



Reducing friction

Friction conflicts with the progress of the car and the engine must overcome it, requiring additional power... which is a handicap in terms of fuel consumption. All the moving parts of a car – engine, tyres, transmission – are sources of friction. It may not be possible to banish it completely, but **reducing friction optimises the overall efficiency** of the vehicle and helps minimise its polluting emissions.



RENAULT COMMUNICATION

BASIC FACTS

In mechanics, as soon as there is movement, there is friction, so any wish to eliminate friction completely would be utopian. Reducing it, however, makes it possible to improve the overall efficiency of a mechanical system. In automobiles, this takes the form of reducing the power that an engine needs to deliver under identical driving conditions, and so cutting polluting emissions. The studies that Renault is carrying out to reduce the friction of its vehicles have an impact on numerous aspects of fuel consumption and, consequently, of exhaust emissions.

IN SHORT

By reducing friction, it is possible to increase the overall efficiency of the car and thus to minimise its exhaust emissions.



➤ HOW DOES IT WORK?

There are two basic types of source of friction: those that are inherent in the design of the vehicle and the technologies that it employs, and those relating to external factors. With regard to the design of the vehicle, numerous solutions have already been found or are under study.

- **The engine** contains numerous moving parts. Friction is directly linked to the contact between surfaces. One of the effects of making the pistons smaller is a reduction in the size of contact surfaces, and hence in friction. Downsizing (see sheet) is a move in this direction.

- **Valve timing** is also a major source of friction in the engine. To reduce it, Renault has equipped some of its engines, such as those powering the Laguna 1.6 and 1.8 16 V, with a roller bearing rocker arm. This configuration makes it possible to reduce friction by up to 50% depending on engine speed. Electrical timing, which makes it possible to dispense with the camshaft and timing belt, will further reduce internal friction in the engine.

- **The gearbox** is also the subject of studies intended to minimise internal friction. In addition, such new solutions as robotised gearboxes (see sheet) mean that the power used by the gearbox to perform a gear shift is reduced to the absolute minimum.

External sources of friction are often linked to the environment of the car or to consumables.

- **Aerodynamics** (see sheet) also plays a large part. By improving the car's penetration of the air, it reduces the car's resistance to forward movement at high speed, which can be assimilated to friction with the air.

- **Oil and tyres** have a direct impact on friction. To gain a better understanding of each problem, Renault has created close links with oil manufacturers, such as Total, and tyre manufacturers, like Michelin. On these two points, the attitude of users is also of great importance. Used oil loses part of its lubricating qualities and becomes less effective in opposing friction in the powertrain components.

- **Tyres** inflated to the wrong pressure, in addition to posing a danger, can considerably increase the rolling resistance of the wheels. The tyres must effect the balance between grip and rolling resistance. The right trade-off can only be achieved for a precise contact surface between tyre and road, directly linked to tyre pressure. Oil and tyres are two aspects that the driver must keep close watch of in order to maintain the overall efficiency of his car.