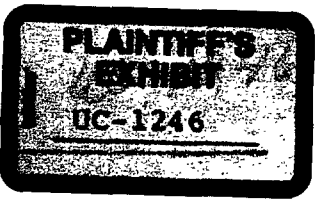
PROCESS SURVEY - ENVIRONMENTAL IMPACT ANALYSIS



~~Process~~ Mine
~~Facility~~ ASBESTOS Plant King City, CA

COMPLETED BY R. O. Hopper DATE March 1973

II - PROCESS/FACILITY DESCRIPTION

The mining procedure can be divided into three phases:

1. Stripping and Mining
2. Ore screening
3. Ore haulage

Phase 1, Stripping and Mining, is usually done simultaneously. Stripping can be defined as the initial removal of approximately thirty (30) feet of surface material that is unsuitable for ore usage. The overburden material is removed from the pit area by means of heavy duty earth moving scrapers and bulldozers and hauled to a designated dump area so as not to interfere with future mining operations. When necessary, the overburden is used for embankment material for building future ore stockpile areas.

As soon as the overburden material has been removed, the actual mining of ore can commence. The mining of ore is done in the same manner as the stripping. Ore is removed by means of earth moving scrapers and bulldozers and hauled to a designated ore stockpile area.

Phase 1 is done entirely by contractor. Bid packages are mailed to at least three contractors for a firm price per cubic yard of material removed, hauled, and dumped. In order to simplify yardage computations, Stripping and Mining costs are integrated. The successful bidder will then enter into a contract agreement for the project. While Stripping and Mining is being performed, the Mine Superintendent and Mine Foreman will keep close scrutiny on the project so as to verify that all rules and regulations are followed.

The present mine design consists of a level pit floor area approximately 1100 feet by 500 feet. Forty feet wide benches extend from the pit area at an over all wall slope of 20 feet of vertical rise for every 60 feet of horizontal increase. The benches continue until the original contour of the hillside is reached, and will usually number 10 to 15 in our present mine location. The bench width is designed to be forty feet so that there is ample room for safe equipment maneuvering.

Phase 2 will usually begin in early May and will last approximately 6 months. This work is totally performed by UCC personnel, and may be performed at the same time Stripping and Mining occurs. The following pieces of equipment are necessary for the completion of the ore screening process: 2 rubber-tired 4 yard front end loaders; 1 D-8 crawler dozer; 1 3000 gallon capacity water tank truck; 1 portable screening unit; and 1 portable conveying-stacking unit.

The first part of the ore screening process will be to position the portable screening and conveyor units at the ore stockpile area. The crawler dozer begins by pushing the stockpiled ore closer to the screening unit. The front end loader in turn feeds this ore to the screening unit. The screened material is stockpiled via the conveyor unit for easy loading into the ore haulage trucks. The water tank truck is used to supply water for a dust suppression program that includes water sprays on the screening and conveyor belts, irrigation type sprays on the ore stockpile area, and watering of the entire work area and haul roads.

Once the screened ore has been stockpiled, phase 3 can begin. Ore haulage is done by contractor and will usually require 5 to 10 trucks per hauling season. The trucks used are tandem bottom-dump units with a 25 ton total capacity. All trucks are equipped with tie-down

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tarps to minimize ore spillage and dusting, and Jacobs electric braking systems. UCC personnel will load the trucks during regular shift hours; however the drivers are permitted to load themselves whenever necessary. Once the truck is loaded, it begins a 55 mile trip to the King City Plant. The route includes 10 miles of UCC private access road and 45 miles of paved state and county roads. Due to the irregular alignment and various elevation changes, the round trip will require an average time of 5 hours. Careful maintenance of the UCC private portion of the route is performed periodically in order to maintain peak haulage efficiency. En route to the plant, the trucks are weighed (loaded and empty) across a public scales.

When the ore haulage truck has reached the King City Plant, it is directed to dump its load on a designated mill ore stockpile area. A quart jar sample of each load of ore is taken and deposited in the laboratory for moisture analysis. When the ore has been properly dumped, it is considered to be part of the plant procedures for all further operations.

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The mill contains 2 separate circuits:

I The main mill circuit in which asbestos ore from the mine is upgraded mechanically to 3 classes of product, i.e., standard grade, superstandard grade, and high purity.

II The RG-244 circuit in which high purity product from the main circuit is further purified and sized, and a fiber coating of SiO_2 is obtained by chemical precipitation.

Circuit I Description

(A) Rock Fiber Department - common to all products. Asbestos ore from the stockpile is moved from the stockpile to the com-bin feeder by loader and a conveyor belt. A controlled feed of ore from the com-bin reports to the primary vibrating screen where, with water addition to form a slurry, the material is screened to ± 3/16 inch.

Upgrading-removal of magnetite, serpentine, and other gangue material - and sizing of fiber content of the primary screen underflow is accomplished by cycloning the slurry through 3 6 inch cyclones, screening of the cyclone product by a 1 mm DSM screen, and cycloning the DSM underflow through 6 4 inch cyclones. The cyclone overflow reports to a 24 ft. thickener to become feed for the Refining Department. The cyclone underflow is processed through a 3 ft. and a 6 ft. magnetic separator - in series - and is then routed to the 24 ft. thickener as refiner feed.

The 1 mm DSM screen oversize is tabled to give 3 table products, i.e., asbestos flake, middlings, and tailings. The middlings return to the DSM screen, the tailings report to the tailings classifier, and the asbestos flake reports to a 12 inch flake mill for grinding. Additional feed to the flake mill results from processing of the primary screen overflow which is upgraded by gangue removal in a jig separator and screened over a 1/8 inch vibrating screen. The screen oversize reports to the flake mill while the screen undersize reports as feed to the DSM screen. Jig separator heavies are tailings, and report to the tailings classifier. Ground fiber slurry from the flake mill is cycloned and the cyclone overflow reports to the 24 ft. thickener as refiner feed. Cyclone underflow material becomes refiner feed following magnetite removal in a 6 ft. magnetic separator.

Total tailings from the mill process are made up of the following streams:

Rock Fiber - Jig mill heavy fraction, shaking table tailings, magnetic separator tailings

Refiner Dept. - A cycloned tailings stream from the refiner primary cyclones.

(B) Refiner Department -

1. Standard Grade Product - Slurry underflow from the 24 ft. thickener is ground through a wet grinding mill - a Bauer Mill - to give 55% -200 mesh, and is pumped to the filter feed surge tank.

2. Super Standard Grade Product - Slurry underflow from the 24 ft. thickener is ground through the Bauer Mill and then additionally ground through an M-30 wet grinding hammer mill. The resulting solids - approximately 75% -200 mesh, are pumped to the filter feed surge tank.

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3. High Purity Product - Super standard grade pulp is further upgraded and fiber size is reduced by additional cycloning through a primary cyclone circuit of 49 4 inch cyclones and then cycloning this overflow product through 120 3 inch secondary cyclones. The overflow slurry from the secondary cyclones reports to the filter feed surge tank. Cyclone underflows become internal circuit circulating streams and tailings result from screening the underflow of the primary cyclone circuit. Product solids are approximately 0.60% magnetite and 88% -200 mesh at this point. The high purity product slurry is used as feed for the RG-244 circuit and by adding TiO_2 at 35% by weight to the slurry entering the filter feed surge tank, the titanated products are made.

(C) Filtering & Drying Departments

The product slurry from the filter feed surge tank is filtered through Shriver filter presses. The filter cake is approximately 50% solids and is moved from the filter area to the dryers by drag conveyers. All product is dried as a pellet by introducing the filter cake to the Roto-Louvre dryer by extrusion through a die plate. The normal product pellet is 5/8 inch diameter although a 1/8 inch diameter pellet is available in special products. Drying to less than 1.0% H_2O is accomplished in the kiln type dryer using natural gas as fuel, and the dried pellets are then routed to one of two bins for storage by a series of bucket elevators and screw conveyors. Dried pellets can also be routed directly to a rail car for bulk loaded product.

(D) Product Handling Department

Product packaging consists of two Raymond Mills, for grinding and opening of pellets prior to packaging, and two pressure baggers for filling bags. Two specialty product mills are available for making special grinds, i.e., a Jeffrey Mill and a Disc Mill.

Depending upon the product being packaged - whether pellets or open material - the pellets are fed from the storage bin by screw conveyor to either the grinding mills, for open material, or directly to the baggers in the case of pellet product. Open product from the Raymond Mills is conveyed by the air stream through a cyclone into a live-bottom bin from where it is fed to the baggers by screw conveyors. Filled bags are palletized in normally 40 bag pallets for shipment by truck or rail car. Product for overseas is hand loaded - individual bags - into containers. All product is palletized for removal from the mill building by fork-lift to the mill yard storage area and overseas containers are filled by breaking down of pallets.

Circuit II Description

The RG-244 circuit receives it's feed from two possible sources:

1. RG Feed Preparation circuit - Slurry from the 24 ft. thickener is ground in an 18 inch wet grinding hammer mill - Rietz Mill - and is then cycloned in 3 inch cyclones. The cyclone overflow, containing 8-12% +200 mesh particles, is routed to the 244 feed surge tank while the cyclone underflow returns to the 24 ft. thickener.

2. High purity product slurry, prior to filtering, can be routed to the 244 feed surge tank as feed material.

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The slurry from the 244 feed tank is further ground in a Rietz Mill and cycloned in a bank of 14 1 inch cyclones. The overflow solids from the cyclones, now containing less than 0.30% magnetite and 0.60-0.70% +200 mesh particles is routed to one of two treatment tanks. Measure amounts of Na_3SiO_3 and CH_3COOH are added and, following the proper mixing times, the treated batch is discharged into the filter feed surge tank.

The treated slurry is filtered in a filter press and the resultant filter cake, approximately 18-20% solids, is forced through an extruder into the Roto-Louvre-kiln type-dryer. The dried pellets are conveyed by a bucket elevator to the storage bin.

All RG-244 product is fully opened prior to packaging by routing the pelletized-dried-material from the storage bin to an 18 inch Raymond Mill. The opened material is air-swept from the mill to a dry cyclone and discharged into the bagger supply chamber. The product is packaged by a pressure packer into paper bags. Each bag is sealed in a polypropylene overwrap bag for moisture control and the individual bags are palletized in a 35 bag pallet enclosed in a waxed cardboard shroud. As with the other mill products, RG-244 being shipped overseas consists of individual overwrapped bags hand loaded into containers. Other shipments are made by rail and by truck.

Tailings are removed from the milling circuits at approximately 70-80% solids by converying to a temporary tailings pile immediately east of the mill building. Periodically the tailings are moved from the temporary pile to the permanent location approximately 1/4 mile east of the mill buildings. Haulage of the tailings is accomplished by use of a self propelled scraper.