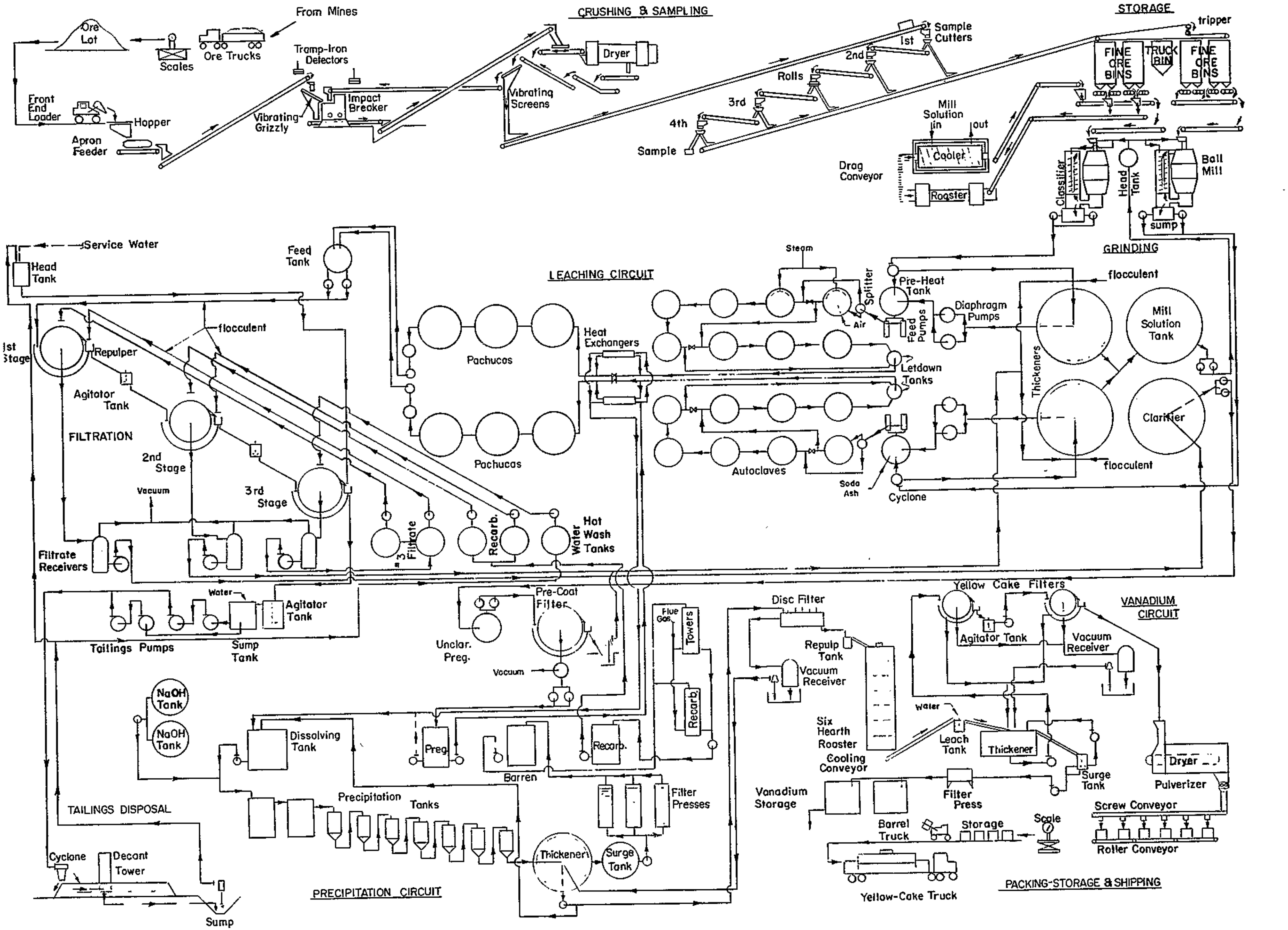
LOW SODIUM CIRCUIT

In order to meet specifications for sodium content in yellowcake if processed into uranium hexafluoride by the Allied Chemical Corporation for commercial sales an additional processing step had to be added to the flowsheet. After removal of vanadium the yellowcake containing approximately 7.5% sodium is dissolved with sulfuric acid at a pH of 2.2 in a ten-foot diameter by twelve-foot deep tank. The overflow from this tank discharges into a ten-foot by twelve-foot tank where ammonia is added to maintain a pH of 7.4. The uranium reprecipitates as yellowcake containing less than 0.5% sodium. This product is filtered by the two eight-foot diameter by eight-foot long, vacuum, drum filters, dried by the Procter-Schwartz steam dryer and packaged as described under the section on Product Handling.

ANCILLARY FACILITIES

Powerhouse. The electrical generation equipment and a portion of the steam generating and air compressing equipment are located in a central powerhouse. The elctrical equipment consists of seven, diesel engine driven generators, which supply all of the electrical energy requirements for the mill. The diesel engines are rated at 1,400 horsepower and are operated on a mixture of natural gas and diesel fuel. The generators are rated at 1,000 kw. The generation and distribution voltage is 4,160 volts.

The steam generating equipment consists of three, 7,500-pound per hour, package boilers which generate steam at 125 psig. The boilers provide the steam requirements for the secondary leach circuit and supplemental steam for heating wash solutions in the filter section. Three 1,350 scfm, 45 psig compressors in the powerhouse supply the air requirements for the secondary leach circuit and supplemental air for the filter building.



CRUSHING & SAMPLING
STORAGE
From Mines
Ore Lot
Scales
Ore Trucks
Front End Loader
Hopper
Apron Feeder
Tramp-Iron Detectors
Vibrating Grizzly
Impact Breaker
Vibrating Screens
Dryer
Sample Cutters
1st
2nd
Rolls
3rd
4th
Sample
tripper
FINE ORE BINS
TRUCK BIN
Mill Solution
in
out
Cooler
Drag Conveyor
Roaster
Classifier
Head Tank
Ball Mill
sump
GRINDING
Service Water
Head Tank
Feed Tank
LEACHING CIRCUIT
Steam
Splitter
Pre-Heat Tank
Air
Feed Pumps
Diaphragm Pumps
flocculent
Mill Solution Tank
Thickeners
Clarifier
1st Stage
Repulper
Agitator Tank
FILTRATION
2nd Stage
3rd Stage
Vacuum
Pachucos
Heat Exchangers
Letdown Tanks
Autoclaves
Soda Ash
Cyclone
Filtrate Receivers
#3 Filtrate
Recarb.
Water
Hot Wash Tanks
Water
Agitator Tank
Tailings Pumps
Sump Tank
Pre-Coat Filter
Unclar. Preg.
Vacuum
Flue Gas
Towers
Recarb.
Disc Filter
Repulp Tank
Vacuum Receiver
Yellow Cake Filters
Agitator Tank
Vacuum Receiver
VANADIUM CIRCUIT
NaOH Tank
NaOH Tank
Dissolving Tank
Preg.
Barren
Recarb.
Filter Presses
Six Hearth Roaster
Cooling Conveyor
Leach Tank
Thickener
Surge Tank
Dryer
Pulverizer
TAILINGS DISPOSAL
Precipitation Tanks
Thickener
Surge Tank
Vanadium Storage
Filter Press
Screw Conveyor
Barrel Truck
Storage
Scale
Roller Conveyor
Cyclone
Decant Tower
Sump
PRECIPITATION CIRCUIT
Yellow-Cake Truck
PACKING-STORAGE & SHIPPING