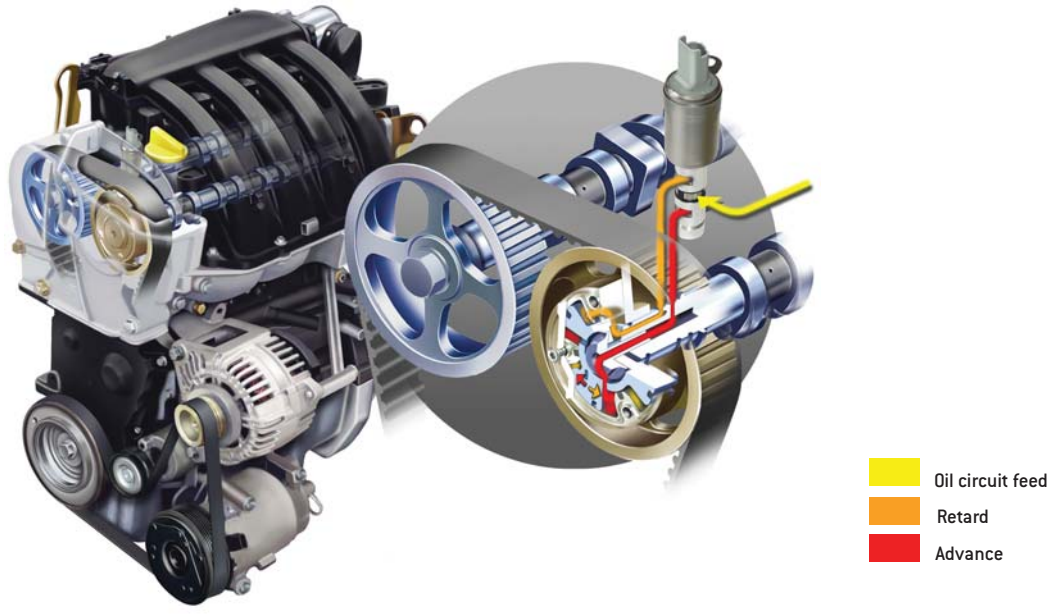
Camshaft angle variator

⁘ The camshaft angle variator optimises the operation of the engine at each engine speed by modifying valve opening and closing according to the angular position of the crankshaft. It gives the engine more torque at low revs, and more power at high engine speeds. It also minimises fuel consumption and polluting emissions.



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⁘ BASIC FACTS

On traditional engines, the opening and closing positions of valves are fixed in relation to the angular position of the crankshaft. They are thus optimised for a given engine speed, but, as they do not take into account the influence of the flame face propagation velocity, they remain more approximate at other speeds. The camshaft angle variator therefore varies the timing of valve opening and closing as a function of the angular position of the crankshaft, according to the speed and load of the engine

If the engine has a twin overhead camshaft, the variator can be located either on the intake or on the exhaust. Optimisation of the intake improves the engine output at high speed, its fuel consumption and its exhaust emission levels, increases its torque at full load and even substitutes for the EGR valve by increasing the overlap between the intake and exhaust valves. The exhaust valve reduces both consumption and exhaust emissions under partial load. If the engine has only a single camshaft, it is not possible to play on valve overlap. The same shift of angular position in relation to the crankshaft is applied to the intake and the exhaust. In addition to the fact that the variator makes it possible to dispense with the EGR valve, it reduces engine consumption under partial load.

IN SHORT ⁘⁘⁘

By adjusting the opening and closing of valves according to engine speed and load, the camshaft angle variator optimises the operation of the engine, giving it more torque at low revs and more power at high revs, at the same time as reducing polluting emissions.

: HOW DOES IT WORK?

Two types of camshaft angle variators exist. The first one is based on a piston combined with helical teeth. This is located on the inner face of the distribution belt pulley. In these teeth are placed gears that are interdependent with the camshaft. The piston allows axial movement of the gear in relation to the helical teeth of the pulley, rather like driving down a corkscrew. When the piston moves the gear in relation to the helical teeth, it swivels slightly. Thus, depending on its position, a more or less great angular shift appears between the camshaft and the pulley and consequently between the crankshaft and camshaft.

However, this complex device is increasingly giving way to the "paddle" variator. This is still located in the camshaft pulley. A rotor separates the chambers, which are cavities arranged in the body of the pulley. By injecting oil under pressure on one or other of the faces of the separator that the rotor forms, the rotor tends to pivot in either one direction or the other. There are "advance" and "retard" chambers, depending on the direction of the shift induced on the camshaft. It is by applying oil under pressure using a solenoid valve to one or other of these chambers that the computer can control the camshaft shift. Depending on the application, this operation can be carried out either in all or nothing mode or uninterrupted. In the first case, two extreme values of shift are available. If the system works in continuous mode, the shift can then take an unspecified value between these two extreme positions to optimise the operation of the engine still further.