

provide for a switch to low-sulfur coal until the alert period is ended. Also, during such periods supplementary air monitoring activities are conducted.

While a number of alert periods have occurred since this procedure was initiated, at no time has significant buildup of pollution occurred.

It appears that for air pollution potential forecasts, power plants should be viewed as a special case for which the meteorological criteria normally used may not be applicable. For example, general air stagnation conditions prevailed in the Kingston Plant area for a 3-day period in the fall of 1964. TVA was alerted by the U.S. Weather Bureau at the beginning of the period and precautionary air pollution control measures were initiated. SO_2 autometers were checked at regular intervals. Special helicopter and mobile sample were conducted during the 3-day period. However, as it turned out frequency and concentrations of SO_2 recorded at ground level were no higher than during normal atmospheric conditions. Absence of SO_2 buildup was attributed to penetration of the low-level inversion by the hot stack gases and transport of the plume from the area by light, persistent winds. Under such conditions air pollution does build up in urban areas, as is evidenced by the abnormally high pollution levels which developed in large urban areas during a long period of air stagnation over much of the Eastern United States in November and December 1962.

OPERATIONAL CONTROLS

The limited special use of low-sulfur coal at the Kingston Plant is the only operational control that TVA has used so far for air pollution control at its plants. However, there are a number of other potentially useful operational controls which might be used singly or in combination to reduce emissions, enhance dispersion, or both, during periods when ground level concentrations of stack emissions might be expected to exceed desired control levels. Among these are load reduction, chemical removal of SO_2 by limestone injection, and raising the temperature of stack gases to increase plume rise. In addition to the obvious operational problems and costs involved in application of measures such as these, there is the problem of forecasting air pollution potential far enough in advance to permit effective application of the controls and accurately enough to limit their use so far as possible to periods when they actually are needed. Intensive dispersion studies at the Paradise Plant are expected to lead to better use of meteorological and operational data in predicting significant ground concentrations. In addition, the studies are expected to result in further improvement in formulas for dispersion of emissions from large power plants with high stacks.

RESEARCH ON REMOVAL OF SO_2 FROM POWER PLANT STACK GASES

Early in its air pollution studies TVA directed attention to possible processes for removal of SO_2 from power plant stack gases. TVA's interest in development of a practical process was twofold: for use, if needed, as an air pollution measure, and also as a possible source of sulfur for fertilizer production and other purposes.

In 1953 TVA initiated research and pilot plant work toward this end at its fertilizer development laboratories. The work consisted of the following: (1) an extensive review of the literature and other available information on the recovery of sulfur dioxide, (2) pilot-plant development of an ammonia-scrubbing process for removal of sulfur dioxide from the stack gases, (3) tests of methods for recovering sulfuric acid, ammonium sulfate, and elemental sulfur from the scrubber solution, (4) preparation of investment and operating cost estimates for the process, and (5) small-scale research studies and exploratory pilot plant tests of several alternate methods for removal of sulfur dioxide.

Among the alternate methods of SO_2 removal which we studied were (1) absorption by activated carbon, (2) absorption by a slurry of steam plant ash, (3) vapor phase reaction with ammonia, (4) scrubbing with a suspension of limestone, (5) catalytic oxidation to yield sulfuric acid, (6) catalytic oxidation in the presence of ammonia to yield ammonium sulfate, (7) absorption and oxidation by a slurry of regenerated manganese oxide, with further processing to yield sulfuric acid, (8) absorption by a slurry of rock phosphate to render the phosphate soluble, and (9) injection of pulverized limestone into the exhaust gases.