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Your Ref: GBC 8386U
Our Ref : CI/TP17022490/D

07 December 2017

**M/s Oliver Company Pte Ltd**
18 Changi South Street 1
Singapore 486780

**AUTOMOBILE INSPECTION REPORT OF A TOYOTA HIACE MOTOR VAN WITH REGISTERATION NUMBER GBC 8386U**

1. I refer to your request dated 15 November 2017 to carry out an inspection of a Toyota Hiace motor van with registration number GBC 8386U.

2. The objective of the inspection was to check on the condition of the motor van's Diesel Particulate Filter (DPF).

3. Following the request, I had inspected the motor van on 17 November 2017 at the premises of Diesel Injectronic Pte Ltd, 1 Soon Lee Street #05-27 Singapore 627605.

4. My observations and comments pertaining to this inspection are set out in the following paragraphs.

5. The motor van was observed to be in good general condition. There was no damage observed on its exterior body. The mileage of the motor van at the time of my inspection was 123,234km.

6. The motor van was subsequently hoisted up for checks on its underside, in particular to its DPF. My visual examination revealed that there was no exterior damage to the motor van's DPF.

7. The DPF was subsequently dismantled and removed from the motor van for further checks, where it was discovered that the filter element contained inside the DPF was removed. This was determined given that a long metal strip was able to be inserted from one side of the DPF to the other side. I was also able to move the metal strip sideways, from one side of the inner wall to the other side of the inner wall, inside the DPF. In the event, if the DPF had contained its filter element, the metal strip will not be able to be inserted all the way through and move sideways due to blockage caused by the filter element. See photo 1 – 8 below.

**Photo 1** shows the motor van at the time of my inspection. The motor van was observed to be in good general condition with no visible damage observed on its exterior body. It was also hoisted up for checks on its underside during my inspection.

**Photo 2** shows a general view of the motor van's Diesel Particulate Filter (DPF). The DPF (arrowed) was noted to be without any visible damage to its exterior body.

**Photo 3** shows a general view of the motor van's Diesel Particulate Filter (DPF). The DPF (arrowed) was noted to be without any visible damage to its exterior body.

**Photo 4** shows the motor van's DPF removed for further checks. A long metal strip (arrowed) was able to be inserted from one side of the DPF to the other side. I was also able to move the metal strip sideways, from one side of the inner wall to the other side of the inner wall, inside the DPF. This would indicate that the filter element inside the DPF was removed.

**Photo 5** shows the metal strip (yellow arrow) was able to be inserted from one side of the DPF to the other side (horizontal red arrow). I was also able to move the metal strip sideways (vertical red arrow), from one side of the inner wall to the other side of the inner wall, inside the DPF. This would indicate that the filter element inside the DPF was removed.

8. Briefly, DPF is a device that captures diesel particulates through a combination of filtration mechanisms, preventing the diesel particulates from being release into the atmosphere as harmful gases. An illustration of a simple filtration mechanism inside a PDF is shown below.

9. Like all filter element, the filter element inside the DPF will begin to clog as soot (carbon) and other diesel particulate starts to accumulate on the filter element inside the DPF over a period of time. When this occurs, a vehicle will tend to loss power as the flow of exhaust gases along the exhaust system becomes blocked/restricted by the clogged filter element, which in a worst case scenario, may possibly result in damage to the engine.

10. Cleaning of DPF is required as part of its periodic maintenance. This is usually done through a process call "regeneration", when the exhaust temperature becomes high enough (usually at 600°c) to burn off the soot and other diesel particulate that have accumulated in the DPF. Driving a vehicle over long distance at speeds higher than road speeds allowed for urban city driving is the most common method of regenerating (cleaning) the DPF.

11. This type of method is typically referred to as passive method. In other words, vehicles that are usually operated for short distances within urban city traffic condition or in start stop type of traffic condition may not have its DPF regenerated properly. Occasional long drive along an expressway or highway is required for the exhaust system of a vehicle to attain temperature that is high enough to burn off the soot and other diesel particulate that have accumulated on the filter element.

12. Other regenerating methods include active method and forced method. Active method is usually carried out when the vehicle is laid up at a workshop while forced method is usually carried out when both passive method and active method had failed to regenerate the DPF.

13. For this case, the filter element inside the motor van's DPF was removed possibly due to clogging. Such removal is a method of permanently preventing the filter element from clogging. However as the DPF is part of the exhaust system of the motor van, removal of its filter element may not comply with the Land Transport Authority (LTA) emission standard for modern day diesel vehicles. The motor van would hence likely fail its mandatory road worthiness inspection stipulated by LTA.

14. In summary, the condition of the motor van's DPF would unlikely comply with LTA's emission standard for modern day diesel vehicles given that its filter element, which captures diesel particulates, has been removed. The motor van's DPF would have to be replaced with an original standard DPF for similar make and model vehicles.

15. The various sensors, which monitors the DPF during engine operation, like the exhaust temperature sensor and the differential pressure sensor would also have to be replaced accordingly.

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