Cylinder Deactivation

Cylinder deactivation is when a number of cylinders are shut off under low-speed and low-load engine conditions. Fewer cylinders are instead run at a higher load to maintain the same power. For example, in a standard four-cylinder engine, the two middle cylinders can be deactivated.

Switching off cylinders is another form of downsizing – as it is effectively creating a smaller engine which can work more efficiently and save fuel in the process. This is because it reduces the amount of throttling required – and therefore limits engine pumping losses – giving a significant reduction in fuel consumption when cruising at constant speed. For an average driver, this would equate to about a 4-6% reduction in fuel consumption. However, this does also present some challenges around noise, vibration and harshness when switching between 2 and 4 cylinders, plus the fuel consumption benefits are largely restricted to lower speed driving.

Looking at global engine production, the use of cylinder deactivation was previously seen on large V-engines in the US market. But production forecast data predicts an increase in global use to almost 10% in 2025, compared with just 3% in 2015. A lot of this is being led by Europe and China, with adoption by large manufactures such as Volkswagen, Ford and General Motors.

Having a mix of deactivated and working cylinders at the same time leads to a difference in pressure and temperature across the cylinders. Nozzle coking can be a risk for both activated and de-activated cylinders. Active cylinders will be working harder and in higher temperatures, meaning increased wear and the potential for nozzle coking to develop.

In deactivated cylinders, the valves are kept closed to trap exhaust gas to keep it warm for when it's reactivated. Without fuel being injected into the cylinder, the mechanism of using fuel to wash off deposits is lost. This, in conjunction with trapped exhaust gases such as NOx, could increase deposit build-up in the engine. This would lead to reduced engine efficiency and Low-Speed Pre-Ignition from poor fuel spray patterns.

Therefore, good quality additised fuel which includes friction modifiers and anti-wear chemistry would be extremely beneficial.

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