EXTRACTION OF SPENT BLEACHING MATERIALS

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Abstract

Large amounts of oils and fats are recoverable from spent bleaching materials. On account of the extreme fineness of the bleaching materials special equipment is required. A solvent extraction process, plant and equipment are described with operating costs and results given.

SEVERAL years ago during a period of high oil prices we were asked to build a small Plant for the Recovery of Oil from Spent Bleaching Materials, in this case fuller's earth and activated carbon. On account of the extreme fineness of the carbon, the rotary extractor, with its comparatively small filter area, did not seem practical. We made some experiments in washing with solvent and settling out the extracted earth but these did not appear very promising.

It was therefore decided to use a Mixing Tank in connection with a Filter Press. This method has been mentioned in several places in the literature and is not original with us. However, we believe that a brief description of our development of it might be of interest.

The first slide shows diagrammatically the operation of the process. The spent earth from the Refinery is brought over to the Extraction Plant in a truck and dumped at the foot of the Bucket Elevator "A." This Elevator with its Cross Conveyor "A-1" conveys the spent earth into the Mixing Tank "B" which is a closed cone bottom tank fitted with a Steam Coil and a heavy, slowly moving Agitator. When the tank has been charged the manhole cover is fitted on and, after all of the air has been displaced by steam, the solvent is pumped in. The Agitator is started and the temperature of the mixture gradually raised to a point just under the boiling point of the solvent. After about half an hour the mixture is pumped through the Filter Press "C" which is of the standard plate and frame type with open discharge cocks and open trough. This Filter Press stands in a Pan "G" provided with a Swinging Hood which is counterbalanced to open and close easily. When closed the lower edges of the Hood project into a Water Seal which extends all around the Pan. Any solvent vapors caused by leakage of the solvent endwise through the cloths or at the open cocks are therefore confined within the Hood. The first wash flows from the Filter Press Trough down into the Underground Storage Tank "D." The Mixer Tank "B" is then refilled with fresh solvent which is warmed and then pumped through the cake in the Filter Press "C." This wash runs off into Storage Tank "E" and is used for the first wash on the succeeding batch.

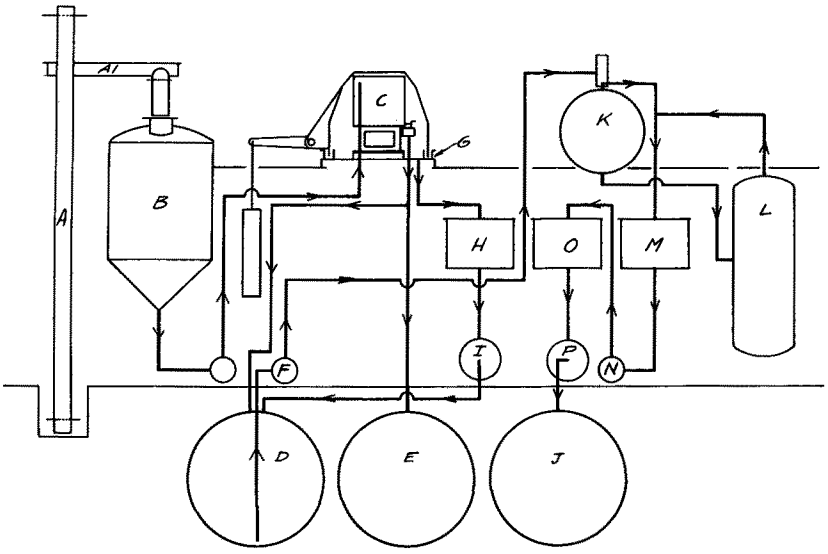
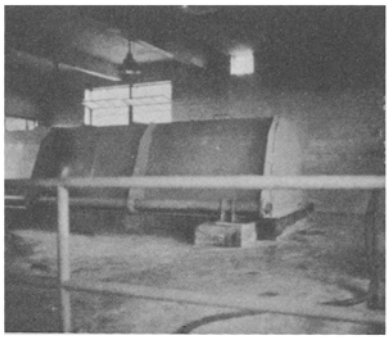
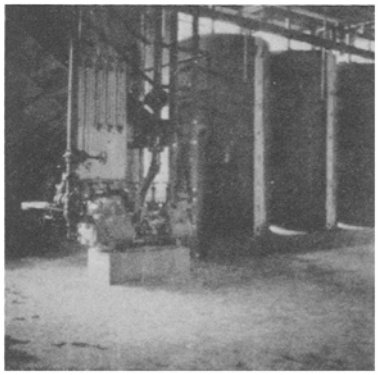


Diagram Showing Relative Location of the Different Pieces of Equipment and Also the Principal Pipe Lines and Connections.



Swinging Hood Entirely Enclosing Filter Press "C."

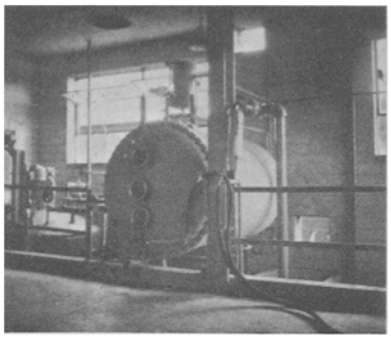
The outlet from Pan "G" is next connected to Condenser "H" and steam is blown through the Filter Press for about three hours. The solvent vapors and steam flow into Condenser "H" where they are condensed and are then separated in the Water Separator "I," the solvent flowing off to Tank "D" and the water to the sewer. The Hood over the Filter Press is then tipped back, the Press allowed to cool off somewhat, opened, the extracted earth knocked out into the Pan and dropped through an opening in the Pan into a Hopper, from which it is



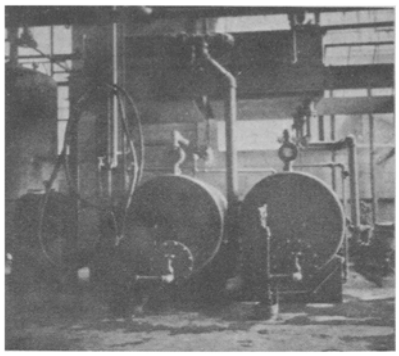
Telegages for Indicating the Depth of Solvent in Underground Tanks, Solvent Pump "F," and Recovered Oil Storage Tanks.

loaded into trucks to be hauled off to the dump.

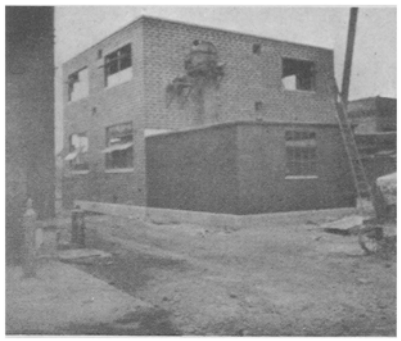
The first wash fat-solvent solution is picked up by the Pump "F" and pumped through the Preliminary Still "K" which is of the tray type with Steam Coils in each tray. The vapors from this Still flow into Condenser "M" where they are



Preliminary Still "K" in Which the Greater Part of the Solvent Is Removed from the Oil-Solvent Solution. The Top of Mixer Tank "B" Is at the Left.



Water Separators "I" and "P" Under Condensers "H" and "O."



Extraction Plant Building Under Construction. The One-Story Section Is Used for Storing Spent Bleaching Materials as They Are Brought Over from the Refinery.

practically all condensed. The condensate and remaining vapors are picked up by the Direct Acting Vacuum Pump "N" and pumped into the Atmospheric Condenser "O" where condensation is completed. The condensate flows off through the Water Separator "P," the solvent going to Tank "J" and the water to the sewer.

The partially stripped fat-solvent from the Preliminary Still "K" flows into the Still "L" where the remainder of the solvent is removed by blowing with live steam. Both Stills "K" and "L" and Condenser "M" operate at about 24-26 in. vacuum, depending upon the temperature of the available condensing water.

The tanks are all of steel, welded construction. All Pumps are Direct Steam Driven, either Simplex or Duplex. The Condensers are made up of cast iron sections of the type used in the petroleum industry. All Electric Motors and Starters are located outside of the building, using totally enclosed motors with the shafts passing through stuffing boxes in the walls. All movable parts are grounded. Shovels and scrapers used in handling the spent and extracted earth are made of bronze or aluminum to avoid the possibility of sparks.

The building is of steel and tile construction, with large windows, and special attention paid to ventilation. Scuppers at the floor level are provided with fixed louvers which cannot be closed. Lights and light switches are of the approved type, the lamps being enclosed in heavy vapor-proof globes.

The equipment will handle one and one-half tons at a charge and two runs can easily be made in twenty-four hours. 1,200 gallons of Skellysolve "B," boiling point 146-156 deg., are used for each wash. The extracted earth will average about 3.0 per cent fat on a dry basis. The color of the extracted oil will, of course, vary with the kind of oil on which the earth is used. In this plant, where corn, cottonseed, soya bean and cocoanut oil are being handled, the color of the extracted oils has been as dark as 18-R—35-Y and as light at 6-R—20-Y. The free fatty acid content has varied from 1.00% to 2.50%.

Extraction of spent earth from Filter Presses which have been blown with steam only gives the best results. One extraction of spent earth, which had been used for bleaching cottonseed oil and which had been blown in the Press with air, gave a dark, viscous oil with an iodine number of 84.6.

The operating cost in this plant is about $45.00 per day which includes labor, power, steam, water, solvent loss, and supplies. This makes a cost of $15.00 per ton of spent earth handled.

Fat Recovery By Solvent Extraction From Animal By-products

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Abstract

It is shown that solvent extraction, although using an inflammable solvent can be made safe. Operating difficulties are discussed, including corrosion caused by decomposition products of animal matter. Costs and returns are shown to demonstrate the profits available.

THE subject of solvent extraction of fat from animal by-products has hardly been touched in literature. Though solvent extraction has been used for many years by laboratories for the determination of the amount of oil or fat in many classes of material including animal by-products such as tankage, meat scraps and so forth, its development into an industrial enterprise has been markedly slow.

A study made of the material produced by fifty rendering plants in the state of Ohio during the year 1936 showed an average fat content of 11.44%. With this as an average, the production of one-quarter of a million tons of this material represents a loss of fat economically available, of $2,600,000.

The rendering industry had the opinions, based on a few old attempts at solvent extraction, that the extracted meal would contain an odor of solvent and the extracted fat show darkening of color due to the use of high temperatures in trying to remove the final traces of solvent. With properly designed equipment and suitable choice of solvent, these opinions are false. Therefore the development of safe, satisfactory and profitable extraction plants has been handicapped.

The safety of the plant, mentioned as the first point, is probably thought of first when solvent extraction is considered. Safety en-