

## TAMPERING OF EMISSION CONTROL SYSTEMS

### 1. Framework

Tampering of emission control systems is becoming popular. The main reasons for tampering are that it is cheaper than properly fixing and maintain the vehicle and may increase the perceived performances. By definition, it is difficult to detect.

The principal tampering activities detected so far are:

- Removal of catalytic converter
- Removal of particle traps
- Tampering the AdBlue system
- Deactivation of the EGR valve
- Chip-tuning to increase performances

### 2. Removal of catalytic converter

This practice is done to gain horse power. Additionally it reduces fuel consumption and other fuels than unleaded gasoline can be used, such as lead-based and/or high-performance fuels. The tampering consists in removing the catalytic converter and modifying the vehicle electronics to avoid the detection by the OBD.

The effect on emissions is a dramatic increase in the content of NO<sub>x</sub>, HC and CO of the exhaust gases.

### 3. Removal of particle traps

This practice may be relevant for vehicles used in urban traffic at low speeds. Those conditions do not allow the regeneration of the particle trap and ends up blocking it. The tampering consists in removing the particle trap and modifying the vehicle electronics to avoid the detection by the OBD.

The effect on emissions is a dramatic increase in the content of PM of the exhaust gases.

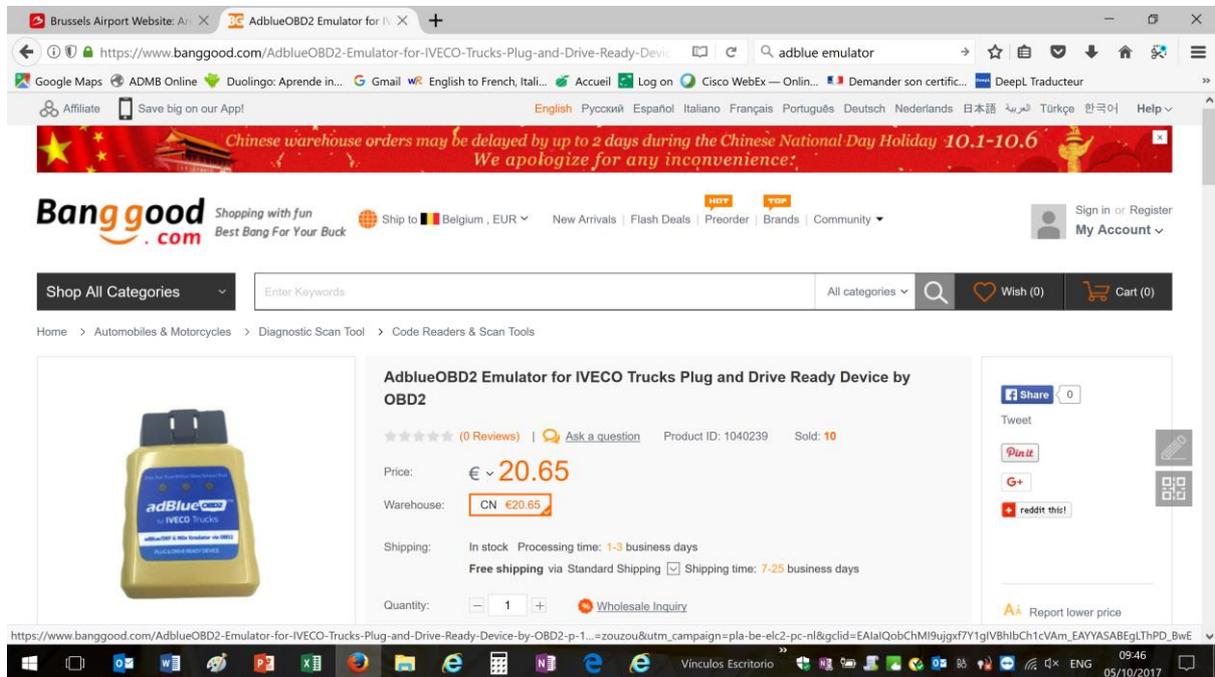
### 4. Tampering the AdBlue system

This case aims to save the cost of the ad-blue and possible repairs of the system. In this situation there are different possibilities of tampering that can be used independently or in combination:

- Permanent modification of the electronics of the vehicle
- Temporary modification of the electronics, by means of a device to be plugged in the OBD connector (figure 1)

- Modification of sensors and other parts of the AdBlue ensemble, to make the system believe that all is running in good order
- Dilution of AdBlue

The impact of this modification is more NOx emissions.



(figure 1) – Result of googling “adblue emulator”

## 5. Deactivation of the EGR valve

The aim of this action is to stop the air recirculation of the EGR and increase the vehicle’s performance. In some cases, this is as well done to avoid to change or repair the EGR valve that may get blocked because of the content in particles of the recirculation air.

EGR tampering may be done mechanically or by software. In the first case, it is anyway necessary to modify the software of the vehicle to avoid triggering the MIL of the OBD or the generation of a DTC.

As in the previous case, this modification increases the emission of NOx.

## 6. Chip-tuning to increase performances

The aim of this modification is self-explaining, although in some cases it implies as well the modification of sensors and actuators along with the software.

The effect of chip-tuning in emissions depends of each case. It also may imply safety challenges thanks to the increase of performances.

## 7. What to do to prevent tampering

Action	Time frame	Comments
Reduce the limits for pollutants of in-use vehicle inspection (1997 Agreement, Rule 1).	Short term	The project SET <sup>1</sup> – Sustainable Emissions Testing shows that reducing the emission limits for periodical technical inspection improves the detection particle trap removal
Define visual inspection procedures	Short term	Under development
Define new measurement inspection procedures	Mid term	New equipment could detect more adequate some tampering
Identify the version of the software installed in the vehicle	Mid term	Almost all tampering procedures involve the reprogramming of the ECU. Checking the software version (checksum or similar) is a must
Allow access to sensors readings	Mid term	To check the consistency of the sensors' reading with other evidences
Allow access to actuators operation	Mid term	To check the consistency of the operation of actuators with other evidences, like the measurement of tail pipe emissions
To define an update type 2 test in the emissions' regulations	Mid term	To facilitate the enforcement of vehicle compliance during its whole life
Modify vehicle homologation regulations to make tampering more difficult	Long term	The price of the AdBlue emulator demonstrates that tampering is too easy

<sup>1</sup> <http://citainsp.org/studies/4259-2/>