

'Clean' diesel engines dirtier than gas guzzlers.

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THE next generation of "clean" diesel engines, designed to deliver greater fuel economy and lower emissions of greenhouse gases, will still create more smog-producing pollutants than their petrol-driven counterparts.

The finding emerged from the first comprehensive analysis of the potential environmental impact of diesel engines fitted with nitrogen oxide filters and particle traps, which are designed to cut levels of these pollutants. Engines of this type are due to go on sale in passenger vehicles in the US later this year.

Mark Jacobson, an engineer at Stanford University in California and his colleagues used a survey conducted in 1999 by the Environmental Protection Agency (EPA) that made hundreds of thousands of measurements across the US. The researchers then modelled how air pollution would change if all petrol-burning cars were swapped for diesel cars equipped with the latest filter technology.

As a starting point for the models, the team measured different levels of nitrogen oxides--the chemicals that contribute to ozone formation--likely to be emitted by the new diesel engines. In every scenario, the ozone level near the ground increased, in one scenario by more than 50 per cent.

"Replacing gasoline vehicles with 'modern' diesel vehicles, which contain stringent pollution-control equipment, might still make smog worse," says Jacobson. His team will publish its results in a forthcoming issue of *Geophysical Research Letters*.

Ozone, one of the main components of smog, is produced when oxides of nitrogen react with hydrocarbons. The two groups of substances are emitted by internal combustion engines of all types. The reaction is triggered by sunlight, which is why smog is worse during summer months and at lower latitudes.

Paradoxically, even though a complete changeover to modern diesels would produce more smog overall, certain dense urban areas such as Los Angeles and New York might experience slight local reductions in ozone.

This is because urban areas are devoid of vegetation, a natural source of hydrocarbons, says Jacobson, and modern diesel engines with particle traps produce lower levels of hydrocarbons than petrol engines. So in cities that lack heavy vegetation, the low level of hydrocarbons would limit the production of ozone.

But in most of the rest of the US, especially in the lush and forested parts of the south-east, the situation is reversed. Where natural hydrocarbons are relatively abundant, it is the level of nitrogen oxides that dictates the amount of smog that forms, and this is higher even with the "clean" diesel engines, Jacobson emphasises that his models predict that ozone levels would increase over more than 75 per cent of the continental US.

DaimlerChrysler, one of the manufacturers planning to introduce new diesel engines, points out that all diesel and petrol-driven vehicles will be held to the same EPA emissions standards by 2009. It also says that new engines to be fitted in the Mercedes-Benz E-Class sedan and Chrysler Jeep Liberty, which will go on sale later this year, will be more fuel efficient than earlier versions and produce less carbon dioxide, the main culprit in global warming.

The engines will also meet strict new regulations for particle emissions produced by new vehicles, the most stringent pollution standards of their kind in the world, due to come into force in California later this year. Furthermore, they will come close to meeting California's new standards for nitrogen oxides. But the research by Jacobson's team suggests that such benefits will still come at a price.

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