be harmful levels in many regions of the country. We do not have adequate technology for controlling nitrogen oxides.

There are some pollutants, like the sulfur oxides, which today almost constantly reach harmful levels in most of our metropolitan areas, and the increasing use of sulfur bearing fuels for energy and other purposes will undoubtedly aggravate this problem in the years ahead. We have reached the prototype stage in one approach to controlling the sulfur oxides, but for the most part we can control sulfur pollution today only by using low sulfur fuels. There are some sources of pollution, like the automobile, whose emissions we can today partially control, and the Federally required national application of this control to new cars in the fall of next year will be a significant step in halting pollution from the motor vehicle. But the rapidly increasing number of automobiles will in the next two decades wipe out the gain from today's partial controls. Further, Mr. Chairman, we can not be complacent about the attractiveness of much of the technology for controlling air pollution. Pollution controls generally do not increase the efficiency of industrial production or improve the quality of the product. In fact, since in our marketplace the focus is on minimizing costs and maximizing returns, present day pollution controls, which add to costs and not to returns, are frequently considered an impediment by those who operate the sources of pollution. We can expect that this attitude will prevail as long as regulation of pollution varies from place to place, or until the technology of pollution control is developed to the point where control is not considered to be an economic impediment by industry.

I would like in the remainder of my statement, Mr. Chairman, to review in some detail the current adequacy of technology for controlling air pollution, and to describe the efforts the Federal Government is making to advance this technology.

MOTOR VEHICLES

Certainly one of the major sources of air pollution in this country is the gasoline powered motor vehicle. Today's motor vehicle discharges four significant pollutants to the atmosphere: carbon monoxide, which is a toxic gas; hydrocarbons, which in the presence of sunlight react with nitrogen oxides to form photochemical smog, which in turn has been widely observed in its damage to plants and its irritating effects on the eyes; the nitrogen oxides, which not only contribute to smog but which in high enough concentrations are hazardous themselves; and lead, which is receiving increasing attention by the Public Health Service of this Department and others because of the possibility that, even in very low concentrations in the environment, lead may have adverse effects on certain segments of the population.

Thee are four sources of emission in conventional motor vehicles: the tailpipe, which is the most important source of hydrocarbons and the only significant source of nitrogen oxides, carbon monoxide, and lead; the crankcase, which receives unburned hydrocarbons blown by the engine pistons and which until recent years vented to the atmosphere through a tube; and the gas tank and carburetor, both of which permit hydrocarbons to evaporate to the atmosphere.

Under the 1965 Amendments to the Clear Air Act Secretary Gardner has issued emission standards for all new gasoline-powered automobiles and light trucks sold in the United States commencing with model year 1968. These standards require 100 percent control of crankcase emission, and limit the concentrations of hydrocarbons and carbon monoxide that can be discharged from the tailpipe. The standards apply for the life of the vehicle, which is defined as 100,000 miles.

Crankcase blow-by can be burned by returning it to the engine intake system. This practice is not new to European car makers and has been used for years in America on certain special-purpose vehicles. There are variations in design: some return the blow-by to the dirty side of the air cleaner, others to the clean side, and still others to the intake manifold through a variable-orifice metering valve. A further variation, now required in California, consists of dual return paths of blow-by gases—to both the intake manifold and the air cleaner.

The principal approach to controlling tailpipe emissions is through engine modification. In meeting the Federal standards on tailpipe emissions, all but one of the country's car makers is expected to us what has been termed manifold air oxidation. Air is introduced under pressure to the exhaust manifold near each exhaust valve. This additional air at this high temperature location oxides some of the unburned exhaust hydrocarbons and some carbon monoxide. The system is accompanied by minor changes in carburetion.