

ILLINOIS POLLUTION CONTROL BOARD

MINUTES OF REGULAR INFORMAL MEETING, January 11, 1971
189 West Madison Street, Chicago, Illinois 60602

Mr. Richard Harrington of the federal Air Pollution Control Office answered Board questions respecting control techniques for sulfur dioxide and particulate matter. Mr. Kissel was absent conducting a hearing.

Mr. Harrington said that there was uncertainty about the extent of the supply problem in low-sulfur fuels; that the technology for desulfurizing oil is known but that much capital and up to five years' lag are necessary to employ it; that perhaps 20% of coal is cleanable to a 1% sulfur content; and that T. Kelly Janes of APCO (Durham) should be contacted for further information on fuel supply and cleaning. Advanced methods of electrical generation, he said, were promising but several years away.

No devices for stack removal of sulfur dioxide, he said, were yet commercially available, by which he meant that none had been satisfactorily tested at the prototype level, sufficiently large to permit scaling up to full plant size without unreasonable risk. Commercial availability, he said, would be assured when a manufacturer would guarantee not only efficiency but also longevity, completion dates, and capital and operating costs for a full scale plant. Several processes were however on the threshold of commercial availability, and stack removal would be the interim answer to the sulfur problem in this area for the coming ten years.

Among the more advanced processes for sulfur stack cleaning, Mr. Harrington said, are various lime scrubbing processes that utilize calcium oxide and water to form an insoluble sulfate, and remove 90% or more of the sulfur dioxide. The Bahco (Swedish) variant of this process has proved fairly successful in ten-megawatt demonstration units and a scaling up to 50 mw appears reasonable. Because of high space requirements and the necessity for calcining outside the system, Bahco is thought to be more appropriate to industrial combustion sources than to large power plants. But modular combinations up to perhaps 80 mw should be commercially available by mid-1971 on the basis of present demonstrations, and a completed installation could be expected within eighteen months thereafter, or by early 1973. Excessive magnesium in the limestone, he thought, might create solubility problems that could be solved at some expense by adding extra lime.

The Combustion Engineering approach is similar but calcines the limestone or dolomite by feeding it directly into the boiler. Two large units of this type have been built (at Meramec and Lawrence) but have not yet operated satisfactorily. With good

luck, this process should be commercially available by June 1972, so that backfitting could be completed by mid-1973 or early 1974. A Combustion Engineering unit could be bought today, but without guarantees.

Limestone scrubbing processes, Mr. Harrington said, are similar but use limestone instead of lime and therefore achieve only 80% removal rather than 90%. Development is somewhat behind the lime scrubbing processes but is expected to catch up. A 37 mw unit is being constructed at Key West and TVA will soon build a 500 mw one.

Magnesium oxide scrubbing (Grillo, Chemico) is similar in principle to the above except that it contemplates recycling of the reactant (with 3% makeup) to reduce solid waste disposal problems. Recycling of calcium would be somewhat more difficult because of the greater heat required to break down calcium sulfate, but even there recycling could increase efficiency by eight or nine times. Magnesium oxide is more expensive but recycling makes it competitive. Though these processes are not as well developed as lime scrubbing, they are not far behind. APCO is funding a 125 mw unit at Boston Edison. Grillo (a German firm) adds about 6% manganese, which is said to help recycling. Commercial availability for Grillo may be achieved by June 1972, with completed backfitting by June 1973. Operating costs for lime scrubbing are estimated at \$1.30 per ton of coal and capital costs at \$12 per kilowatt; for magnesium oxide the figures are \$1.50 and \$18.

Monsanto's Catalytic Oxidation process was operated at Metropolitan Edison in Reading in the 15-20 mw size range and Monsanto claimed the results successful. APCO is financing a 100 mw unit at Illinois Power that will cost perhaps \$6.7 million, or \$65-\$70 per kilowatt. This plant is at the stage of developing a firm cost proposal, after which detailed design will begin. Six months more for design and eighteen for construction plus six months of testing are required before commercial availability, and another year to complete construction of another unit; commercial availability is not expected before 1973. The market for sulfuric acid as a byproduct is important in the economics of this process.

Dry injection of limestone or dolomite into boilers without scrubbing is low in capital cost and easy to backfit, with costs roughly \$9 per kilowatt and operating expenses of \$1 per ton, and as low as 85¢ per ton for larger plants. Removal efficiency is only 25% for each stoichiometric dose of limestone, with a practical limit of about twice stoichiometric and thus a maximum of 50% removal. Moreover, the increase in dust emissions requires an increase in precipitator size, and in addition the

loss of sulfur increases ash resistivity and decreases precipitator efficiency. Mr. Otto Klein of EPA noted that sulfur is not essential for good precipitator operation unless the unit is designed to operate with high sulfur; witness collectors on basic oxygen furnaces. This process is in operation since mid-1970 at TVA's Shawnee plant near Paducah. The process should be commercially available by September 1971 and units could be functioning a year later.

Scrubbing processes, Mr. Harrington said, would logically be designed to allow interruption of scrubbing without boiler shutdown, and the Kansas Power and Light installation is of this design.

Mitsubishi has a dry-injection manganese oxide process with recycling of the reagent. It has been shown to function pretty well at the 15 mw level but requires refinement and calls for a good precipitator since MnO is itself a pollutant. Apparently it is applicable only to oil-fired units now since clean gases are required. It is more expensive than any other process save CatOx.

Reinluft is one of half a dozen char processes involving activated carbon to absorb SO₃ after catalytic oxidation and mechanical removal of particulates. The problem is with removing the SO₃ from the char. Washing produces a 25% H₂SO₄ of no value, and thermal regeneration of SO₂ for use in acid manufacture has a tendency to consume the char itself, and the four or five units built so far have burned down. This process is largely applicable to small facilities of 1-5 mw. Hatachi is similar; Japanese utilities are proceeding to build large Hatachi and Mitsubishi units and commercial availability could be reached by early to mid-1973.

Farther away from commercial availability, according to Mr. Harrington, is the Wellman-Lord process, which has been sold to Olin Mathewson for a sulfuric acid plant but whose test on a combustion source at Baltimore apparently demonstrated the failure of the potassium chemistry for which the process was designed. Stanford has been hired to report on the process, and it is believed it will be redone using sodium. The Stone-Webster process, which uses sodium with electrolytic regeneration, is in operation at a small (300 cfm) unit in St. Petersburg. The Tyco process, four or five years away at the very best, contemplates control of nitrogen oxides too by oxidation to NO₂ and the manufacture of nitric acid.

With respect to particulate control Mr. Harrington stressed the importance of particle size. Cyclones and other mechanical collectors he described as almost worthless: they remove the large "rocks" that cause local nuisance but not the fine particles that remain airborne, 5 microns or less. Precipitators, despite

their touted efficiency, have something of the same problem; they remove 99% or more of the total weight of particulates by removing the large ones and are relatively ineffective against particles in the 0.3 to 2 micron range. Scrubbers are not quite so sensitive to particle size, but only fabric filters adequately handle small particles. The small particles, moreover, are the ones easily respirable and the ones that most scatter light. The typical process weight approach does not therefore meet the problem; it would be better to speak in terms of collection efficiencies for various size particles. Although fabric filters cannot be used in all types of processes, they probably could be used on electric generating stations; costs are higher than for precipitators, but filters have been used on a few large pulverized coal furnaces.

With reinjection of removed particulate, a very high removal efficiency can still result in a dark plume because of the additional volumes of particulates. Moreover, Mr. Harrington said, there has been little followup to be sure that design efficiencies are actually met; cost competition creates a looseness, and a precipitator touted for 99% removal may not perform up to that level. Mr. Currie suggested this problem could be met by requiring a stack test before issuing an operating permit.

An APCO-sponsored study of coke oven emissions began six months ago and Carl Still of APCO-Durham has the information.

Mr. Dumelle reported that the Ohio River Valley Sanitation Commission had recently adopted effluent standards, some tighter than those proposed by the Board in #R70-8, and that he would circulate copies and write for a transcript of the ORSANCO hearings or other background information.


Mr. Dumelle agreed to work further on a proposed resolution for Board consideration respecting improvement of the federal-state water pollution conferences.

After preliminary discussion of ##PCB70-10, EPA v. Truax-Traer Co.; 70-17, EPA v. Charlett; and 70-8, EPA v. Glendale Heights, Mr. Lawton agreed to prepare opinions for Board consideration in #70-10 and Mr. Kissel in the other two cases. Mr. Kissel said he was preparing an opinion in #R70-3, Mississippi River Treatment Dates, and Mr. Dumelle in #R70-6, Phosphates, Lake Michigan.

Mr. Dumelle reported that he had heard the technology was available to cut noise from air compressors from 106 to 85 db, at perhaps 25% increased cost.

Mr. Dumelle said the City of Wheaton was holding hearings January 13 on regional sewage treatment and the DuPage County mayors and managers would meet January 20 to pass on that question, and that he would schedule the Board hearings on regionalization thereafter.

I, Regina E. Ryan, certify that the Board has approved
the above minutes this *3rd* day of *February* 1971.


Regina E. Ryan
Clerk of the Board