The use of high stacks is successful in the West where the population is sparse. It should be used with caution, however, in heavily populated areas, as the net effect of high stacks is to disperse the pollutants over a large area at high altitudes and so may reduce sunlight, give an appearance of dirtiness to the whole area, and in general insult the aesthetic senses of the community.

Another method of control through atmospheric dilution that is receiving increasing consideration is curtailing or shutting down operations when the meteorologic factors preclude adequate dilution. One of the first such procedures used was in Trail, British Columbia. When ground concentrations reached a certain level, the plant curtailed or shut down operations until the weather conditions were more favorable for dispersion. Later this smelter employed large holding tanks and discharged their effluent into these tanks until the weather conditions were favorable, then the contents of the tanks were discharged into the atmosphere. In 1954 the Governor of California requested the oil refineries to shut down until meteorologic conditions became more favorable. Los Angeles County now has a plan whereby industry, automobiles, and other sources of pollution will cease operation if weather factors prevent dispersion for an extended period of time.

C. SUBSTITUTION

The principle of substituting materials and methods to lessen hazards has been used successfully for many years in industrial hygiene. It has been used to some degree also in air-pollution work. Probably the most noted example of this method of control is the substitution of Diesel for coal-burning engines on trains. Until this change came about, the switch engines, particularly, were a constant cause of complaint from the citizens. In addition to improving their relations with the smoke inspectors and the community, the railroads found that the Diesels were more efficient and more economical.

Many industrial processes today contributing to air pollution can be redesigned to comply with the most rigid air-pollution law if adequate deliberation is given to the problem by the process engineer in cooperation with the air-pollution engineer. Wise management takes air pollution into consideration before expanding present facilities or building new plants.

Another example of this method of control is the elimination of backyard incineration, as recommended in Los Angeles, and the substitution of other means of disposal, such as the use of sanitary landfills.

In Los Angeles one theory has been that reduction in the emission of hydrocarbons from auto exhausts would eliminate the smog problem. There have been many suggestions as to how this can be done. One method considered by the authorities is the use of an alternate fuel to gasoline, such as liquefied petroleum gases. Another possibility is the limiting of the number of automobiles in the area, providing in their place an adequate mass transit system.

London, England, has been bothered with air pollution for many years. Several groups studying the problem have recommended that central heating systems be installed and the homes provided with heat from these systems, in order to eliminate one of the major sources of pollution, the home heating unit. The central heating units could easily be provided with proper controls for the elimination of smoke.

D. ZONING

Zoning as a method of control has merit in eliminating nuisances, but if meteorologic conditions were such as to cause a disaster in the area, this procedure would have little value, unless the plants were requested to close. In zoning a community, consideration must be given to prevailing wind direction and speed, wind turbulence, frequency and severity of temperature inversions, and topography. After these factors have been considered and the community zoned, residential buildings should be prohibited in industrial areas, as industry is prohibited in a residential zone. In applying the principle of allocating land for industrial purposes, it is desirable to know the maximum levels that various contaminants can reach before injury to health and excessive damage to property occur, so that some measures could be taken to prevent the contaminants from reaching such levels.

VI. Legislation

A. PAST PRECEDENTS

How limited is the power of the states to control air pollution? Could control be so stringent as to ruin an established business, regulate the manner of doing business and the use of property, or prohibit it altogether, or require large expenditures for equipment, if necessary? An answer to these questions can be obtained by reviewing state laws and state and federal court decisions.

Available only prohibitive provisions in the federal Constitution that apply to the police power to control smoke nuisance (or air pollution) are the "due process" and "equal protection" clauses of the Fourteenth Amendment, which states: "Nor shall any state deprive any person of life, liberty, or property, without due process of law, nor deny to any person within its jurisdiction the equal protection of the laws." This clause, however, has not been a strong factor in defense tactics, and it has been settled that any provision of a statute or ordinance regulating a nuisance (such as smoke) is valid, in so far as the due process clause is concerned, if it is reasonably necessary for the accomplishment of the purpose and for the public welfare generally, and if it is not unduly oppressive, does not arbitrarily interfere with private business, nor place extraordinary and needless restrictions upon a lawful occupation. The pivotal point of the cases tried has been the "reasonableness" of the law in dispute—which rests on the facts and circumstances of each case. It has been settled that a law is not invalid because it puts an establishment out of business, or requires expenditure of large sums of money