



Cybrand AEC's Jerry Darlington explains the Defender's new exhaust after-treatment to Ed Evans

Defender comes clean on emissions



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Win, win
After covering 2000 miles with the SCR system installed, the Euro 6 Defender drives like any other 2.2-litre model, yet leaves a healthier environment in its wake.

Thanks to an independent developer, Defender TDCi goes Euro 6 compliant and emission zone friendly. Ed Evans reports

DEFENDER 2.2-litre diesel models built from 2011 onwards to the old Euro5 emissions requirements can now be upgraded to Euro 6 compliance. British-based Cybrand AEC's Defender-specific conversion service is a new development which has been available only since the beginning of February, and uses established exhaust treatment components developed and manufactured by the German emissions specialist, HJS.

For 2.2-litre diesel Defender drivers, this means the daily charge for entering urban Low Emissions Zones will no longer apply to their vehicles. It's a massive reprieve for the original shape Defender, especially as more towns and cities across the UK introduce their own low emission and clean air zones.

Cybrand AEC's Defender 90 development vehicle, equipped with the Euro 6-compliant technology, was submitted for Euro 6 emissions testing in January this year and gained full German type approval (applicable to EU countries and the UK). Orders for

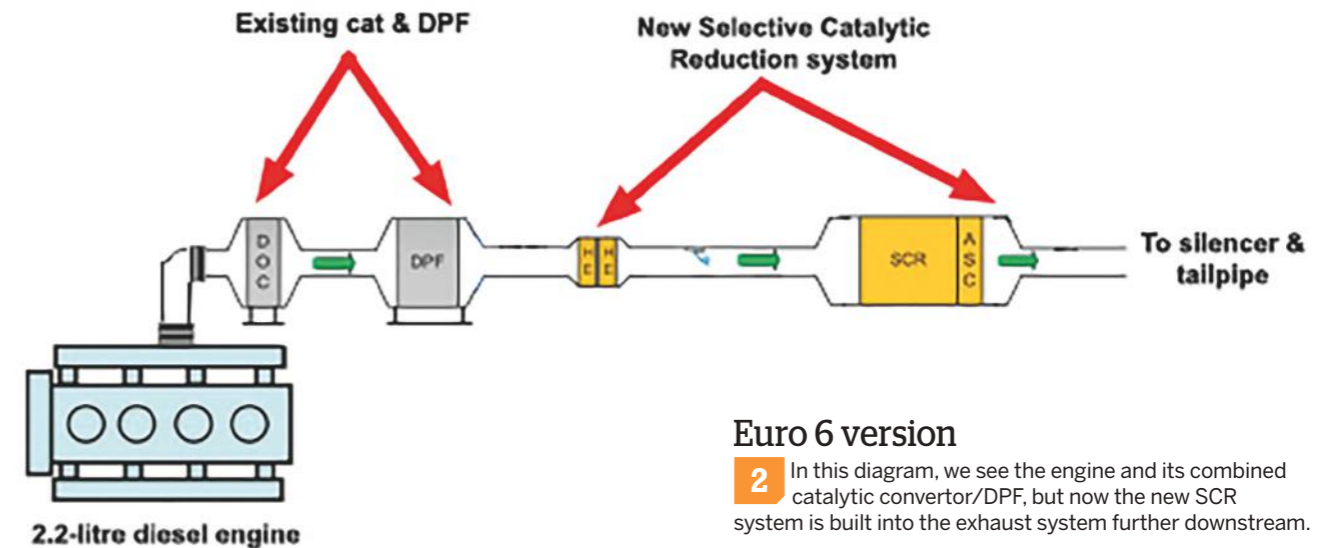
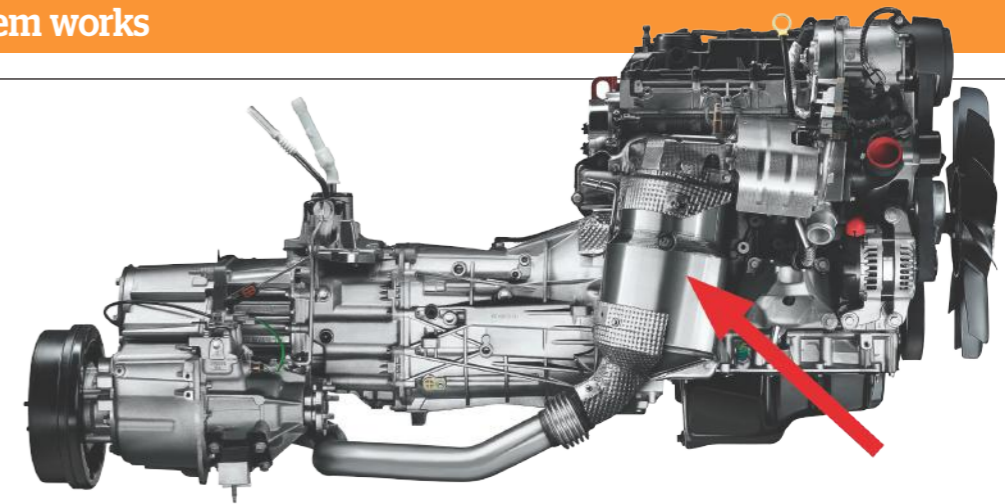
conversion were being taken from February 1. The Euro 6 Defender uses established technology known as Selective Catalytic Reduction (SCR). It works on the same principles as the SCR system fitted by Land Rover to all its diesel models from model year 2016 onwards. SCR reduces the harmful oxides of nitrogen (NOx) emitted from the tailpipe — the area in which the production Defender failed to meet Euro 6. Cybrand's installation is an addition to Defender's existing exhaust after-treatment which comprises a combined catalytic converter and Diesel Particulate Filter (DPF) in the engine bay. The new Selective Catalytic Reduction system is located further downstream in the exhaust system, beneath the vehicle.

Developer, Jerry Darlington of Cybrand, explains that during Euro 6 Type Approval certification tests, the Defender achieved an 83 per cent reduction in NOx emissions. That comfortably exceeds the 55 per cent reduction demanded over the original Euro 5 spec.

How the SCR system works

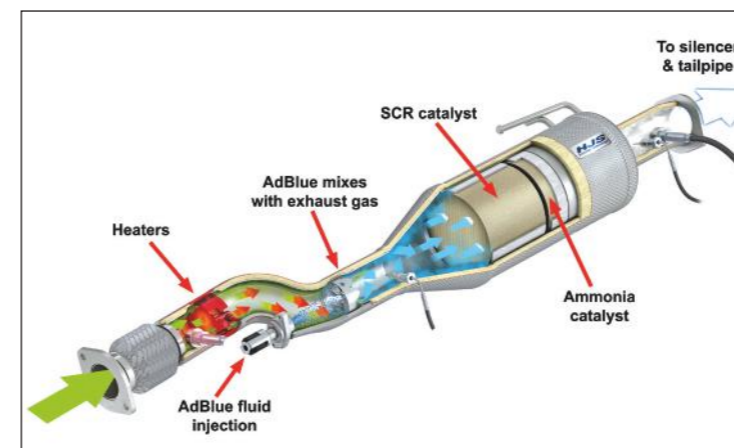
Existing exhaust treatment

1 On the standard Euro 5 compliant Defender, exhaust gas from the turbocharger passes directly into the combined catalytic converter and Diesel Particulate Filter (arrowed), and from there through the silencer to the tailpipe.



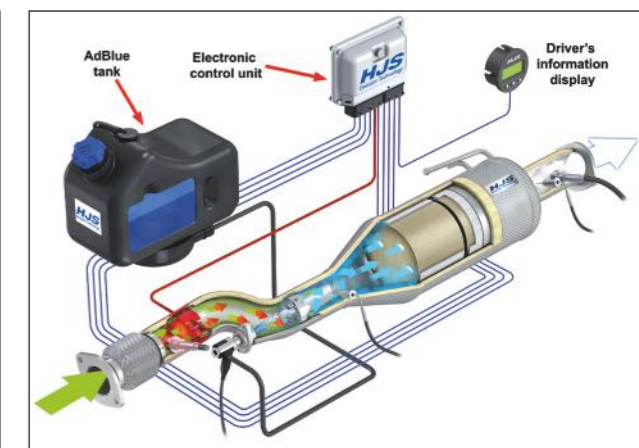
Euro 6 version

2 In this diagram, we see the engine and its combined catalytic converter/DPF, but now the new SCR system is built into the exhaust system further downstream.



SCR in detail

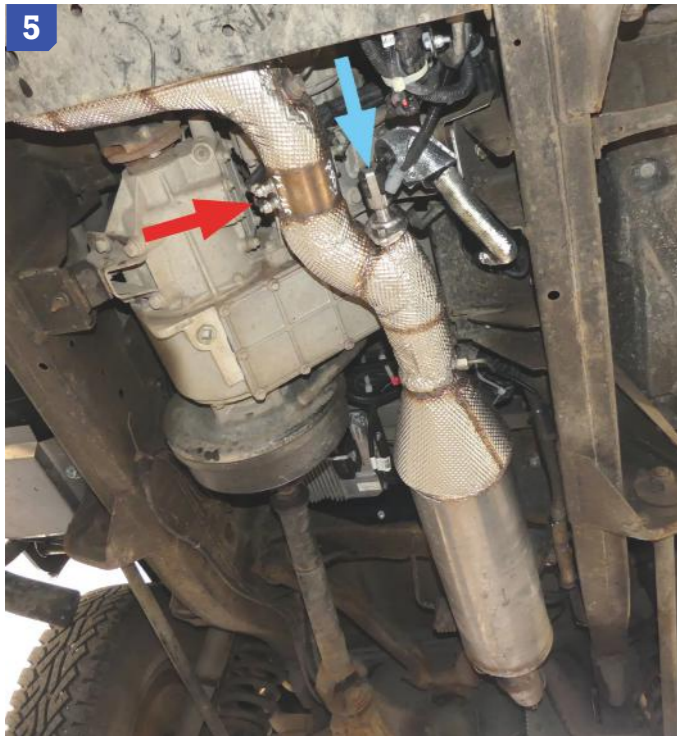
3 From left to right: exhaust from the existing cat and DPF enters the SCR system. The heaters (when needed) bring the exhaust to the ideal temperature for efficient catalytic conversion. AdBlue (diesel exhaust fluid) is injected into the gas flow and this works with the SCR catalyst to reduce the NOx level. Ammonia by-product is safely converted in the ammonia catalyst, and the cleaned exhaust passes to the silencer and tailpipe



Controlled and connected

4 The whole system is orchestrated by an electronic control unit sensing every stage of the SCR system, controlling the AdBlue injection and exhaust heater operation, and monitoring incoming and outgoing gas temperature and NOx content. The controller modulates the system according to engine running parameters, it monitors the level in the AdBlue tank and displays data on the driver's information panel.

The hardware



In the flesh

5 This is the real SCR system. At top left is the heater section (red arrow). Downstream from that is the AdBlue injector (blue arrow). After that, the pipework expands out to contain the catalytic converters.

Heat and insulation

6 During cold engine starts, the heaters increase the exhaust gas temperature to the ideal conditions for catalytic conversion. They switch off when the engine is at working temperature.

Blended in

7 The AdBlue reservoir tank is installed underneath, below the driver's seat and looks similar to the side-mounted fuel tank on earlier 90 models.



Pumping station

8 The silver cover protects the AdBlue pump underneath the tank. A stainless steel drilled full tank guard is being developed for off-roaders.



Control unit

10 The ECU is safely stowed, high up under the floor. The system operates independently of any vehicle connections, save for one lead to the engine air flow meter.

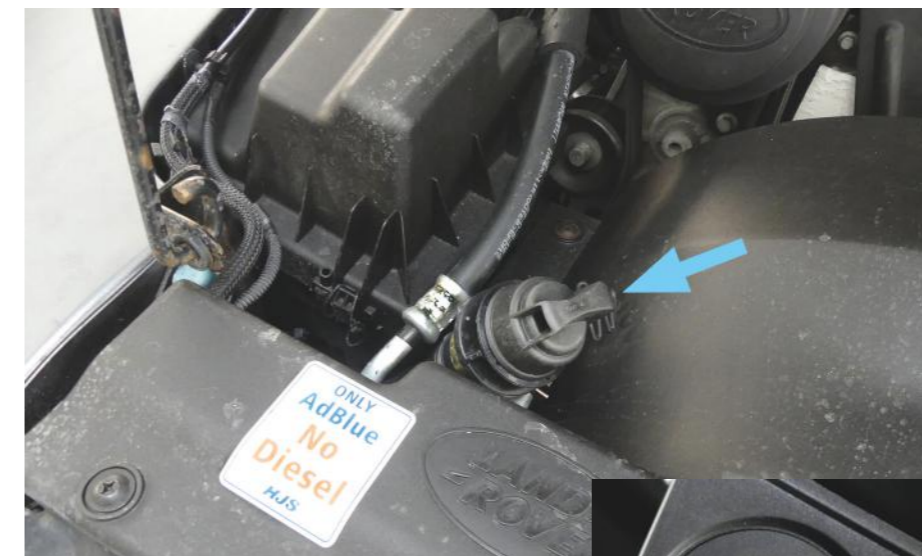
Maintaining the system

THE only owner maintenance required is to occasionally top up the AdBlue fluid at the filler under the bonnet. The small SCR display panel in the cab warns the driver well in advance when a top-up will be due. Otherwise, the system is self-monitoring.



Information display

11 The SCR's small display unit can be sited to suit the driver. Here, it's attached to the left underside of the instrument panel, angled to the driver.



AdBlue

12 The AdBlue (diesel exhaust fluid) is topped up via this under-bonnet filling point, from where it's piped directly down to the tank under driver's seatbox.

Selectable info

13 The left/right buttons allow the driver to tab through a menu. Here, it displays remaining AdBlue range of 3418 km (2123 miles), suggesting a good mileage between top-ups.



2.4 TDCi Defender

Although the conversion is currently available only for the 2.2-litre Defender, Cybrand are currently developing a system for the earlier 2.4-litre (Euro 4 spec) model. This will involve the addition of a catalytic converter/DPF in the downpipe (similar to the 2.2 layout), plus the additional SCR system downstream.

Converting your 2.2 Defender

CYBRAND AEC is currently setting up fully trained installation partnerships across the UK to fit and commission the new SCR system on customers' vehicles. The installed price is expected to be around £5500 plus VAT, depending on the hourly rates of your chosen installer.

The exhaust system will be completely renewed from just below the existing DPF in the engine bay, and includes a new silencer with piping and tailpipe. Any future maintenance or diagnostics can be carried out by the installer.

Warranty

THE complete conversion, including hardware components, software, control system and installation has a two-year warranty from Cybrand AEC Ltd.

Emission zone charges

CYBRAND AEC has gained Type Approval for the Defender with SCR system. When your vehicle is converted they will send the appropriate documentation to the UK Vehicle Certification Agency (VCA). So, for example, Transport for London would be automatically notified that your registration plate refers to a Euro 6 compliant vehicle. Thus, it would not be identified for a penalty charge in that emissions zone. As other towns and cities introduce their own zones, data requested from VCA would exempt your Euro 6 vehicle.

Re-mapped and tuned engines

AS we said earlier, the SCR system operates independently of the vehicle's own systems and ECUs, and it works purely by sensing the temperature and NOx content of the exhaust gas. So it automatically adjusts to the effects of existing and future re-maps and other engine modifications, modulating the gas heating and AdBlue dosage according to the temperature and NOx content sensed upstream of the SCR system.

Benefits

IN addition to making the Defender acceptable to towns and cities with emission zones, the vehicle will be producing fewer harmful pollutants wherever it is driven, which is a benefit to all. And with growing interest in making pre-Euro 6 Land Rovers more environmentally friendly, the re-sale value may be enhanced.

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