

gory are studies on the formation of hydrogen sulfide from the action of moisture on blast furnace slags.

We concur with this subcommittee that no technology is available to deal with nitrogen oxides, if in the future that proves necessary. Research on the control of emission from coke ovens is being accelerated by the steel industry. It appears that most of this experimentation will have to be done on plant equipment.

The first step is to confine the escaping gases and then to clean them. The program consists of an engineering evaluation of industry and suppliers' ideas, installation of devices on commercial equipment, followed by evaluation of the good and bad features as well as the effectiveness of the devices. Further changes are then made as indicated.

In water pollution abatement technical advances would be most welcome in the treatment of mine acid discharges and in the development of methods for slowing down or stopping the formation of the constituents found in mine water discharge.

As you know, the control of ammonia and other nitrogen compounds is often discussed in dealing with excess nutrients going to receiving waters. The steel industry is faced with large volumes of plant discharges containing a few parts per million of ammonia. No economically practical system for treating such wastes is known.

A particularly thorny problem arises when chlorides are discussed since no practical method for removing them is known.

I served on the Technical Committee to the Conferees of Lake Michigan to recommend water quality criteria. Research needs are listed in the report of this committee. The first is to obtain a better understanding of the causes of eutrophication.

While it appears to many that a limitation on the phosphate content holds the best promise for reducing the rate of eutrophication, actual limits are in doubt. Although the Conference dealt mainly with protecting Lake Michigan waters, many streams suffer from eutrophication. In a recent paper by McDonnell and Koutz, "Algal Respiration in a Eutrophic Environment," *JWPCF*, 38, 841 (1966), linear regression analysis was used to determine the primary factors affecting the dissolved oxygen resources in Spring Creek. This stream in central Pennsylvania is characterized by excessive plant and algal growth. The waters of Spring Creek receive the completely treated effluent from the sewage plant serving Penn State University and the surrounding community. Several fish kills and the gradual deterioration of reaches of the upper stream prompted an investigation of the ability of Spring Creek to assimilate organic pollutants imposed by the sewage plant effluent. It was demonstrated that the biological oxygen demand (BOD) remaining in the treatment plant effluent had little if any effect on the depletion of dissolved oxygen at the critical stream sag point. Excessive algae are evidently the culprits.

The authors believe the solution lies in the removal of nitrogen and phosphorus from the effluent. For Spring Creek further investigation is required to answer the question of how much removal of nitrogen and phosphate is necessary. Is it possible that control of phosphate alone would solve the problem? I feel certain that many streams should be studied in a similar manner to Spring Creek in order that the correct control measures may be applied.