POLLUTION FILE

JRD

Reprinted From . . .

Modern Plastics

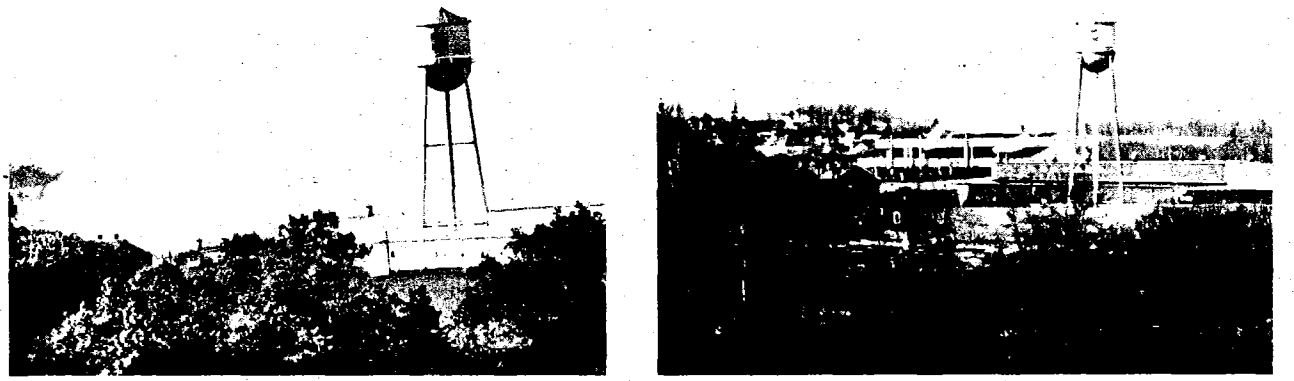
One answer to plasticizer pollution

Vinyl processing frequently releases plasticizer vapors into the air. Here's a device that solves the problem

Monsanto Enviro-Chem Systems Inc.

DSW 588118

STLCOPCB4093454



Vinyl flooring facility of GAF Corp. at Fullerton, Pa. before (left) and after (right) installation of Brink mist eliminator. White stack plume in photo at left is plasticizer vapor. (Illustrations, Monsanto Enviro-Chem Systems Inc.)

One answer to plasticizer pollution

Vinyl processing frequently releases plasticizer vapors into the air. Here's a device that solves the problem

While plastics processing is generally regarded as a "clean" industry as far as air pollution is concerned, plastics that are processed with plasticizers, particularly PVC, can cause air pollution problems. In the case of PVC, air pollution is caused by plasticizer that has volatilized in the heat of processing and is emitted from the plant in the form of vapor or extremely fine droplets that can, in certain weather conditions, cause severe fogging in surrounding areas.

Two cases in point are facilities operated by GAF Corp. and Monsanto.

1) GAF's Whitehall plant at Fullerton, Pa. emitted plasticizer vapor that formed white plumes when stack gases cooled in the atmosphere. The plasticizer vapors were exhausted from curing ovens for PVC flooring. The haze reduced visibility, and the oily smell of the plasticizers brought complaints from local residents.

2) Monsanto's sheet extrusion plant at Trenton, N.J. was equipped with an impaction-type collection device that did not operate adequately, and plasticizer mists were still carried out of the stacks. Fallout from the resulting plume was causing considerable damage to the roofs of the plant and of adjacent structures, and was producing a disagreeable odor in the area.

To cope with these problems, both processors have installed a device that is manufactured by Monsanto Enviro-Chem Systems Inc., Chicago, Ill. Tradenamed the Brink Mist Eliminator, it removes plasticizer droplets by intercepting and trapping them in a bed of glass fibers.

The active element of the Brink device is the fiber bed. It consists of two circular wire screens that are arranged concentrically. The space between them is filled with specially oriented glass fibers. Mist-laden gases enter the bed from the side and pass through the fibers in a horizontal direction. As the gas passes through the bed, the mist is collected by the fibers and drains down them to the inside screen of the bed. It then flows down the inside screen to the bottom of the element.

Depending upon the size of the particle, three mechanisms of entrapment occur (see drawing, right). As the gas moves through the fiber bed, it streamlines around individual fibers. Large particles with diameter greater than 1 micron have sufficient momentum to deviate from the gas stream and continue in a straight line toward the fiber where they are trapped. Particles with diameters less than 1 micron will follow the streamline around the fibers, but since they exhibit considerable Brownian movement (the motion of submicron particles caused by collisions between them) they diffuse from the gas stream to the surface of the fibers. Collection efficiencies increase as particle size decreases because smaller particles move greater distances as a result of Brownian movement. Particles can also be collected by direct interception if their path takes them close enough to the fiber so that they touch it.

The Brink device collects particles with diameters

STLCOPCB4093455

larger than 3 microns at efficiencies of essentially 100% and particles smaller than 3 microns in diameter at efficiencies up to 99.98%. In actual installations, the devices are generally designed to operate at efficiencies in the 94 to 99.3% range, since the cost of designing at higher efficiencies only rarely can be justified. Contrary to other types of liquid/gas separation systems, the Brink system is said to be more efficient at low rates of gas flow because the longer particles take to travel through the bed, the greater the possibility of entrapment.

How units are installed

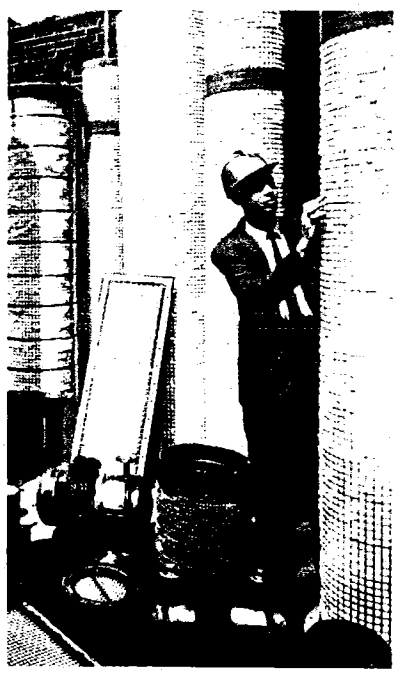
In a typical Brink system installation, fiber-bed elements with flanges on their top edge are suspended vertically in the center of a tank by bolting to a horizontal support plate toward the top of the tank (see drawing below). The bottom of the fiber-bed element is bolted to a drain leg that empties into the bottom of the tank. Mist-laden gases enter the tank at the bottom and pass through the fiber bed into the center of the element. The separated liquids drain through the drain leg and collect in the bottom for disposal or reclamation of plasticizer for reuse. Clean gases exit at the top of the tank.

Since the Brink device can only separate pollutants that are in the liquid phase, cooling of plant exhaust gases is sometimes necessary. This was the case at the GAF plant where gases left the plastisol curing ovens at temperatures between 350 and 400° F. Plasticizer vapors are condensed prior to entering the Brink mist eliminator in a cooling unit that combines direct water cooling with surface heat exchangers. After separation, the mixed water/plasticizer effluent enters a settling tank where water and oil phases separate. The water is pumped back to the cooling unit for reuse and the plasticizer is drawn off and returned to GAF's supplier for reprocessing. The Brink system at GAF consists of two tanks which contain 12 fiber-bed elements 2 ft. in diameter and 10 ft. high.

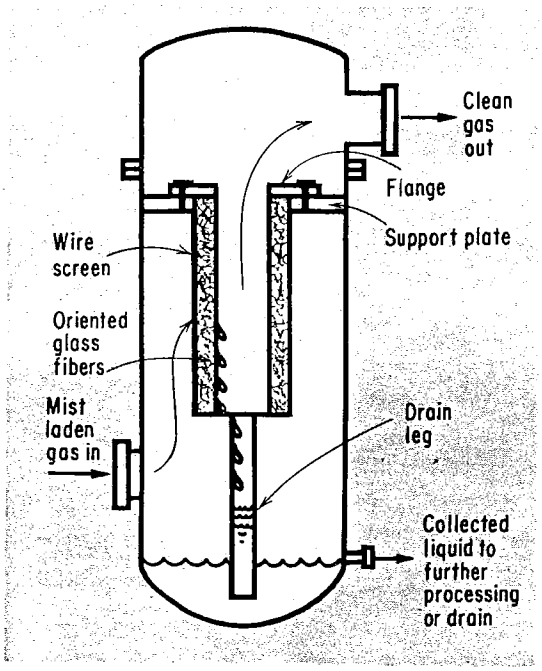
In extrusion operations where exhaust hoods are employed, such as Monsanto's Trenton plant, exhaust gases are usually in the 90 to 120° F. range and plasticizers are in the liquid phase so that no cooling is required. The system in use at the Monsanto facility is a single tank 20 ft. high and 10 ft. in diameter that houses 10 Brink fiber-bed elements.

While high-energy scrubbers can have comparable separation efficiencies, they require large amounts of energy to operate. Installation costs and initial expenses are comparable between high-energy scrubbers and Brink mist eliminators, but operating costs of the Brink system are claimed to be 15 to 20% of the cost of operating a scrubber at similar efficiencies. The efficiency of scrubbers depends upon the pressure at which gases are driven through the unit, but the Brink device can operate at 99.98% efficiencies at pressures ranging from 5 to 17 in. H_2O. Comparable efficiency in a scrubber requires pressures ranging from 60 to 80 in. H_2O.

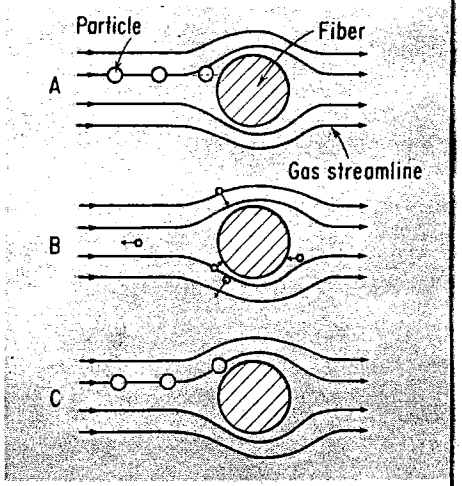
Approaches other than the Brink device or scrubbers are not practical for eliminating plasticizer vapors from plant emissions at this time. Because plasticizers can contain phosphorus, chlorine, sulphur, or nitrogen, the combustion by-products produced by high-temperature incineration often are more noxious than the plasticizer itself.- END



Fiber bed elements of mist eliminator before installation.



Typical system and how it operates. Mist-laden gases enter tank at bottom.



How fiber bed acts to trap particles from gas stream. A) Large particles have sufficient inertia to diverge from streamline and strike fiber. B) Submicron particles diffuse from gas stream as a result of Brownian movement. C) Particles follow streamline but pass close enough to fiber to be collected.

DSW 588120

STLCOPCB4093456

ANOTHER ENVIRONMENTAL CONTROL SERVICE OF

Monsanto EnviroChem

for more information contact:,

Monsanto EnviroChem Systems, Inc.
800 N. Lindbergh Blvd.
St. Louis, Mo. 63166
Tel. (314) 694-2259

General Offices:
Monsanto EnviroChem Systems, Inc.
10 S. Riverside Plaza
Chicago, Ill. 60606
Tel. (312) 782-5041

DSW 588121

Article # 35

Reprinted from Modern Plastics, June 1971

STLCOPCB4093457