

Service Alert

Mazda North American Operations
Irvine, CA 92618-2922

**Subject:**

ENGINE OIL DILUTED WITH FUEL CAUSES P0172:00

Service Alert No.: SA-026/18

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APPLICABLE MODEL(S)/VINS

2014-2018 Mazda3	2016-2019 CX-3	2016-2018 CX-9
2014-2018 Mazda6	2013-2018 CX-5	2016-2018 MX-5

DESCRIPTION

If a vehicle is driven on extremely short trips most of the time (where the engine never reaches normal operating temperature), the engine oil may become diluted with fuel and the engine oil level will increase. Engine oil dilution with fuel occurring under this specific driving condition is normal with direct injection engines.

If the vehicle is driven on a longer trip after a lot of short trips (where the engine reaches normal operating temperature), the Check Engine Light may turn ON with DTC P0172:00 (Fuel system too rich).

The attached information can be used to explain this to a customer with a complaint/inquiry on this issue.

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Engine Oil Dilution with Fuel

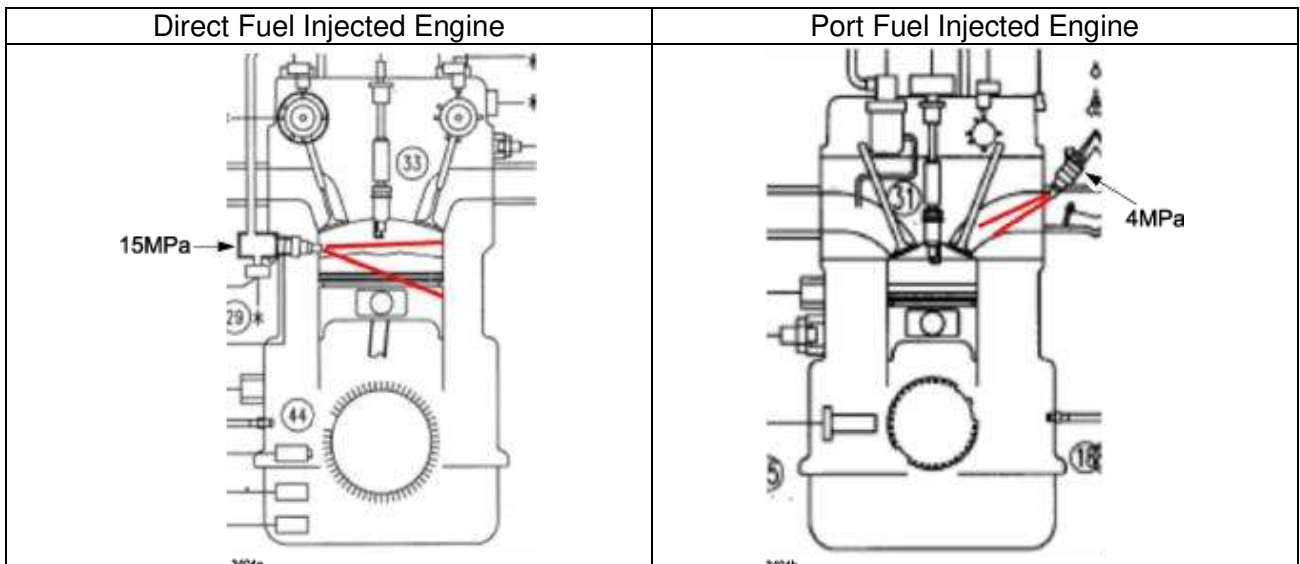
If a vehicle is driven on extremely short trips most of the time (where the engine never reaches normal operating temperature), the engine oil may become diluted with fuel and the engine oil level will increase. Engine oil dilution with fuel occurring under this specific driving condition is normal with direct injection engines.

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How does the engine oil become diluted with fuel?

Newer direct fuel injected gasoline engines are designed such 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 ring and flows down into the crankcase where it mixes with the engine oil, causing the engine oil to become diluted with fuel.

On an older port fuel injected gasoline engine, fuel is injected upstream of the intake valve, so it is unlikely fuel will adhere to the cylinder walls.



What happens if fuel is mixed with engine oil?

Normally the fuel content mixed with engine oil evaporates at normal engine operating temperatures. The evaporated fuel passes into the PCV system together with blow-by gas where it is burned off when it enters the combustion chamber. In this case, the engine oil level stays constant.

However, if the engine is operated in a cool condition most of the time by taking repeated short trips (where the engine never reaches normal operating temperature), the fuel content in the engine oil cannot evaporate. In this case, the engine oil level will increase.

What causes the Check Engine Light to turn ON?

If the vehicle is driven in a fully warmed-up engine condition with an increased engine oil level diluted with fuel, a larger than normal amount of fuel content evaporates and burns off in the combustion chamber. This causes the air fuel ratio to become rich. If the amount of fuel coming from the PCV system increases further and exceeds the air fuel ratio correction system limit, the system turns on the Check Engine Light and sets DTC P0172:00.

HOW TO EXPLAIN ENGINE OIL DILUTION WITH FUEL TO A CUSTOMER

Case 1: The engine oil level has exceeded the “F” mark.

Explain to the customer that this is a normal condition (engine oil diluted with fuel) that occurs when the vehicle is driven on extremely short trips most of the time (where the engine never reaches normal operating temperature). Advise them to replace the engine oil and filter. Explain to the customer how the engine oil becomes diluted with fuel.

Case 2: The Check Engine Light turns ON with DTC P0172 stored.

In this case, perform the following diagnosis procedure to verify if this is caused from engine oil dilution with fuel or by other factors. If the engine oil is diluted with fuel, replace the engine oil and filter.

Procedure to determine if engine oil dilution with fuel is the cause of DTC P0172

Perform the following test to specify the cause:

NOTE: When the air fuel ratio is becoming rich due to engine oil dilution with fuel and the dipstick is pulled out while the engine is idling, the air fuel ratio changes significantly.

- 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 dipstick.
 - 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 significantly, the problem is caused by other factors and should be diagnosed according to the instructions on MGSS.

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

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 extremely short trips (*). When you take a lot of extremely short trips (where the engine never reaches normal operating temperature), it is recommended to reduce the engine oil change interval.

***Extremely Short Trip:** A trip where the engine is turned off while the low engine coolant temperature indicator light (BLUE) is ON or within 5 minutes after the blue light goes OFF.

Low Engine Coolant Temperature Indicator Light (BLUE)



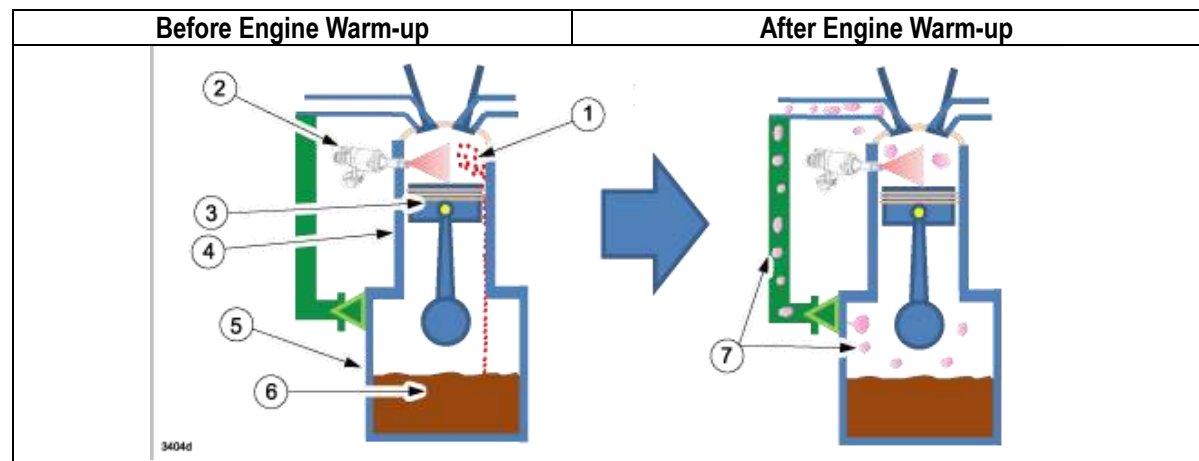
Q: If the engine oil level has exceeded the “F” mark by any little amount, is it really necessary to replace the engine oil?

A: If the engine oil level increase is caused by engine oil dilution with fuel and the exceeded level is only a few millimeters above “F”, it will not affect the engine reliability. However, if the vehicle is driven continuously in a normal driving condition (where the engine reaches normal operating temperature), the fuel content in the engine oil will gradually evaporate and the engine oil level may go back to normal. Check the engine oil level regularly to see if it goes up or down. If it continues to go up, replace the engine oil and filter.

Normal Engine Operation:

When the engine is not warmed up, fuel (1) from the fuel injector (2) flows down between the piston (3) and cylinder wall (4) and enters in the oil pan (5) mixing with the engine oil (6).

After the engine is warmed up, fuel content (7) in the engine oil evaporates from normal engine operating temperatures and the evaporated fuel is sucked into the combustion chamber and burned off. The amount of fuel injected by the fuel injectors is adjusted according to the amount of fuel evaporated from the engine oil and entering the combustion chamber.



HOW TO HANDLE A CUSTOMER INQUIRY ABOUT CHECK ENGINE LIGHT ON CONCERN

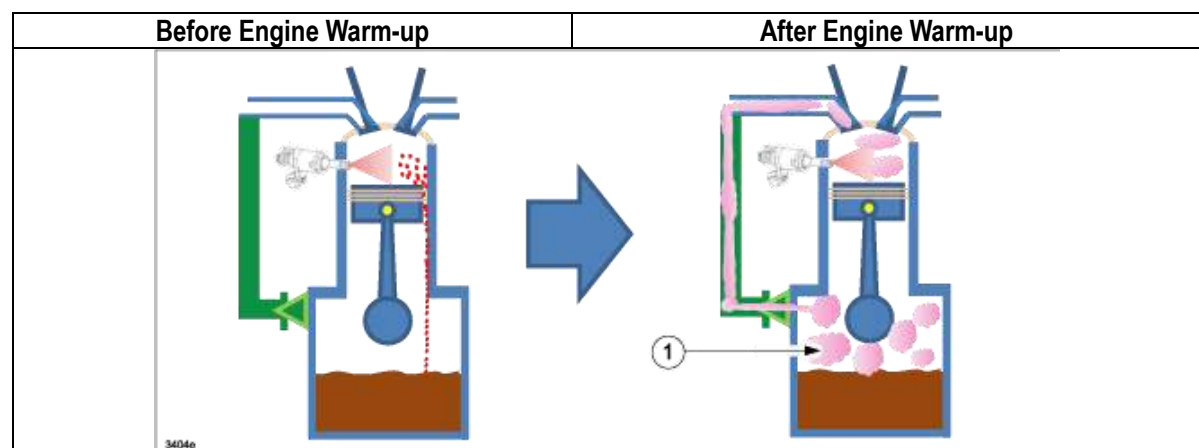
1. HOW IT HAPPENS

If the vehicle is driven on extremely short trips most of the time (where the engine does not reach normal operating temperature), fuel continues to mix with the engine oil and the fuel content in the engine oil does not evaporate.

2. WHAT CAUSES IT

The vehicle is driven repeatedly where the engine never reaches normal operating temperature, then the vehicle is driven for a longer period of time and reaches normal operating temperature.

After the engine reaches normal operating temperature, a larger amount of fuel content (1) in the engine oil evaporates and is burned off in the combustion chamber and the amount of fuel evaporated exceeds the limit that the fuel injectors can adjust by changing the injection amount. In this case, the system turns on the Check Engine Light.



3. CONCLUSION

There is no problem as long as extremely short trips are not taken.

If a lot of extremely short trips are made where the engine is turned off while the low engine coolant temperature indicator light (Blue) is ON or within 5 minutes after the light turns OFF, the engine oil and filter will need to be changed more frequently. It is recommended to immediately check and replace the engine oil and filter when the Check Engine Light turns on.

NOTE: The deterioration of engine oil is accelerated during winter time driving. If short distances are driven and/or stop and go driving occurs often in the winter time, it is recommended to reduce the engine oil change interval.