

Sulfur oxide control: A grim future

Present technology is limited, the future is underfinanced

by Richard Gilluly

Sulfur oxides—mainly sulfur dioxide—are among the most common air pollutants in the United States. They are also among the most harmful to plant and animal life and to human beings, and a recent report by the National Research Council suggests that the problem will get worse before it gets better.

"Contrary to widely held belief," says the NRC, "commercially proven technology for control of sulfur oxides from combustion processes does not exist."

More than half the total sulfur dioxide emissions this year will be contributed by electric generating plants fueled by sulfur-containing oil or coal. Other sources include petroleum refineries, smelting of metallic ores and various kinds of fuel combustion for other purposes. Most of these uses are on the increase; given present trends, total sulfur dioxide emissions will increase more than threefold by the year 2000. The bulk of the increase will come from power plants, with oil refineries the runners-up but trailing far behind. Without controls, power plant emissions nationwide would increase from the 20 million tons expected in 1970 to 94.5 million tons in 2000.

This gloomy picture is bringing increasing attacks on power companies from clean air advocates, to the point that electricity is becoming almost as unpopular as the internal-combustion engine. The major complaint is that not enough is being spent to develop the technology of sulfur oxide removal.

There are a number of possible technological approaches to sulfur oxide abatement, falling into several categories:

- Removal of sulfur oxides from stack gases;
- Combustion techniques which fix

sulfur as sulfate during combustion of oil or coal;

- Gasification of coal, or other techniques for removal of sulfur from fuel before it is burned;

- Wholly new generating techniques, such as magnetohydrodynamics;

- Massive rearrangements of utility systems to remove power plants from congested areas (which systems would have benefits in addition to sulfur oxide abatement).

Another approach could be the use of naturally low-sulfur fuels, such as coal or natural gas, an approach already being tried. But the supply of low-sulfur coal is limited in the East and Midwest (although some Midwestern utilities are now importing it from Montana) and reserves of natural gas are becoming seriously depleted.

The NRC report projects time frames for the commercial feasibility of some of these technologies and options, assuming that research funds become available. Removal of sulfur—before, during or after fuel-burning, or a combination of all three approaches, depending on location and other specific conditions—is seen as the best approach.

Technologies for removal of sulfur during fuel combustion are three to eight years away in the study group's view, and it questions whether these techniques can be retrofitted to existing plants. For removal of sulfur oxides from flue gases, at least 25 processes are under development by industry and the National Air Pollution Control Administration, or in foreign countries. The more costly of these processes—because they do not provide salable byproducts—have been demonstrated in small plants. The less costly but more complicated processes that would provide salable products, such as sulfuric acid, are three to ten years away, says the report.

Techniques for removing sulfur from coal or oil before it is burned pose a number of problems. Residual fuel oils are difficult to desulfurize because metals in them poison catalysts that are necessary to the process. The cost of the fuel might increase 20 to 35 percent when a process is developed. Existing techniques can remove some of the sulfur from coal, but others, not yet developed, are necessary to remove the balance; thus present technology only sometimes allows bringing sulfur levels in coal down to the one percent or less that is desirable.

Remote siting of power plants is offered as a possible option. This is the approach that might involve changing the total structure of the power industry. Instead of building power plants in or near heavily populated areas, utilities would build them near coal mines.

An Interior Department study indi-



Interior

A minor effect: Tarnished statue.

cates that such a sophisticated grid system in the western two-thirds of the United States might pay for itself by allowing giant interchanges of power between regions, taking advantage of seasonal, hydrologic and time-zone diversity between the regions. A further advantage would be that low-sulfur coal from the mountain states could furnish the bulk of the fuel for such a system. Utilities in the mountain and plains regions have reported that the low-sulfur coal reduces the efficiency of electrostatic precipitators in removing particulates, but the remote siting would ameliorate whatever pollution problems might arise.

The other approach is the substitution of new, low-polluting kinds of generation. A crash program for nuclear plants is out of the question, in the NRC report's view, because of high costs and existing over-commitment by constructors of the plants. This leaves MHD or other new fuel-burning technologies.

A recent Office of Science and Technology report indicated that there are still unsolved materials problems in connection with MHD (SN: 7/5, p. 8). "These are not insuperable," says Dr. John B. Dicks of the University of Tennessee, who has been active in MHD research.

The crux of all these development needs is the little money being spent to meet them. And it is over the question of who should break loose with the money that a major fight is brewing between environmentalists and the power industry.

The NRC report recommends that a high level of Federal support is needed for several years for research and development of the more promising technologies. A similar investment by power companies, however, is not called for

... pollution

because, according to the report, the peculiar legal situation of utilities makes it impractical.

"As regulated monopolies, electrical utility companies are subject to the control of various governmental bodies, Federal, state and local," the report says, "Consequently, funds spent by utilities for development and application of pollution control processes may not readily be included in their capital structure, which is the basis for establishing consumer rates."

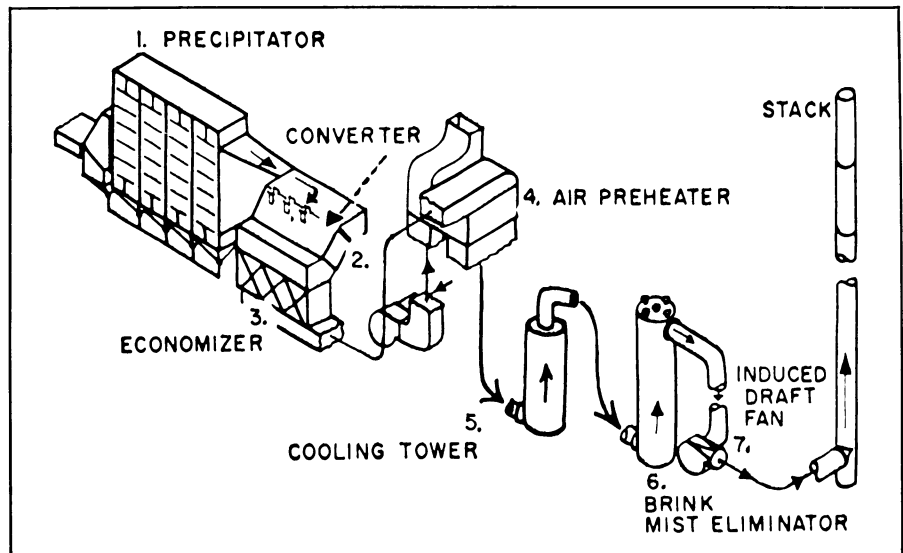
The impression from this statement, the only one in the report that refers to power industry research and development, is that the utilities cannot afford to spend such money because they get no reimbursement for it. But it is this position that is openly contradicted by environmentalists. In fact, they suggest, the power companies can get back the money by passing the cost along to the consumer.

The Federal Power Commission, for example, recently ruled that utilities may include R&D expenditures as a part of operating expenses. Since increases in operating costs can be used in requests for higher rates when figuring the return that utilities are allowed on their capital investment, R&D money would be included in any calculation of rates to consumers.

Although the FPC has only a small role in regulating utility rates—as the NRC report points out, control is largely in the hands of local regulatory agencies—environmentalists insist that local agencies are generally even more permissive about what constitutes expenses than is the FPC. Thus, they argue, the power companies should contribute their share to the expense of the problem, and could do so without fearing loss of their investment in R&D.

Air quality officials agree with the NRC that Government expenditures for sulfur oxide abatement should be increased—NAPCA estimates that a maximum program could effectively absorb \$250 million to \$300 million over the next four years, well above the \$18 million in the current budget.

But such a maximum effort should also be accompanied by industry contributions on a corresponding scale, according to NAPCA, and that kind of money has not been forthcoming so far. The agency reports that all industry has spent a total of \$50 million to \$60 million on research, development and demonstration of sulfur oxide abatement techniques, at a rate of \$15 million to \$20 million a year. Over half of this money came from the petroleum industry; some 13 percent, or \$7 million, came from electric utilities.



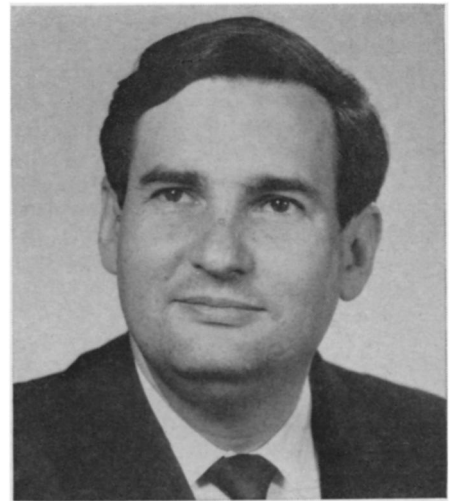
Monsanto

Cat-ox process: One of the more promising for removing SO₂ from flue gases.

There are indications that the situation is beginning to improve. On the industry side, the Edison Electric Institute says that research and development money is increasing, and the recent report of the President's Council on Environmental Quality (SN: 8/15, p. 133) recommends that incentives to accelerate industrial support for research, particularly by the power industry, should be considered.

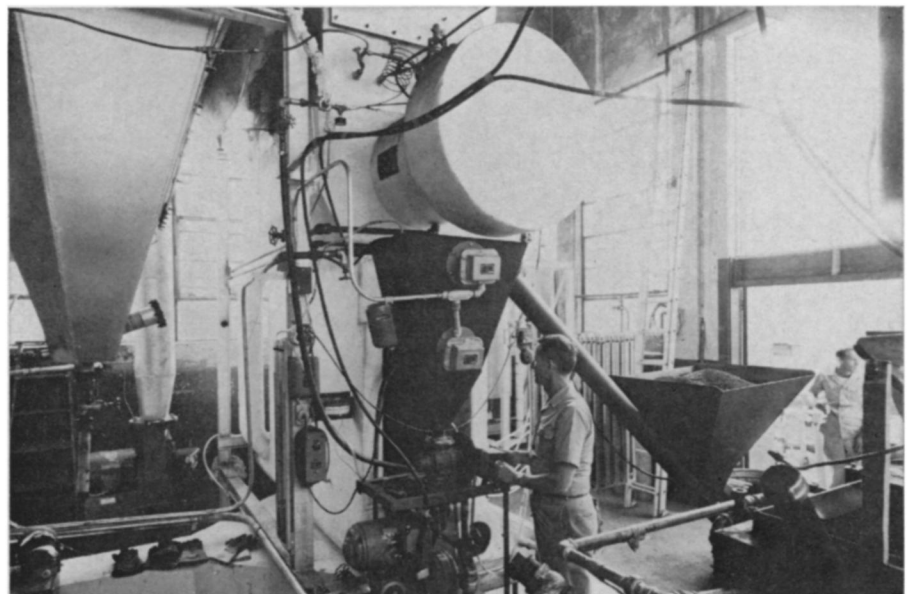
But the battle has just begun.

Says Dr. Dicks: "They (the utilities) could get rid of the sulfur dioxide problem if they wanted to. The power companies right now are panicked by the air quality standards being adopted by states (based on National Air Pollution Control Administration criteria) but so far it is mostly limited to worrying instead of acting." □



Univ. of Tenn.

Dr. Dicks: Utilities drag their feet.



Turner Studio

Fluidized bed boiler fixes SO₂ as sulfate during the combustion process.