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PINSON MILL

The Pinson Mine and Mill are located northeast of Winnemucca, Nevada, about six miles short of the Getchell Mine which was operated before and after World War II. Clouis Pinson found the Pinson mine, a siliceous outcrop containing gold valves, and staked a group of claims in 1945. Getchell Mines, Inc. operated the property and shipped 0.1×10^6 tons of ore from an open pit. In 1949 the orebody appeared to be exhausted. In 1970, two geologists, John Livermore and Pete Galli, financed by Cordex I Syndicate (organized by J. C. Byrne of Rayrock Resources and John Livermore), obtained a lease on the property. Drilling through 1972 indicated 1.7×10^6 tons at 0.15 oz gold per ton plus additional low-grade reserves. The Preble deposit, 15 miles south of the Pinson deposit, was also discovered. The Preble deposit contain 1.5×10^6 tons at 0.08 oz gold per ton. From 1970 to 1979, $\$1 \times 10^6$ had been spent developing the Pinson Mine. In 1979 the Cordex I Syndicate reorganized into a production partnership called Pinson Mining Company, which included the following partners: Lacana Mining, Inc., Rayrock Mines, Inc., Siscoe Metals, Inc., D. M. Duncan, P. E. Galli and J. S. Livermore. Senior production management staff included D. M. Duncan, General Mgr; R. Pittman, Mine Supt.; B. Thorndycraft, Mill Supt.; and J. E. Connor, Business Mgr. The Pinson Mine and Mill employ 80 people, mostly from Winnemucca, with payrolls, purchases, taxes, and royalties over $\$8 \times 10^6$ per annum. Ore reserves are sufficient for an 8-year life with possibilities for extension with reserves from the Preble deposit.

The mining at Pinson is by the open pit method, permitting recovery of gold from low-grade rock, as well as from the best part of the deposit. Drilling to date indicated ore reserves are 2.9×10^6 tons with a grade of 0.13 oz gold per ton in the main pit. In addition, gold will be recovered by heap leaching low-grade rock.

Rotary drills, hydraulic shovels, front-end loaders, (five yd bucket CAT 992) 50-ton capacity trucks, a road grader, and a water truck (for dust suppression) are the principal mining equipment. At the present stage of pit development, approximately 15,000 tons of ore and waste are mined every working day. The ore is trucked to stockpiles at the mill's crushing plant which is located about one mile from the mine. Ore is dumped from trucks into three stockpiles - high-, medium- and low-grade and never dumped directly into the jaw crusher. A CAT 980C front-end loader with five-yard bucket is used to blend ore and to feed the jaw crusher.

Buck Bradshaw conducted the tour of the mill. The Pinson Mill was designed for 1000 tons per day by Industrial Design Corp. in Salt Lake City. The current throughput is 1200 tons per day with current heads at 0.20 oz gold per ton with average recovery of 86%.

The first gold production was obtained in February 1981, eleven months after construction began. The total investment, including working capital in the Pinson Mine and Mill, was $18.8 million, with most of that money spent in 1980. The debt in the capitalization was about $15 million and they expect to have it paid back slightly after the first of the year (summer of 1982). This, a medium-size mine, produces about 5% of the annual USA gold production.

The Pinson Mill is a carbon-in-pulp cyanide mill circuit (see flowsheet attached). Following crushing, two stages of ball milling and thickening prepare a 42% solid slurry of 90% minus 200 mesh ore for leaching. The slurry is agitation leached in a double-impeller turbine aerated, stirred-leach train prior to contacting with carbon in a series of carbon-in-pulp center draft tube tanks to extract solubilized gold. Carbon in the carbon-in-pulp tanks is advanced countercurrently with a movable recessed impeller centrifugal pump. The discharge from the carbon-in-pulp tanks is sent to a tailings pond from which cyanide-containing water is returned. Total leach time is 24 hours. There is no attempt to destroy cyanide in the tailing. Fifty percent of the gold is dissolved in 20 minutes with overall recovery of 86% during 1981.

The crushing plant consists of the 42" x 48" AC primary jaw crusher followed by double-deck 7' x 16' screen, on open circuit with a 5 1/2 foot Simons shorthead cone crusher. The screen is now set for -3/4". They have had difficulty handling wet ores with the screen. The screen undersize and the crusher product go by conveyor belt to a 1700-ton fine ore bin which only has a live capacity of about 800 tons. Two 30" wide belt slip feeders feed out of the fine ore bin. The entire crushing plant, including the fine ore bin* has some difficulties with wet ore. This was a common problem found in the Nevada mills.

One solution to fine ore handling problems which no one has yet dared to try, but which seems quite straightforward, is to simply use a SAG mill immediately following the jaw crusher. This would eliminate the screens, cone crusher and fine ore bin. This would eliminate or reduce operating difficulty, operating and maintenance labor, and capital costs. A SAG mill could grind crushed ore efficiently to the grind required to attain maximum gold extraction.

* A wider feeder belt and bin opening would improve handling of wet ore.

The Pinson crushing plant also has a loadout hopper system so that crusher plant product can be stockpiled. A front-end loader can remove ore from the open stockpile and can fill a feed hopper on the ball mill feed belt. It should be emphasized that the fine ore bin gives very little surge capacity. The real stockpiling and blending is done by the front-end loader and the three stockpiles ahead of the jaw crusher.

One of the interesting aspects of the Pinson Mill is that they simply add dry lime (2 1/2 lbs per ton) and dry sodium cyanide pellets (0.3 lb per ton) to the 24" belt conveying ore from the fine ore bin directly into the first ball mill. This approach is simple, easy to maintain, and requires very little capital. It is certainly an improvement over the conventional approach of preparing lime slurries and cyanide solutions separately and pumping them to the mill. (This was our method at Mercur Utah in 1936)

The first of two ball mills in the series is a 9' x 13' 500 hp mill with a trommel discharge. The pulp 68-70% solids, is diluted with recycle water and pumped from a sump to a bank of four Krebs D158B-852 cyclones. The cyclone underflow passes to a 12' x 14' 1000 hp ball mill and is then returned to the main sump for recycle to the cyclones. Cyclone overflow passes across two 6' x 6' DSM screens that are used to remove wood chips and other trash from the cyclones. Removal of this trash prevents carbon contamination and thickener overflow problems. The use of a trash screen ahead of a carbon-in-pulp circuit is mandatory. However, the operators were not terribly happy with their DSM screens. I suspect the use of the DSM screen is, however, the best approach to solving this problem. The ball mill discharge, which had an optimum pulp density for cyclone efficiency, was too low in density for efficient leaching with minimum leach tank and CIP tank volumes. Therefore, the cyclone overflow passes to a 100 foot thickener where the pulp is thickened to about 42% solids with Celenese flocculant 640 or 540. Four-hundred-fifty gpm of the 1000 gpm Eimco thickener overflow containing 60% to 70% of the recovered gold passes through a series of five 4' x 12' carbon columns before being returned to the ball mill circuit. Hence, there are essentially two carbon adsorption trains. One is the fixed bed adsorption train for the thickener overlow and the other is the fluidized bed CIP train.

The series of four leach tanks (2 - 27' x 32'; 2 - 27' x 29'6") when combined with the thickener and ball mill circuit have a total leaching time of approximately 24 hours. The Pinson Mill uses a double turbine agitator with a small bleed of air (250 cfm at 30 psi max) into the bottom of the leach tanks to provide aeration of the pulp. They feel this uses much less electric power for agitated leaching and is perfectly adequate for oxidation. Cyanide is added to the ball mill feed belt to control cyanide content of the mill solution. The solution from the last CIP tank contains 0.18 lb of sodium cyanide per ton of solution with a pH of 10.5. Cyanide and lime adjustments are made to maintain these values. It's interesting to note that both the leach tanks and the thickener and the crushing plant are located outside in an environment in northern Nevada above 6000 feet. The CIP tanks use a 40 mesh stainless steel screen with air blowing to keep carbon from clogging the screens. The slurry has a 37 minute residence time in each CIP tank. The operators at Pinson felt that this system worked well and had very little problem with it. Details could be obtained from Pinson for a design. The problem of transferring carbon without breaking it and without clogging the screens can be a mechanical difficulty. Pinson seems to have solved this problem. An L44-2-0 Liquidfax vibrating screen is used for final shakeout of the carbon as it comes from the first CIP tank. The carbon is loaded into the gold stripping columns.

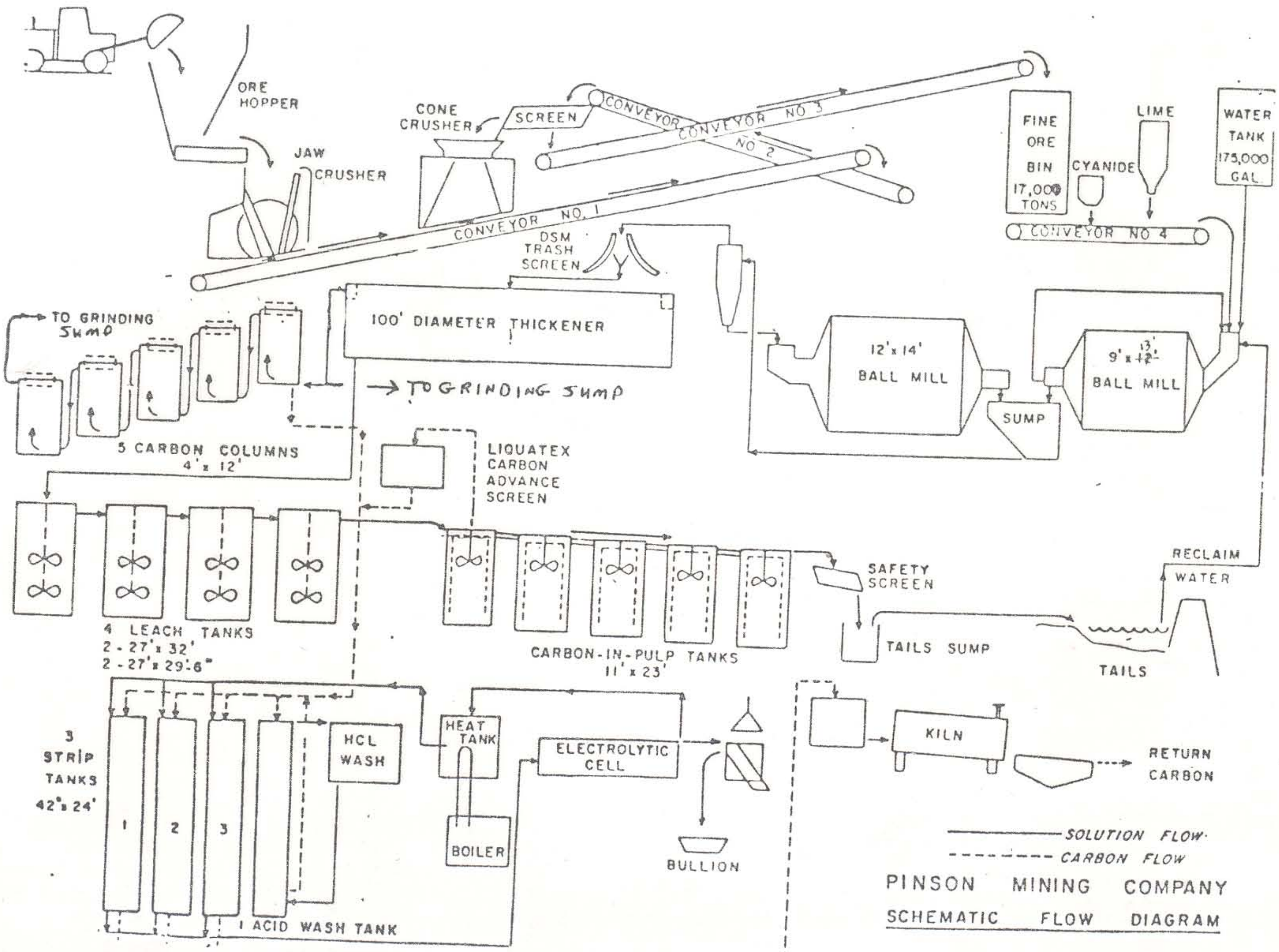
Homestake says NEVER put carbon through a centrifugal pump - use an air lift to avoid abrasion of the carbon.

The Pinson operating scheme is to transfer carbon in the CIP tanks every other day and carbon in the thickener overflow carbon absorption tanks on alternate days. Consequently, the gold stripping operation is operated each day on day shift and the resulting carbon is reactivated with a rotary kiln. Recycling of carbon countercurrently in the CIP tanks every two days, requires the pumping of carbon and leach slurry for approximately two hours. Pinson has found that controlling the time of pumping is an effective way of controlling the amount of carbon that's moved in a countercurrent direction. The final CIP tank is operated with twice the normal dosage of carbon (2 tons) to guarantee sufficient carbon. The normal amount of carbon in the CIP tanks is 20 gpl or about one ton. About 5 gpl carbon is left in the tank when transfer is complete. With this amount of carbon in the tanks, the loading is approximately 200 ozs/T of carbon. Similar loading is obtained in the fixed bed carbon absorption cells from the thickener overflow which also contain about one ton of carbon each. Carbon stripping is done at 190°F to 195°F in a water solution containing 1.5% caustic and 0.1% sodium cyanide.

It's interesting to note that neither pressurized stripping nor alcohol stripping is employed. These newer methods developed by the U. S. Bureau of Mines, frankly don't seem to be worth the bother since carbon adsorption plants that we visited used atmospheric water stripping instead.

The stripping time is approximately 24 hours per stage with an advance of carbon through three stages of stripping and one wash stage. The final stripped carbon contained 0.3 ozs. gold per ton after two days. It should be noted that during stripping, the strip liquor is circulated at 40 gpm continuously through the electrowinning cell as the liquor extracts gold from the carbon. The strip liquor contains five ozs. gold per ton at the beginning of stripping (up to 24 hours.) This stripping procedure is pretty much standard practice in Nevada carbon gold operations now. Carbon consumption is approximately 200 lbs. per month. The cycle in the strip tanks is: one being filled, one being emptied and 2 stripping. Carbon regeneration includes washing with HCl to remove calcium scale and regeneration in a kiln at 60 lbs/hr. The final solution out of the last CIP tank contains about 0.18 lbs. per ton of cyanide and occasionally some carbon comes over with it so that pulp is sent over a vibrating safety screen to catch any carbon in the final tailings. Driscopipe is used to pipe the tailings to the claylined disposal area and to return solution from tailings to the mill.

The Pinson mill appears to be an extremely efficient and compact plant and was much more impressive than the Comstock Mill seen the following day. They also plan to heap leach 5×10^6 tons of ore in the range of .02 to .08 oz. per ton. Construction of heap leach facilities was scheduled for second quarter of 1981 although this work has only been started on an experimental basis thus far. Flowsheets and other details on the Pinson Mine were obtained and are in the Research Department files.



PINSON MINING COMPANY

SCHEMATIC FLOW DIAGRAM

① Pinson Mine incl. ② Preble deposit:

1.7×10^6 T @ .15 oz Au

8 yr. life

15,000 total miles each day.

1.5×10^6 T @ .08 oz

Present

2.9×10^6 @ .13 oz

2,900,000 T @ .13 oz = 377,000 oz @ \$300 = \$113,100,000

− \$8 × 10⁶ × 8 yr = 64,000,000

49,100,000

NaCN .3 lb/T // 2.5# lime − 15,800,000

Preg. soln. from 100' thickener thence to 5 − 4' × 12' carbon columns. 450 gal goes to carbon cols. ret. to BM circuit.

Soln from last CIP tank contains .18% NaCN/ton.