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Guardian Chemical Corporation

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April 2, 1976

Mr. R. T. Gottesman
Assoc. Dir., R & D
Tenneco Chemicals
Turner Place, P. O. Box 2
Piscataway, N. J. 08854

Dear Mr. Gottesman:

We are pleased at your interest in AIRefine (a Polycomplex derivative).

We are enclosing the preliminary brochure on AIRefine and expect to have a revised one available which will contain additional information specifically in reference to its use for removing organic vapors such as VCM from exhaust streams. Actually, with efficient scrubbers and gas washers, VCM can be taken down to as low as several parts per million from original levels, ranging from 70-150 ppm.

Please remember that where acid gases are present, which could neutralize the normal pH of the AIRefine, and inactivate same, it is advisable to add soda ash to the AIRefine solution, (which is usually employed in an initial concentration of 3% by weight on a recirculating basis).

Please contact us if you have any technical questions in the meantime.

Sincerely,

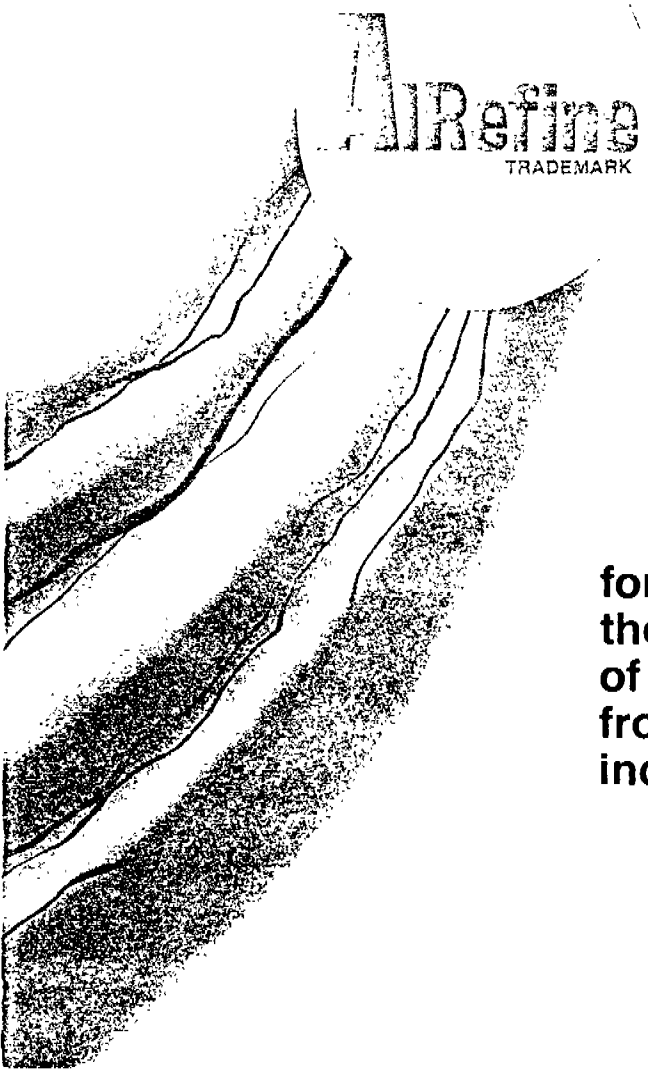
GUARDIAN CHEMICAL CORPORATION

Alfred R. Globus
Alfred R. Globus, D.Sc.
Director of Research

ARG:rs
Encl.

P. S. The AIRefine (concentrate) is \$6.95 per gallon in 52 gallon drums, f.o.b. our plant.

R. T. GOTTESMAN
COLORITE 006649



AirRefine
TRADEMARK

**for
the removal
of pollutants
from
industrial emissions:**

NITROGEN OXIDES
HYDROGEN SULFIDE
SULFUR DIOXIDE AND TRIOXIDE
ACID SPRAYS
ORGANIC VAPORS
FLY ASH and SOOT
RADIOACTIVE TRACE ELEMENTS
UNBURNED OIL RESIDUES



Introduction

In these days of ecological awareness and the desire to protect the environment, atmospheric pollution becomes a major problem, for its signs are evident for all to see. The emission of acidic gases of hydrogen sulfide, oxides of nitrogen, coal tar, unburned oils and other hydrocarbons, with their destructive effects upon the nostrils, lungs, and skins of people in the area, as well as upon the surrounding property, have placed the producer of industrial emissions in the position of having to "either clean up or shut down".

It is with the purpose of cleaning up these pollutants to an acceptable level that AIRefine was developed and tested on an industrial scale, demonstrating its ability to react rapidly with a wide range of acid gases (nitrogen oxides, sulfur dioxide or trioxide, hydrogen chloride, chlorine or bromine) to absorb hydrogen sulfide, to remove odorous mercaptans to react with hydrochloric or sulfuric acid spray (as in pickling plants or plating assemblies), to form complexes with oil droplets, unburned kerosene or coal tar, to absorb carbon particles, soot, smoke, fine fly ash, or dust. Thus AIRefine diluted with water (to a 2-5% solution) and sprayed into a gas stream, drawn in through an eductor activated by water or utilized in mechanical washers, can remove one or a multiple of these typical pollutants, so that the air-stream can be discharged with only minimal residual pollution.

AIRefine is a straw-colored to golden-yellow liquid, miscible in water in all proportions. Its powerful wetting properties, complexing action upon hydrocarbons, its strong neutralizing action on acid gases and acid compounds, its absorbing power for fine dust, carbon, ash, etc., its complete water solubility and its biodegradability, make it highly effective for treating of industrial gas emissions and air streams

having a high level of noxious pollutants, without becoming a pollutant itself. In a typical test (employing a venturi scrub system) air with a level of 50 ppm of bromine by weight was washed in a mechanical scrubber by means of a 3% aqueous solution of AIRefine with the elimination of almost 99% of the bromine in a single pass, while better than 98% or more of sulfur trioxide can be removed in a single pass. Hydrogen sulfide, sulfur dioxide or nitrogen peroxide are removable to the extent of 95-99% in only one pass through an effective scrubber. Multi-pass washers can eliminate all but traces of the foregoing gases.

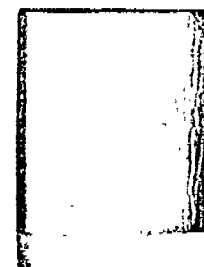
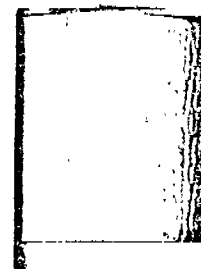
A fine spray of 3% AIRefine injected directly into a paddle-wheel blower and out through special stainless steel entrainment devices (1) eliminated all but 0.37-0.4 ppm of an original 25 ppm of chlorine gas and (2) protected the blades from the destructive effect of the oxidizing and acidifying power of the chlorine.

A fine mist of acid-spray from a plating tank and sent through a primary separator, can be scrubbed by means of a 3% solution of AIRefine in a gas washer to complete neutrality. The resultant air passed over steel plates produced no corrosion effects on the latter.

Styrene vapors from fiberglass operations (The emissions contained 250 ppm of styrene.) were reducible to 35 ppm with a single pass through a 2% spray, and to 12 ppm. using the same concentration of solution in an efficient mechanical washer.

Dusts containing a small amount of citric acid crystals can be stripped and neutralized by a single or double stage scrubber. Oxides, such as arsenic oxide, titanium dioxide or silica of greater than 1 micron can be stripped from an air stream by means of a 2 stage scrubber utilizing a 3% solution of AIRefine to the extent of 95-99%. Starch dust (explosive) containing 1% of thorium oxide (radioactive) showed 9% explosivity and no detectible radiation level after a 2 stage washing operation with 2% of AIRefine.

Solutions of AIRefine can be injected into flue gas at 1200-1400°F. as long as the solution is always maintained in excess. Make-up water can be added continuously or intermittently without loss of efficiency but dehydrated AIRefine will tend to decompose if exposed to high temperatures.



From a toxicity standpoint, AIRefine can be classified as safe to handle and store. It exhibits an oral L.D. 50 on mice of greater than 1 gram/kg. Patch tests on humans of a 3% solution of AIRefine demonstrated that the solution was neither a primary irritant nor a sensitizer. Feeding toxicity tests on mice at a rate of greater than 100 mg/Kg. per day for 90 days showed no decrease in growth rate or gross changes on macroscopic examination following autopsy.

Some of the physical properties of AIRefine are listed below:

Form	liquid
Color	straw-color to light amber
Odor	mild
pH of a 3% solution	10.7
Viscosity (100%)	80 cps
Viscosity (3%)	17.5 cps
Solubility in water	complete
Biodegradability	complete
Stability	excellent
Flash Point	300°F.

IMPORTANT: The information contained herein is believed to be correct, but no guarantee with respect to accuracy, completeness, or results is implied and no liability is assumed. The uses referred to or suggested are listed for purposes of illustration only and it is recommended that sufficient investigation be carried on to establish the suitability of this product to any particular case. Nothing herein is to be construed as authorizing practice of any invention covered by existing patents without license from the owners thereof or to manufacture or market any products containing this material without conforming to all government regulations which may apply.

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Asarco smelter gets its emission variance—The Puget Sound Air Pollution Control Agency has granted a 5-yr variance to Asarco Inc. (New York) for continued operation of its Tacoma, Wash., copper smelter at arsenic and sulfur dioxide emission levels above the agency's filings. Asarco agreed to spend \$4.7 million on control equipment during that period, and will additionally in its liquid sulfur dioxide and sulfuric acid plants in order to recover "the greatest amount" of SO₂ from fumes. However, court challenges could delay implementation of the plan, and an environmental impact statement might be needed to make the variance legal. See *Chem. Eng.*, Nov. 10, 1975, p. 118, and Feb. 17, 1975, p. 41, for earlier reports on the running fray.

Good news and bad news for pesticide makers—

- Sandoz, Inc. (East Hanover, N.J.) has won the first registration from the U.S. Environmental Protection Agency (EPA) for a natural virus insecticide, and intends to market it by June or July. Tradenamed Elcar, the nuclear polyhedrosis virus specifically attacks cotton bollworms and tobacco budworms. It survives a relatively long 3-7 days, apparently the key to its application as a wettable powder rather than via a more complicated delivery system such as microencapsulation (*Chem. Eng.*, Jan. 19, pp. 57-59).

- EPA outlawed most but not all mercury-bearing pesticides. The ban should reduce by 98.5% the amount of mercury entering the environment via pesticides, EPA says, and thus mitigate health hazards. Pesticide makers had used 90% of the banned products.

- Allied Chemical Corp. (Morristown, N.J.) won't activate its Aberdeen, Miss., plant for formulating fireproof, a fire-retardant insecticide. EPA has challenged Mirex for years because of cancer concern. Allied still disputes this, but says it can no longer justify the time and expense of defending the product. The U.S. Dept. of Agriculture has been financing Mirex use, and claims there is no known effective substitute.

Vinyl-chloride control news also comes in threes—

- A proprietary, non-noble-metal catalyst jointly developed by Harshaw Chemical Co. (Cleveland, Ohio) and Air Resources, Inc. (Palatine, Ill.) stars in the latter's new catalytic incinerator for destroying halogenated organics, such as vinyl chloride, which attack conventional catalysts. The fluid-bed unit operates at low 700°F and 1/4-s residence time—said to slash energy use compared with thermal incinerators running at 1,800-2,000°F and 2-s residence. The first commercial unit has started up at Chemetron Corp.'s La Porte, Tex., plant, for treating an off-stream of mixed halogenated hydrocarbons; the hydrogen chloride byproduct is recovered.

- A liquid chemical boasting high affinity for vinyl

chloride and other organics has been developed by Guardian Chemical Corp. (Hauppauge, N.Y.) for use in air washers and scrubbers. It derives from the firm's Polycomplex, an oil-spill cleanup agent that reportedly helps strip oil from tar sands, and also spawned an emulsifier touted for water/gasoline/alcohol fuels.

- A continuous stripping process for cleaning residual monomer from polyvinyl chloride resins (and thus abating emissions) will be used by KemaNord in Sweden, the firm says, under one of the first licenses from developer B.F. Goodrich Chemical Co., Cleveland (*Chem. Eng.*, Nov. 24, 1975, p. 27).

Olin will triple its hydrazine capacity—Anticipating 15-17% annual growth for hydrazine usage over the next nine years, in the U.S. alone and worldwide, Olin Corp. (Stamford, Conn.) is about ready to start building a \$25-million plant adjacent to an existing unit at Lake Charles, La. Olin's capacity will reach 30 million lb/yr upon plant completion in 1978. Major hydrazine outlets include rocket fuels, blowing agents, pharmaceuticals, pesticides, corrosion inhibitors, and reducing agents.

Carbide buys another pollution-control business—Just two weeks after announcing acquisition of Westinghouse Electric Corp.'s reverse-osmosis and ultrafiltration technologies (*Chem. Eng.*, Feb. 16, p. 44), Union Carbide Corp. (New York) revealed its purchase of licensing rights and assets of W. R. Grace & Co.'s business in ozone generators and systems. Ozonation has been gaining stature as a fill-in for chlorination of wastewaters and potable waters, Carbide says, and meshes especially well with its Unox oxygen-activated-sludge system.

Liquid-sulfur-dioxide process is spreading—A low-cost, closed-loop method for recovering liquid SO₂ from exhaust gases, developed by Stal Refrigeration AB (Norrköping, Sweden), went onstream early this year in a Finnish plant, and will soon serve in a plant going up in Zaire. The maiden installation has been running in Sweden for several years. The technique avoids the usual sequence of absorption of SO₂ by water- or solvent-scrubbing, stripping, and liquefaction. Instead, a desired portion of SO₂-bearing raw gas (e.g., from copper smelting) goes directly to a -70°C, atmospheric-pressure refrigeration train for partial SO₂ liquefaction; the gas then recycles for blending with the untreated portion, and the mix continues on to a sulfuric-acid plant.

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