

Service Information

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Category F	Technical	Ref. No. E023/17	Page 1 of 4
Coverage <input type="checkbox"/> Distributor only <input checked="" type="checkbox"/> Please inform your dealers		Date Issued December 13, 2017	
Please convey this information to your <input type="checkbox"/> Director <input checked="" type="checkbox"/> General Manager <input checked="" type="checkbox"/> Warranty Dept. <input checked="" type="checkbox"/> Parts Dept. <input checked="" type="checkbox"/> Training Dept. <input checked="" type="checkbox"/> Field Rep.		Date Revised	
Applicable Model All Models equipped with SKYACTV-G Engines of Direct Fuel Injection System		Applicable Countries and/or Vehicle Specifications Worldwide	

Subject: Engine Oil Dilution with Fuel

DESCRIPTION

If a vehicle is driven a lot of short trips leading to the engine running in a cool condition for a long period of time, an engine oil dilution with fuel and thus engine oil level increase may occur. If this condition is further developed, the check engine light is illuminated with the DTC P0172:00 (Fuel trim system too rich) stored.

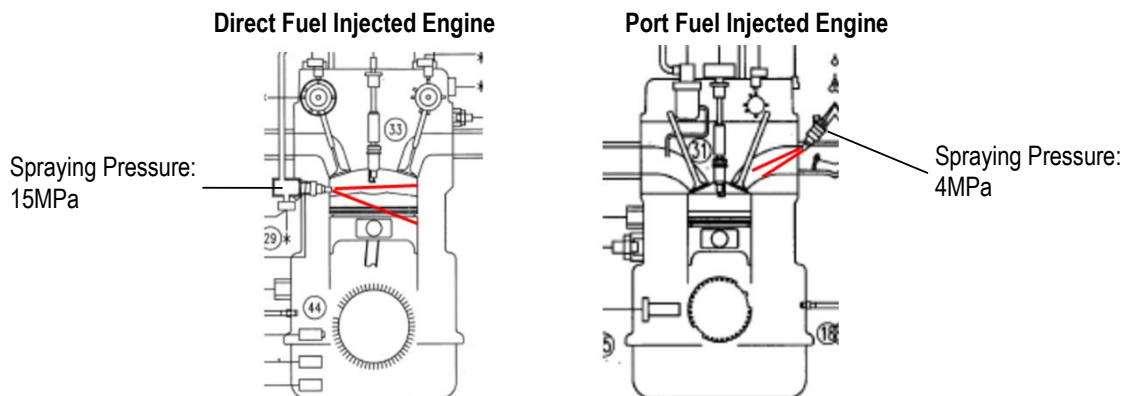
An engine oil dilution with fuel to a limited extend occurring under specific driving conditions is a common phenomenon. This Service Information provides information to be used when dealing with a customer complaint/inquiry on this matter. The information includes the occurrence mechanism and dealing with customer.

OCCURRENCE MECHANISM

How does engine oil dilution with fuel occur?

A direct fuel injected gasoline engine is designed that high-pressurized fuel is injected directly into the combustion chamber, which may cause the fuel to adhere to the cylinder wall. The fuel is then scraped by the piston, flows down into the crankcase and mixes with the engine oil causing "an engine oil dilution with fuel".

On the contrary for a port fuel injected gasoline engine, a fuel is injected toward the upstream of the intake valve and so it is unlikely to have fuel adhering to cylinder walls.



What happens if fuel is mixed in engine oil?

Normally fuel content mixed in engine oil evaporates by normal engine operating temperatures. Then the evaporated fuel gas passes through PCV system together with blow-by gas, enters in the combustion chamber and is burnt off. Thereby, the engine oil level is maintained constant. However, if the engine is operated in a cool condition for a long period of time by taking repeated short trips, fuel content in engine oil cannot evaporate actively and the engine oil level increases.

In what condition is Check Engine Light turned ON?

If the vehicle, having a condition of engine oil dilution with fuel and engine oil level increase, is driven in a fully warmed-up engine condition, a larger amount of fuel content than normal evaporates and is burnt off in the combustion chamber causing the air fuel ratio to become rich. Then if the amount of fuel coming from PCV system is further increased exceeding the air fuel ratio correction system limit, the system turns on Check Engine Light and set the DTC.

DEALING WITH CUSTOMER COMPLAINT/INQUIRY

Case 1: The engine oil level has exceeded "F" mark.

Please explain to the customer that this is a normal phenomenon by engine oil dilution with fuel that occurs under specific driving conditions and advise to replace the engine oil. Please explain the occurrence mechanism of engine oil dilution with fuel as necessary.

Case 2: The check engine light is turned on with the DTC P0172 stored.

In this case, perform the following diagnosis procedure to verify if this is caused by engine oil dilution with fuel. If so, replace the engine oil.

Procedure to separate engine oil dilution from other causes

When the air fuel ratio is becoming rich due to engine oil dilution with fuel and the engine oil level gauge is pulled out while the engine idling, the air fuel ratio changes significantly. Use this method to specify the cause as follows.

- ① Warm up the engine to its normal operating temperature.
- ② Connect the Mazda Modular Diagnostic System (M-MDS) to the vehicle, and select the PID "SHRTFT1" in Datalogger.
- ③ While the engine is idling and monitoring the PID "SHRTFT1", pull out the engine oil level gauge.
 - If the value of "SHRTFT1" changes significantly, it indicates that the problem is caused by engine oil dilution with fuel.
 - If the value of "SHRTFT1" does not change, the problem is caused by other factors and then diagnose according to Workshop Manual.

NOTE: The value of "SHRTFT1" is (+) when the air/fuel ratio is lean and (-) when rich.

Others: Deterioration of engine oil is accelerated in winter time driving. In case that short distance and stop and go driving often occurs in winter time, it is recommended to reduce the engine oil change interval.

<Q&A Samples>

Q: I take a lot of short trips. What should I do?

A: There is no problem as long as they are not extraordinary short trips (*). When you take a lot of short trips with a condition that the engine is not fully warmed up, it is recommended to reduce the engine oil change interval.

***Extra Ordinary Short Trips:** This is a repeat of short trip with the engine being turned off while the low engine coolant temperature indicator light (Blue) is ON or within 5 minutes even after the blue engine coolant temperature light is turned OFF.

Low Engine Coolant Temperature Indicator Light (BLUE)



Q: If the engine oil level has exceeded "F" mark by any little amount, is it necessary to replace the engine oil?

A: If the engine oil level increase is caused by engine oil dilution with fuel and the exceeded level is a few millimeters only, it will not affect the engine reliability. Further, if the vehicle is continuously driven in a normal driving condition, fuel content in engine oil gradually evaporate and the engine oil level may back to normal. So, you may consider watching and seeing the condition for the moment. Please check the oil level regularly.

NOTE: As necessary, use the customer explanation material in the attachment.

**-Explanation Material for handling Customer Inquiry
about Check Engine Light Illumination-**

1. PHENOMENON

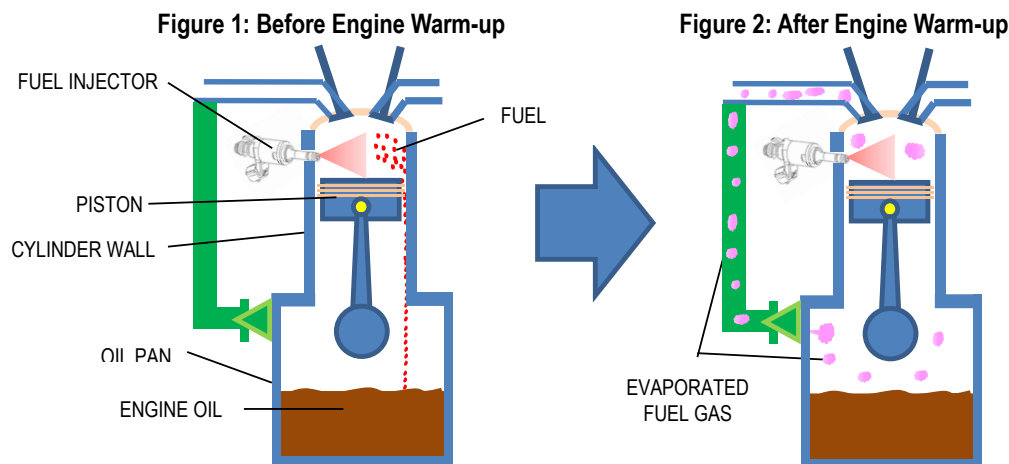
If the vehicle is taken a lot of short trips leading to the vehicle running in a cool condition for a long time, fuel may mix with the engine oil and the check engine light is illuminated.

2. OCCURRENCE MECHANISM

<When a vehicle is driven in a normal engine temperatures condition :>

Figure 1: While the engine is not warmed up yet, fuel flows down between the piston and cylinder wall and enters in the oil pan mixing with the engine oil.

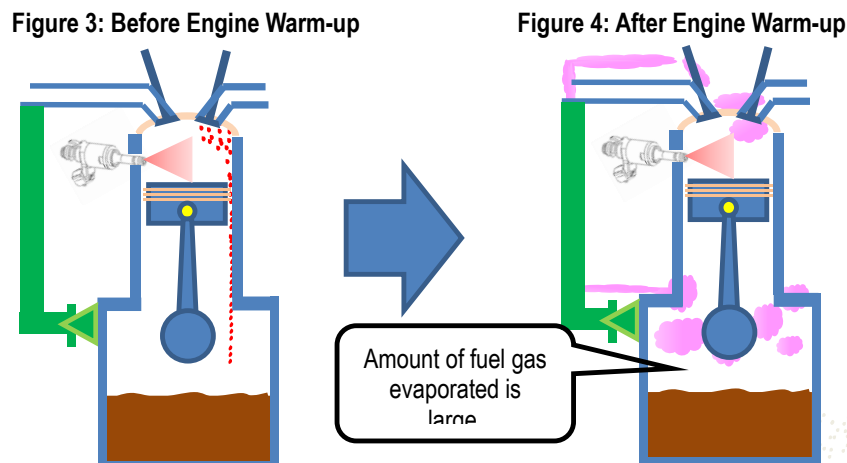
Figure 2: After the engine is warmed up, fuel content in the engine oil evaporates by engine operating temperatures and the evaporated fuel gas is sucked into the combustion chamber and burnt off. At this time, the amount of fuel injected by fuel injector is adjusted according to the amount of fuel evaporated from the engine oil and entered in the combustion chamber.



<When a vehicle is driven repeatedly at cool engine temperatures condition :>

Figure 3: In this case, fuel content in the engine oil does not evaporate actively and so the amount of fuel remaining in the engine oil is increased (Engine oil level is increased).

Figure 4: After the engine is warmed up, a larger amount of fuel content in the engine oil evaporates and is burnt off in the combustion chamber. In this case if the amount of fuel evaporated exceeds the limit that the fuel injector can adjust by changing the injection amount, the system turns on the warning light.



Attachment 2/2

3. CONCLUSIONS

Engine oil dilution by fuel is a common phenomenon for gasoline engines that occurs when the vehicle is driven in specific conditions, and not a problem. There is no problem as long as extraordinary short trips are not taken.

***Extra Ordinary Short Trips:** This is a repeat of short trip with the engine being turned off while the low engine coolant temperature indicator light (Blue) is ON or within 5 minutes even after the blue engine coolant temperature light is turned OFF.

Low Engine Coolant Temperature Indicator Light (BLUE)



In winter time, if a lot of short trips with the engine running in cool condition, are taken, it causes a condition that an engine oil dilution with fuel is likely to occur resulting in the accelerated engine oil deterioration. Therefore, it is recommended to immediately check and replace the engine oil when the check engine light is illuminated.

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