ENVIRONMENT

A Burning Issue

IT is clear that the British government is soon to take the first steps towards its long promised regulation of car exhaust emissions. As long ago as December 1970, Mr Peter Walker was making vague promises about limiting exhaust emissions, and it seems that the first step will be the reduction of the permitted lead levels in petrol by 25 per cent.

This reduction, however, is simply paying lip service to the real problems. The average lead level in British petrol in 1971 was 0.54 g $l.^{-1}$. The current permitted lead level is 0.84 g $l.^{-1}$, and following the 25 per cent reduction—if that is all it proves to be—that level will drop to 0.635 g $l.^{-1}$; such a reduction will make little or no difference to lead levels in Britain. Even the lead levels of five star petrol—which forms a comparatively small part of the total sale—were only 0.64 g $l.^{-1}$ last year.

Last year British cars swallowed 14.5 million gallons of petrol and in so doing put 9,000 tons of lead into Britain's air. Yet there is no evidence to show that the lead levels found even in the busiest streets in Britain are dangerous to adults.

Nonetheless the cry for the removal of lead goes up, and when it comes to environmental issues in politics it is one of the easiest bandwagons upon which to jump. But if lead is to be removed, people must be prepared to pay. Removing the lead from petrol completely would involve building £200 to £250 million of extra refining plant in Britain alone. There would be smaller amounts of high octane petrol available, and virtually no five star grade. A gallon of petrol could cost between 2p and 3p more, which would put between £5 and £10 on the average motorists' annual petrol bill and between £80 and £120 million on Britain's. Alternatively, the compression ratios of cars could be lowered and lead free petrol used. The result would be a 10 per cent fall in efficiency or a ten per cent increase in the amount of fuel used if efficiency is to be maintained.

Lead is put into petrol—and has been since 1925—as an anti-knock agent. It is the simplest and cheapest method known to raise the octane level that modern high compression cars demand.

The call for its removal is on two counts. First, that lead is cumulative both in the environment and man ; and therefore pouring 9,000 tons of it into the atmosphere a year cannot be a good idea. Second, lead damages the catalysts that various companies are trying to develop to remove the hydrocarbons, nitric oxides and carbon monoxide from exhaust gas in order to meet the 1976 Federal emissions standards in the United States. These are 0.41 grams of hydrocarbon per mile, 3.4 grams of CO per mile, and 0.4 grams of oxides of nitrogen per mile. These figures represent a fall of 90 to 95 per cent on uncontrolled emissions.

At present European standards are generally easier than the proposed American ones, but there is no doubt that Europe will follow America's lead.

In the short term the best hope of meeting the 1976 standards seems to lie in "hang-on" devices. These involve exhaust gas recirculation, injecting air into the manifold or attaching catalysts to the exhaust system to render the gases harmless. Because of the possible financial returns on a successful catalyst many companies are examining the last possibility. The biggest fly in the ointment as far as these are concerned is that one of the rider clauses to the 1976 levels is that the catalyst system must last 50,000 miles. Apart from the problem that to test a catalyst under real road conditions takes the best part of a year, there is also the problem that many exhaust systems fall apart before the car has travelled 50,000 miles.

The chief problem with exhaust gases is the oxides of nitrogen. The carbon monoxide and hydrocarbons can be dealt with efficiently by oxidation, but removing the nitrides of oxygen is more difficult, although it can be done, but probably not for 50,000 miles and probably not cheaply. British Leyland and ICI have developed a system that looks promising, and Shell among others is also working on the problem. No one has yet tested any system successfully to 50,000 miles, and current estimates put the extra cost per car for any foreseeable catalyst in the order of £100.

In the long run—and maybe even in time to meet the 1976 standards—there may well be other, more radical answers to exhaust emissions, involving major redesign of the internal combustion engine, electric or diesel engines, or the limited use for car fleets of liquefied natural or petroleum gas.

One of the most promising ideas is a lean mixture system being developed by Shell at its Thornton research centre. The compression ratio of most cars is about 12 : 1, but by producing a perfect mixture of air and fuel and feeding it to the engine Shell has succeeded in getting a car to run perfectly in the laboratory at a ratio of 22.5 : 1. (A normal car would be backfiring severely at about 17 : 1.) With this system the emissions fall dramatically, although hydrocarbon emissions remain high, but Shell points out that this is less of a problem than having to remove excess oxides of nitrogen. There is, however, a serious power loss with the system (this could be overcome by increasing engine size) but there is also a considerable saving of petrol, because the mixture is so lean. At the moment the system consists of 2 tons of laboratory equipment which needs shrinking to an acceptable size and fitting with a revolutionary carburettor which someone has yet to design. It is clear that, however it is done, clean air is going to cost.

UNIVERSITIES

Five Years On

THE time is drawing nearer when Mrs Margaret Thatcher, Secretary of State for Education and Science, must decide on the future of the universities for the next quinquennium, but there are, as yet, few indications of what is in her mind.

The announcement of the allocation of resources—which are distributed by the University Grants Committee—must come by the autumn of this year, although it is possible that the announcement could come towards the end of the next session of Parliament. The UGC has put its submissions to Mrs Thatcher, and the universities must await the outcome.

The student numbers towards which the universities have been working are 320,000 by 1976/77, compared with the 234,000 in universities this year. This is the figure suggested by the UGC in its preliminary memorandum of guidance, but the government is in no way tied to this figure. Memoranda from the Committee of Vice-Chancellors and the Association of University Teachers among others have made it plain that to many this figure is the minimum acceptable. There have, however, been rumours—and they are only rumours—that this figure may be cut to 305,000 by 1976/77. The universities have to compete for funds not only with the polytechnics, but also with the colleges of education and the schools, within the education budget. Added to this there is the current difficulty in finding jobs for graduates to the extent that 9 per cent of last year's applied science graduates and 6 per cent of pure science graduates were still unemployed in December.

Whatever the final numbers, it seems likely that the largest expansion will be in the arts, not the sciences. The buildings already in existence for science and technology will be able to handle the expected increase in science students, and it is in science that the unused capacity in the universities lies. For science, the next quinquennium looks like one of consolidation, not expansion. Further, the spare capacity is likely to be used for undergraduates rather than postgraduate work. It is certainly the opinion in some university science departments that the money for research is going to have to come increasingly from the research councils and industry.