Alliance for waste war

A specially developed process for treating waters from a vinyl chloride polymerization plant will be demonstrated before year's end by B. F. Goodrich Chemical (Cleveland), when it starts up its new PVC plant near Pedricktown, N.J. The process is one of the first fruits of a joint pollution abatement effort by industry and government.

And though the new process equipment is still being installed, the main features of the new plant were described last week at the 42nd annual conference of the Water Pollution Control Federation (WPCF). The six-day meeting—held last week in the Memorial Auditorium of Dallas, Tex., and attended by 3,600 engineers, scientists, industry executives and government officials—was billed as "the largest single gathering on water pollution control in the history of the fight for clean water."

Cooperation Vital: The tenor of several papers at the meeting made it clear that the sort of industry-government alliance that produced the new PVC plant waste treatment plan will be seen frequently in the future. In fact, John Gillis, senior vice-president of Monsanto (St. Louis), said such cooperative efforts would be the only way to reduce the nation's water pollution control problem to manageable proportions by '80.

"Stiffer pollution control laws are the trend of the times," Gillis said in chiding industries that have opposed such laws. By offering cooperation, Gillis said, business would gain an opportunity to "participate directly in the framing of meaningful laws and local water quality standards." And he suggested that more rigorous laws would help justify expenditures for pollution control equipment.

Gillis said it's probable that "the manufacturer of a new product will be required to account for that product's ultimate disposal." He pointed out three possibilities for acceptable disposition of used products: perpetual reuse, conversion into other useful forms, or neutralization in a non-polluting manner.

In proposing a government-industry coordination conference, the Monsanto executive listed three questions that he felt should be resolved: (1) Just what are the pollution abatement goals for '80? (2) Do we have technological ability to meet those goals? (3) How much will the nation pay for an improved environment?

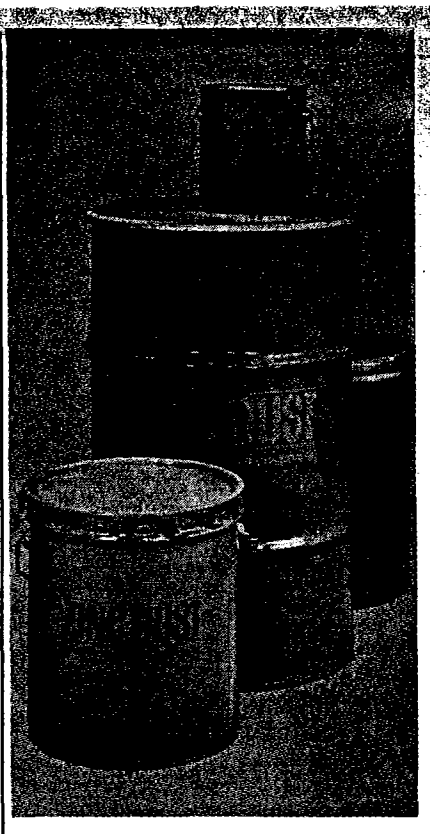
Plant Preview: Cost of Goodrich's effluent-treatment system will be more than $1 million. That's a big hunk of the $15-million total cost of the PVC plant now being constructed at Pedricktown, across the Delaware River from Wilmington, Del. The company was granted $364,900 by the Federal Water Pollution Control Administration for developing the system. Goodrich has agreed that for one year after startup it will show the treatment unit to industry observers approved by the agency (*CW Technology Newsletter, Apr. 26*).

It took two years of laboratory and pilot-plant studies to develop the system. Both chemical and biological methods will be used to treat wastes from the PVC plant, which will produce emulsion, suspension and bulk-polymerization resins by Pechiney-St. Gobain technology. The plant's liquid wastes, estimated at 800,000 gal./day, will contain vinyl monomers and polymers, organic and inorganic salts, organic acids, fine solids, dispersants, wetting agents and catalysts.

No comprehensive system for treating such wastes had previously been developed, although about 30 PVC plants now operate in the U.S.

Doubly Regulated: The Goodrich plan will be subject to the regulations of New Jersey's Dept. of Health and of the Delaware River Basin Commission. Minimum requirements: secondary treatment and 90% removal of biological oxygen demand (BOD).

According to Goodrich environmental engineers W. C. Holbrook and John Lank, the company used effluent samples from Goodrich's existing PVC plants in checking out a variety of possible treatment methods. However, because of recent improvements in plant design, it was estimated that water use in the new plant will be 20% less than in any existing plant. The expected effluent volume (800,000 gal./day) includes all process wastes, utility water, storm-sewer drainage from areas subject to acci-



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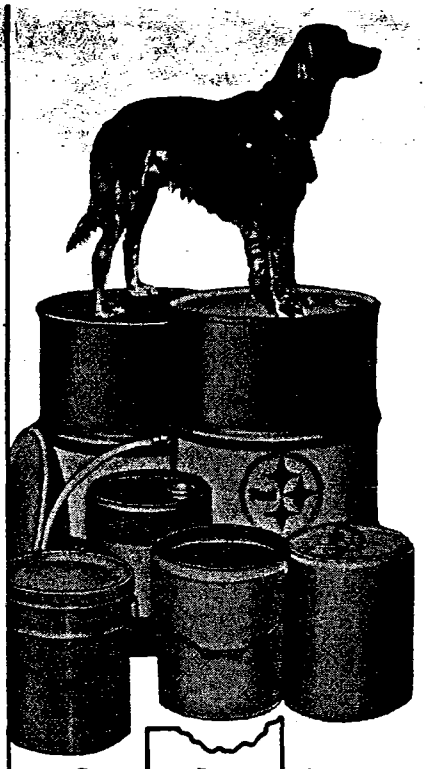

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Composition of the wastes: BOD, 720 mg./liter; chemical oxygen demand (COD), 1,285 mg./liter; total solids, 2,000 mg./liter; and suspended solids, 1,000 mg./liter. Great variations from these average levels are expected, so the company is building a 950,000-gal. waste-equalization holding and mixing tank.

Speeding Up the Settling: For primary treatment of the milky white wastes, Goodrich engineers tried settling, dissolved-air flotation and chemical coagulation.

Flotation (to produce a waste product that could be skimmed off) was ruled out, Holbrook said, because it produced a fragile floc and didn't remove enough solids. About 48% of the suspended solids would settle out unaided; Goodrich found that the use of a ferric-ion salt with certain coagulant aids could boost the removal rate to 95%, with a settling time of 30-60 minutes.

The Goodrich team found that the optimum dosage level of the ferric salt is about 150 mg./liter. This coagulant should be mixed into the effluent before a coagulant aid—such as Calgon 227 or Nalco 670—is added.

Secondary Sequence: BOD reduction of the primary waste stream is dealt with in the plant's secondary treatment. One technique—adsorption on activated carbon—was dropped because the waste contains water-soluble, long-chain organic soaps that greatly reduce the carbon's adsorption capacity.

So the company turned to biological treatment. Three such methods—trickling filters, aerated lagoons, and contact stabilization—were tested and found wanting. The successful method: mixed activated-sludge treatment. But to make it successful, certain latex solids first have to be removed from the sludge; caustic soda must be added to the sludge to maintain the proper pH and prevent bulking; and nitrogen and phosphorus nutrients have to be added to support bacterial life. Final sludge output: 23 cu.-yds./day.

One further recommendation by Holbrook: install a centrifuge to dewater the sludge, thus reducing the landfill disposal problem. *END*

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How to keep watch on what goes up the stack

"When the air pollution emphasis switches from what's in the air to what's going up the stack, the stack gas monitor will be a vital instrument."

And the chemical company executive who so tersely summed up this situation predicts that the most important role for these instruments will be as controls for the processes that absorb or convert the sulfur oxides in stack gases. But, according to the users, the monitors are a long way from filling that role.

The instrument that will do both the measuring and controlling jobs will probably evolve from the various infrared and ultraviolet instruments now on the market. But first the industry will have to overcome such serious problems as capturing representative samples, nullifying interference from other gases and particulates, offsetting the effects of high temperatures in the stack, obtaining consistent readings, and reducing the relatively high costs (*table, below*).

The manufacturers of both families of instruments agree on one point: these problems will be overcome. In the infrared group are Beckman Instruments (Fullerton, Calif.), Mine Safety Appliances (Pittsburgh), Research Appliance Corp. (Allison Park, Pa.), and Leeds & Northrup (Philadelphia). In the ultraviolet corner are Barringer Research (Toronto, Ont.) and Du Pont's Instruments Division (Glasgow, Del.), And coming on strong is the "little black box," an electrochemical transducer device made by Whittaker Corp.'s Narmco Research & Development Division (San Diego, Calif.).

Best Customers: "Our best customers are the power generating plants and the developers of systems to control sulfur emissions," says a spokesman for one instrument manufacturer.

The systems developers with most experience in monitoring stack gases are the Tennessee Valley Authority and Combustion Engineering. At TVA's Shawnee plant near Paducah, Ky., a dry limestone injection process for the absorption of sulfur oxides has been operating since mid-May.

On one 175-mw. boiler of the 10-unit plant, Du Pont's Model 400 photometric analyzer is being used at six different points. The instruments are on loan from the manufacturer.

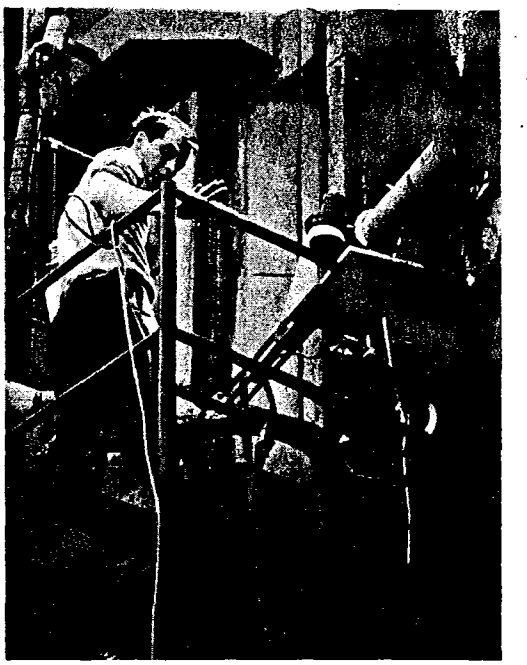
How well have they operated? "It's still too early to give any definitive judgment," says a process control engineer for TVA. But he concedes there have been problems. Chief among them was conditioning the samples taken from the stacks so that accurate readings (i.e., free from interference) could be taken.

"According to the wet-chemistry samples we test just to check the instruments, these monitors are not quite as efficient as we would like," says the TVA spokesman, "but using monitors seems to be the thing to do now."

Kansas Case: Combustion Engineering's experience echoes that of TVA. A Du Pont unit has been used at its wet-dolomite scrubbing operation on Union Electric's Meramec installation (*CW, July 5, p. 46*). And both Du Pont and Leeds & Northrup instruments are being tried on the 125 mw. boiler owned by Kansas Power & Light, in which CE has installed its absorption equipment.

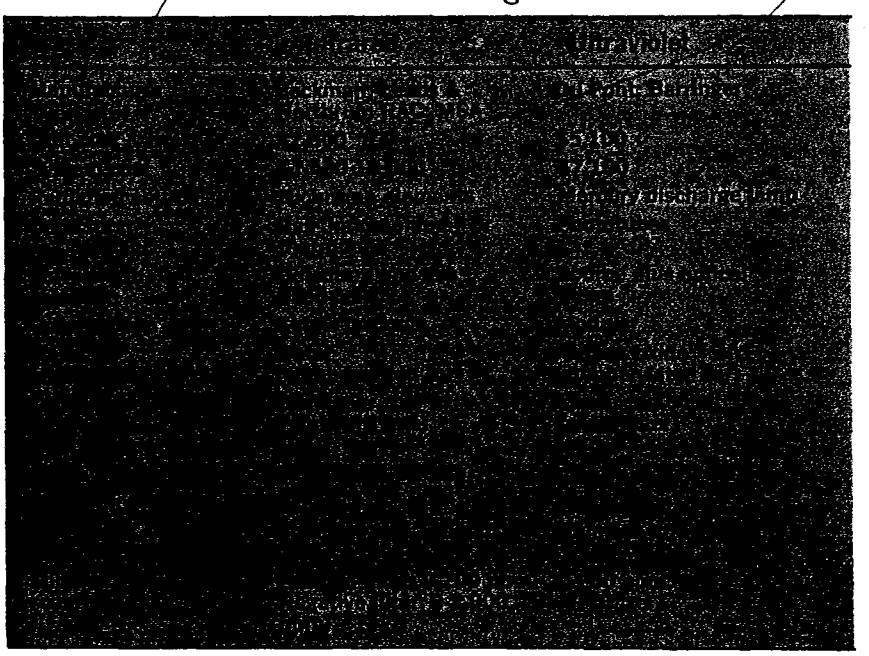
"The instruments work well," states Art Plumley, CE's assistant manager for chemical process development, "but they are not free of problems. The problems with both relate to getting the sample to the instruments."

At KP&L the instruments are on two stacks. There are two Du Pont analyzers ahead of the scrubbers and two after. The two L&N instruments are placed after the scrubbers, with



Into a 6-in. breach in the stack goes Barringer's instrument to monitor SO_2.

Who offers what in stack gas monitors



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manual readings taken before.

"So far," says Plumley, "our best readings are from our manual instruments." But he points out some extenuating circumstances. "We have been using the monitors for only a couple of months, and during that time we kept changing the combinations to test our own process."

How They Work: Both the ultraviolet and infrared instruments are based on the absorption of a specific wavelength of light by the substance being measured.

Typically, Leeds & Northrup's infrared monitor has a probe in the center of the stack to take samples, which are than transported by tubes and conditioned for the analyzer. MSA has two infrared models: the more sensitive and expensive, Model 200, is for gases from the low-sulfur fuels burned in power plants, and Model 300 would be used in the stacks of sulfuric acid plants.

Research Appliance has developed a stack-sampling device intended to overcome the difficulties in obtaining a representative sample.

Du Pont's analyzer grew out of 25 years of development of ultraviolet process control equipment (*CW, July 5, p. 39*). Rays from the light source pass through a sample. A portion of the light is absorbed by the pollutants, and the remaining light continues into the photometer. There, the difference between the two light-intensity readings is deemed proportional to the SO_2 content in the sample.

Barringer Research has a relatively compact instrument (40 in. long). Its 20-in. probe can be put into a 6-in. breach in the stack wall (*photo, p. 31*).

Black Box: "We recommend Beckman simply because we have had more experience with it," says a spokesman for the National Air Pollution Control Administration. "But the best bet for the future is Narmco's electrochemical transducer. It's simpler, cheaper and smaller (6x6x9 in.)." Pollutant gas molecules diffuse to the surface of the sensing electrode, setting off an electric current that is directly proportional to the gas concentration.

Summarizes the NAPCA spokesman: "Right now, wet-chemical techniques are the best and most reliable, but to control the recovery and absorption processes we're going to need reliable monitors." *END*



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