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[Uranium Metal]

METHOD OF WASHING SAWDUST

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MALLINCKRODT CHEMICAL WORKS
Plant 4
Contract W-7405-eng-29

William A. Oppold
February 26, 1945

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METHOD OF WASHING SAWDUST

A different method of washing sawdust has been in operation for the last three months at Mallinckrodt Chemical Works. Prior to this time, sawdust was washed with tri-chlor-ethylene in an open wire basket, by moving the basket full of sawdust up and down in a tank of the solvent. The sawdust was then dried by spreading it on sheets of kraft paper. When the sawdust was washed inside, the men doing the work often became nauseated from the solvent fumes. For this reason, the sawdust was washed outside at all times, weather permitting. This method of washing sawdust was quite tedious in that only twenty pounds of sawdust could be washed in one basket load. Therefore, it was decided to make a mechanical sawdust washer to wash one furnace load of sawdust at a time (200 pounds). See Figure I.

The sawdust washer consists of a tank 32 inches long made from "heavy" 12-inch pipe. On one end of the tank is welded a dished head made from 1/4-inch plate. A machined groove for a gasket and machined flange is welded on the tank at the other end. There are four baffles made from 2" x 2" x 1/4" angles welded at 90° from each other running the length of the inside of the tank. Halfway between two of the angles, 1/16-inch holes are drilled one half inch apart for the length of the washer. A piece of 1-1/2-inch pipe was cut in two and welded shut at the ends. This was then welded along the outside of the tank to cover up the 1/16-inch holes. A 1/2-inch hole was drilled in the center of this length of pipe and a 1/2-inch coupling was welded on to this. A pipe plug was then inserted in the coupling. This serves as a drain for the tank.

A 15-inch outside diameter ring made from 1-1/8-inch barstock is welded around the tank at each end. These rings roll on four rollers which are supported on a frame. The sides of the frame are made from 2" x 2" x 1/4" angles and are welded to 8-inch channels which form the ends of the frame. The frame is supported by six inch swivel casters. Two 1-1/2-inch drive shafts, supported by split bearings at each end, hold the rollers for the tank. The two shafts are connected by a chain drive and the shaft nearest the motor is chain connected to the motor drive shaft and sprocket.

The open end of the tank is covered with a dished head which has a machined surface flange that fits into the groove in the end of the tank. A one-inch wide by 1/4-inch thick ring is welded around the head and twelve holes are drilled in the rings at regular intervals. One-quarter-inch studs are put through these holes and fastened into threads tapped in the 15-inch ring near the end of the tank. A neoprene gasket is used to seal the tank.

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There is a one-quarter-inch stopcock and a one-half-inch inlet in the end of the tank. There are two lugs welded on the sides of the washer near its center of gravity when it is in a horizontal position. A grapple fits on these lugs so that the washer can be lifted by a hoist. The washer can be stood on end by picking it up with a hoist and putting the closed end down in a bracket that fits up against the roller ring.

The gear head motor used to drive the rollers has the following characteristics:

220 volt, 2.2 amp.
60 cycle, 3 phase
3/4 horsepower
1725 rpm at motor
58 rpm at shaft

The rollers are geared so that the sawdust washer travels at 25-30 rpm.

Standard Procedure for Washing Sawdust

The maximum load limit of the sawdust washer is approximately 200 pounds of wet sawdust. The sawdust is drained of cutting oil (equal parts of coal oil and Socony Vacuum DTE Heavy-Medium oil) for one hour and then it is loaded into the washer. Ten gallons of CCl_4 used on the last wash from the previous run are used on the first wash of this run. Tri-chlor-ethylene was used at first, but it could not be completely removed from the sawdust in the washer. Technical grade CCl_4 was tried and found to be successful. The lid is bolted on the washer and it is put on the rollers and turned for twenty-five minutes. At the end of this time, the washer is drained and the CCl_4 is discarded. A funnel is then fitted to the inlet at end of the washer and ten gallons of fresh CCl_4 is added to the tank. The washer is then turned for fifteen minutes for the second wash. The CCl_4 is then drained off and saved for the next run.

After the tank has drained as much as possible from the second rinse, it is raised off the rollers and forty cubic feet of nitrogen is run slowly through the washer. While the nitrogen is being run in, the tank is tipped up each way to let any CCl_4 run out that is trapped in the ends of the tank. The drain plug is then inserted in the tank and the washer is connected to a water aspirator.

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The water aspirator is connected in a 1-1/4-inch water line with water at 75 psi pressure. There is a glass trap between the tank and the aspirator. The aspirator valve is opened first and when the vacuum gauge reads twenty-five inches, the valve to the tank is opened. Constant watch is kept on the glass trap to prevent any back pressure from filling the tank with water. After the vacuum gauge reads twenty-five inches again, the pump is left on the tank for ten minutes. The valve at the tank is then closed and the trap and pump are disconnected from the washer. The tank is then rolled for about five minutes. This process is repeated five times.

At the end of this time, the sawdust should be completely dry. If there is an appreciable odor of CCl_4 , the sawdust is spread on an aluminum sheet for a few minutes till it is dry. After the sawdust is dry, it is run over a Stearns magnetic separator to remove any iron which may have gotten into the material. The sawdust is then weighed and recast immediately.

Fairly good yields are obtained from sawdust washed in this manner. Yields ranging from 82.6% to 90.0% and averaging 86.0% have been obtained on runs using sawdust only. By adding 30-50 pounds of crops to the run, the yield can be increased about 2%. This practice has been discontinued as the crops can be better used to make up biscuit loads to the correct weight.

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