PREPARATION OF KILN FEED AT THE HAWKEYE PLANT

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Our rock, after being crushed to 3/4" size, is put in storage consisting of 32 individual square concrete tanks, each about 300 tons capacity. The shale is put in a large enclosed storage space located at one end of the rock storage and withdrawn on the same conveyor belts which serve the rock storage through tunnels underneath.

We have in our quarry, rock which would be slightly low for a mix, rock which would be somewhat high and, finally, rock which if used alone might run the magnesia in the cement above 5%. By storing various rocks in so many individual bins and keeping a record of them, we are able, by drawing several of them together, to approximate a desired mix. Besides, we can, in this way, hold the magnesia below 3%.

From storage the rock is screened over a 4-mesh screen and the oversize crushed in a No. 4 Symon crusher and a No. 85 Smidth kominuter. Due to the small size fed to the four No. 85 Smidth wet kominuters, there is no need of trixes or other screening devices, but the slurry is pumped direct from each kominuter to No. 18 Smidth tube mills, of which we have one for each kominuter.

Our slurry storage consists of one surge tank of about 70 bbl. capacity, eight steel tanks of 700 bbl. capacity each, and three concrete basins each about 1,000 bbl. capacity, or a total of 8,670 bbl. The eight large steel tanks have individual mechanical agitators and each of the concrete basins have standard Smidth triple agitators.

As is well known, mechanical agitation may prevent slurry from settling, but it has a tendency to leave it stratified for a long time, especially in 36 foot high tanks, so some means of vertical agitation is needed. We found that compressed air is not only expensive to use, but difficult to apply in order to get the desired result, and we, therefore, employed a system of withdrawing the slurry from the bottom of the tanks and pumping it to the top.

The slurry, as it comes from the raw mill, enters the surge tank by gravity, and is pumped from there to the top of four tanks grouped in a battery. Any of these four tanks can be drawn together and pumped to four other tanks. Any combination of these are then transferred to No. 3 storage basin. Through an opening near the top of this, the slurry runs by gravity into No. 1 and 2 basins.

On the slurry pipe line, about 15 feet above the surge tank pump to the first group of storage tanks, a hole was drilled and a 1/4" diameter pipe inserted to catch the slurry as it passes and deliver it to a small storage similar to the shape of a casing for large screw conveyor. This is about 20"x24"x40" long, capacity approximately 11.0 cu.ft. of slurry, equipped with horizontal agitator and driven through a speed reducer by a one horsepower motor. Near the top is an overflow, and at the bottom is a discharge valve, and up on the side about half way is another valve for withdrawing the samples. There is also a water hose connection for occasional wash out.

The samples are taken at two-hour intervals, corresponding to the time at which slurry measurements are made by the tank attendant. There is always one sample and sometimes two taken while each tank of slurry is filling.

At first, we tried to determine the proper size nozzle for the sampling tube that would fill the sample tank in a two-hour interval, but due to the variation in moisture content and viscosity and the frequent attention necessitated due to stoppage of slurry through a small diameter opening, we were unable to do so.

At present, a larger tube (5/8" diam.) is used, and we leave the discharge valve in bottom open so that the slurry runs out almost as fast as it comes in at the top. The mixing done by the mechanical agitator enables us to obtain an average sample of the slurry passing through the sampler, which in turn represents slurry passed through the pipe line.

The accuracy of this method is checked by the grab samples taken of the kiln feed, and is preferable, in our estimation, to other methods of sampling.

We are able to keep the CaO content within 2 or 3 tenths of 1 per cent of the 24 hour average kiln feed the greater share of the time.

Only No. 1 and No. 2 concrete basins are used for kiln feeding. The pump handles several times the amount of slurry needed for the kilns, and the six Ferris wheels are provided with extra large overflow pipes, which distribute the extra slurry to the top of all three basins. This insures at all times a constant level of slurry in which the Ferris wheels may operate. The system helps greatly to mix the slurry in storage, and eliminates the trouble which we have had plenty of in the past, namely, heavy slurry in the bottom of the storage basins. No. 3 basin, which receives all the fresh slurry from the mixing tanks, is equipped with a separate pump, and the slurry line parallels the regular feed line. It is provided with three return outlets to the top of the basins, and is primarily operated for the purpose of mixing, but is connected to all the Ferris wheels so that it also serves the purpose of an emergency feed line.

Our slurry pumps are all 4" Morris pumps driven by 10 to 20 horsepower motors. They are all the same kind, so the spares may be operated in any of the nine places we use them. We find it generally quicker to replace the entire pump than to repair it in place.