

Waste water treatment costs reduced by 50% with rotary vacuum precoat filter

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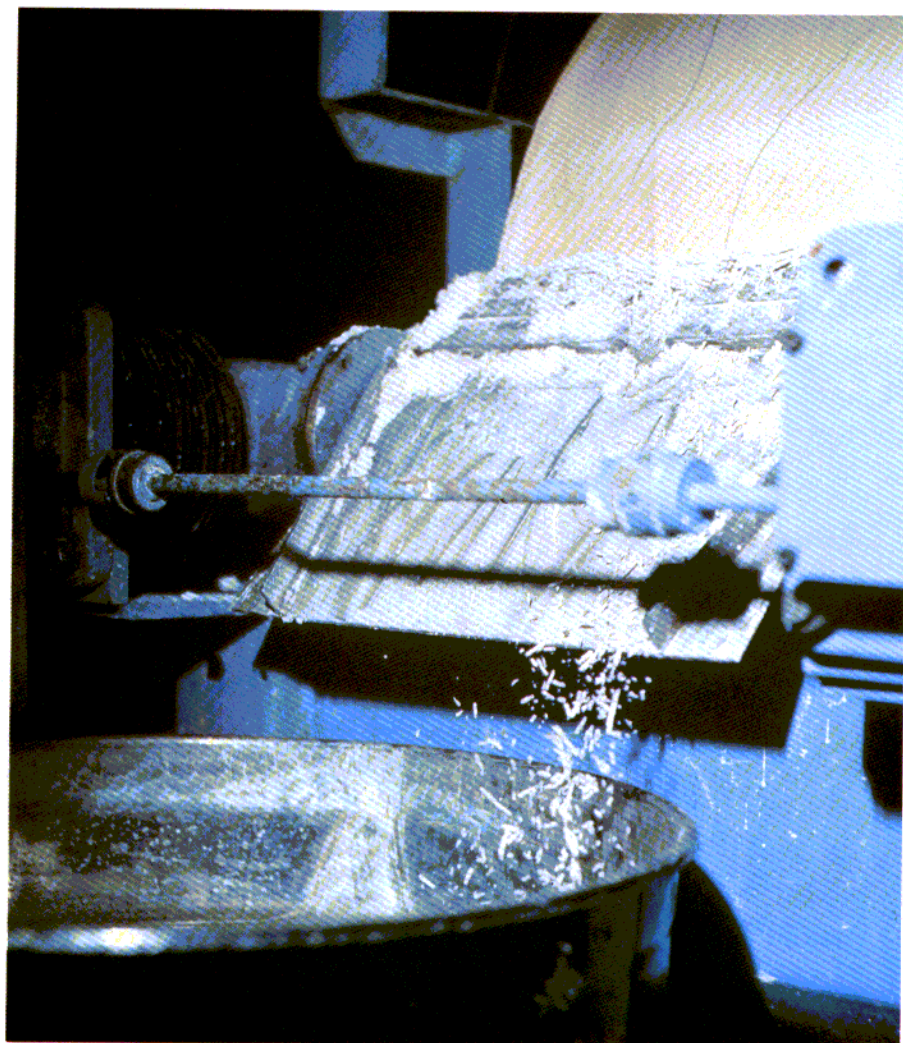
New Solutions to Plant Problems

Problem: The solids separation system at Linde's waste water treatment facility had high operating, maintenance and sludge disposal costs. High operating costs were caused by the large pumps and special treatment chemical required to operate the filter, and frequent cleaning, repair and replacement of filter elements resulted in high maintenance costs.

Union Carbide Corporation's Linde Division in Tonawanda, N.Y. fabricates and assembles process equipment. Surface treatment of metal parts, such as cleaning, etching and passivation, produces waste water streams containing acid, chromate, and substrate metals, including traces of heavy metals.

The treatment system for the acidic, heavy metal bearing waste water only needed to handle about 30 gpm, yet it was required to meet all the stringent standards for discharge to the municipal sewer system. Of particular importance is the removal of heavy metals. The total treatment system, which provided pH adjustment, chromate reduction, heavy metal precipitation and solids removal, is shown in Figure 1. The filtration system, though providing excellent removal of metal hydroxide solids from the discharge water, required FeSO_4 flocculant and a high operating pH (10.5), and suffered frequent downtime for cleaning and repairs. In addition, the resultant sludge contained only 10% solids, which necessitated expensive disposal.

Solution: In May 1982, Union Carbide installed a small rotary vacuum precoat filter on a trial basis. Using a



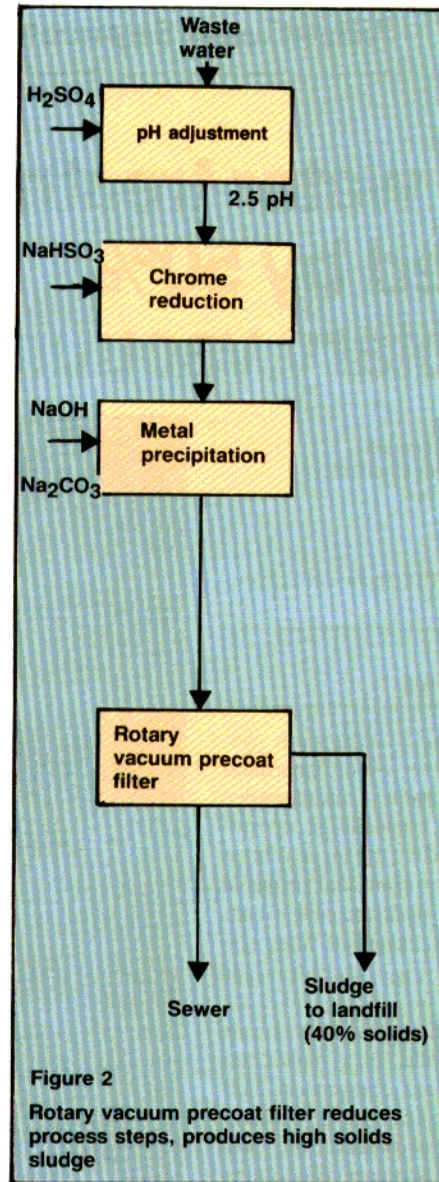
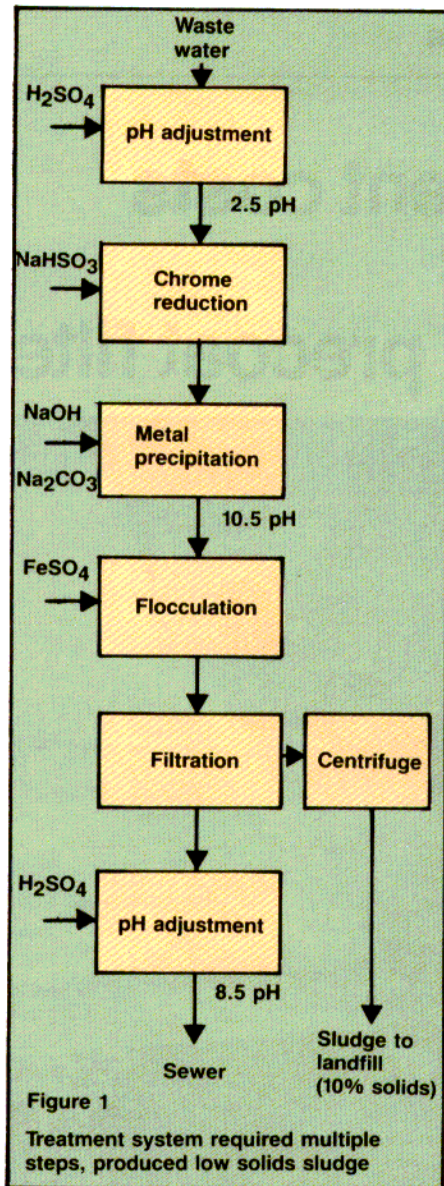
High solids filter cake reduces disposal costs

precoat of coarse diatomite filter aid, the filter not only removes metal hydroxide from the treated waste water, but also produces a sludge that, at 40% solids, is sufficiently dry to allow disposal in other than expensive chemical landfills.

The 3' diam, 1' wide rotary filter is precoated with 50 lb of diatomite to form a 2" cake. No body feed is required to aid in filtration. During operation, a knife blade scrapes off the filter cake and spent diatomite at a rate proportional to the

drum speed. A sensing device automatically adjusts this rate so as to maintain an optimum operating vacuum level (in this instance, 19-20" Hg.) This automatic scraping feature allows the precoat to last for 24-30 hr before it is all scraped off and must be replaced.

Tests of the rotary vacuum precoat filter also demonstrated that FeSO_4 was not required to aid in the filtration, nor was a high filtration pH required. Reduction of filtration pH to only that required



to precipitate the heavy metals allowed elimination of the post treatment pH adjustment step. Figure 2 shows the final flowchart of the treatment system.

Results: The rotary vacuum precoat filter with diatomite precoat performs the same functions as were previously accomplished with the high pressure filter and a centrifuge, and does these with less total horsepower, fewer water treatment chemicals, reduced maintenance, and lower water content in the sludge. All of these improvements have added up to a 50% reduction in the total cost of waste water treatment.

On a trial-basis, the small rotary vacuum precoat filter satisfactorily handled all the waste water treatment required at present plant production rates. Based on

full plant operating rates and the installation of an appropriate sized filter, total savings from using this system are estimated at \$92,000/yr.

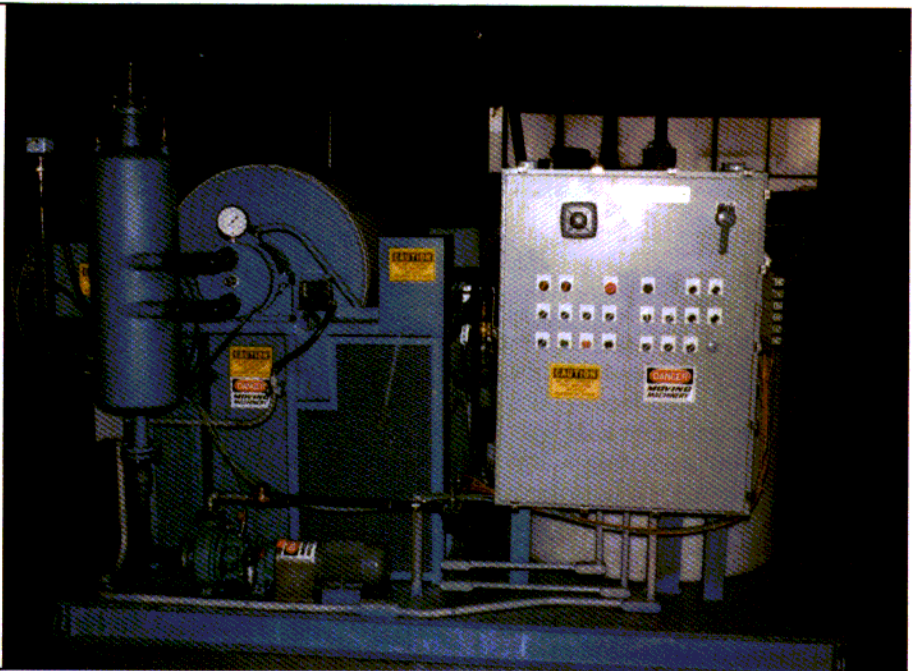
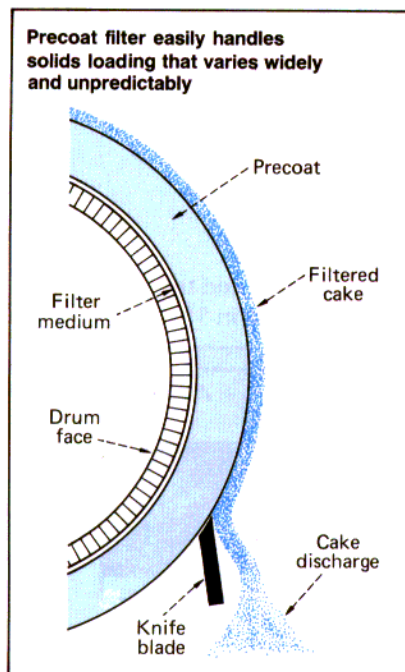
Celite® 545 diatomite filter aid is available from Manville Products Corporation, Filtration and Minerals Division, PO Box 5108, Denver, CO 80217.

Rotary vacuum filter with Precoat Miser was provided by Komline-Sanderson, Process Equipment Division, Holland Avenue, Peapack, NJ 07977.

Manville

Manville Products Corporation

P.O. Box 5108
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FILTERING A PROBLEM FEED

Greatly varying flowrates and compositions of silica in an effluent called for an automated, precoat discharge vacuum-filter.

Union Carbide Corp.'s Specialty Gas Div. (Keasbey, N.J.) was faced with a sticky problem—removing silica dust (SiO_2) in varying amounts from a wastewater stream. The silica is used to make silane (SiH_4), a colorless gas. Silica dust is removed from the air by a wet scrubber, which has an effluent of 3,000 ppm of suspended solids. This effluent is filtered to meet a discharge clarity of 30 ppm of solids; typically, the actual concentration is below 1 ppm. Plant and corporate engineers at Union Carbide looked at alternative means of dust removal and decided that a rotary-drum vacuum-filter with a precoat discharge was the best candidate for the job.

Such a filter can deliver consistently

high-clarity filtrates, regardless of influent feed compositions. At Union Carbide's plant, the solids loading varies widely and unpredictably. Thus, a filter was needed that did not require adjustments to compensate for these feed variations.

Handles difficult materials

Continuous precoat filters are used to handle slimy, tacky cakes or dilute slurries that cannot be processed by conventional rotary-drum devices because the cake either is too thin to be discharged continuously or blinds the filter cloth after a short period. These filters are precoated with a 1 to 6-in. layer of diatomaceous earth or other suitable material, depending on the application. Once the desired precoat thickness is achieved (depending on filtration parameters), the process stream is introduced into a vat, in which sits a part of the drum. As each part of the drum rotates through the vat, the vacuum pulls a layer of feed onto its outer surface. A knife blade advances across the face of the drum, shaving off the filter cake and a thin layer of precoat, resulting in a clean filtering surface as each section of the drum contacts the slurry in the vat. The filter yields a cake that is always

dry, regardless of the feed conditions, and a clear filtrate that meets local standards.

Union Carbide selected a continuous-precoat filter supplied by Komline-Sanderson Engineering Corp. (Peapack, N.J.), which conducted laboratory studies to determine the feasibility of using a precoat filter and to collect sizing data. A sample containing 246 ppm of suspended solids was clarified to the specified 30-ppm level. After startup, another sample of over 2,000 ppm was clarified to less than 30-ppm.

The unit is 3 ft dia., with a 3-ft-wide face (28.2 ft² of filter surface), and is skid-mounted with all required auxiliaries (the control panel, vacuum-source filtrate receivers and pumps) piped and wired prior to shipment, to reduce installation costs.

Komline-Sanderson incorporated instruments and controls that allow the precoat filter to respond to flow and concentration changes; also, the unit switches to an idle mode in the event of no flow. The filter automatically reapplies precoat when the initial coat is used up. The firm engineered the complete skid-mounted system to meet the needs of Union Carbide.

Reduce waste water surcharges and sludge disposal costs: Clarify your effluent and dewater your sludge.

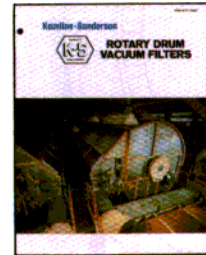
Fully "packaged" and integrated, K-S Rotary Drum Vacuum Filters can be used on the wide variety of waste waters and liquid sludges generated by chemical and food processing, metal working and finishing and flexographic printing. A K-S RDVF delivers dry, solid filter cake and clear filtrate.

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