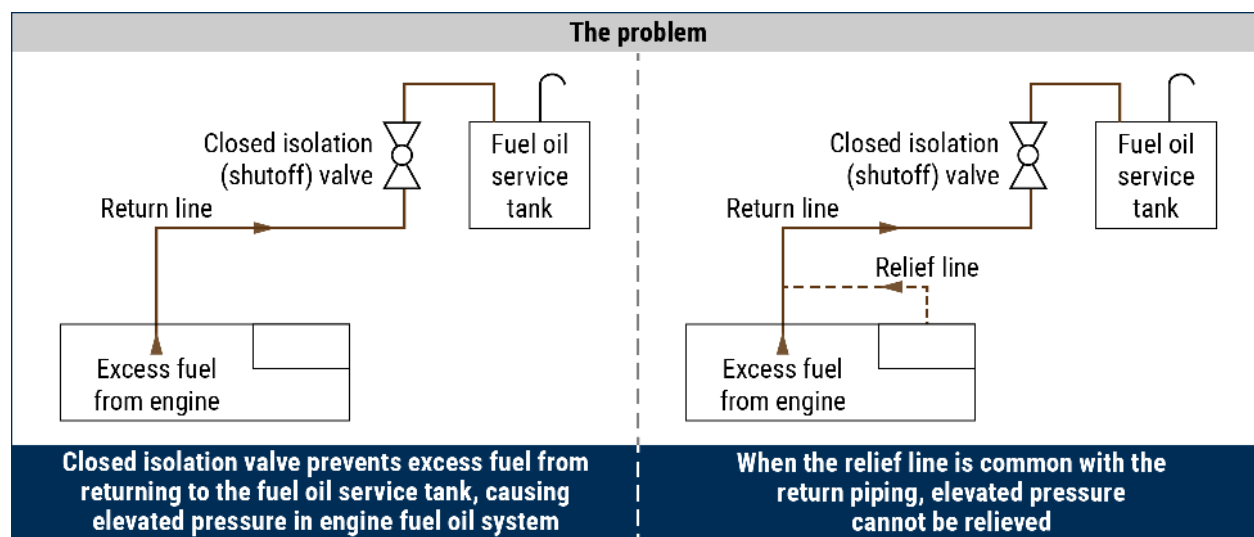


Reducing the Risk of Diesel Engine Fuel Return System Overpressurization

The problem

- Diesel engine fuel return systems are designed to return unburned, excess fuel from the engine back to a designated tank, typically at atmospheric pressure. If an isolation (shutoff) valve is installed in the return line before the tank, closing the valve will result in a pressure build up in the return line.
- High fuel return system pressure may also subsequently overpressurize the fuel supply lines to engines. Engine-mounted pressure relief valves built into supply line fittings can be routed to relieve overpressurized fuel supply lines into the return lines. However, if relief valves are piped into a fuel oil return line that has a closed isolation (shutoff) valve, the relief valves will be ineffective, and pressure will continue to rise.
- In diesel engine fuel return systems, pressure can build up in a closed return line such that the fuel system components rupture, causing fuel to spray into the engine room and possibly ignite a fire.



Simplified diagram of a diesel engine fuel system, showing a return line with closed isolation (shutoff) valve and relief line common with return piping system.

Related accidents

Following are casualties investigated by the NTSB in which overpressurization of a main engine fuel return system—caused by closed valves—led to diesel fuel spraying onto hot components and igniting a fire:

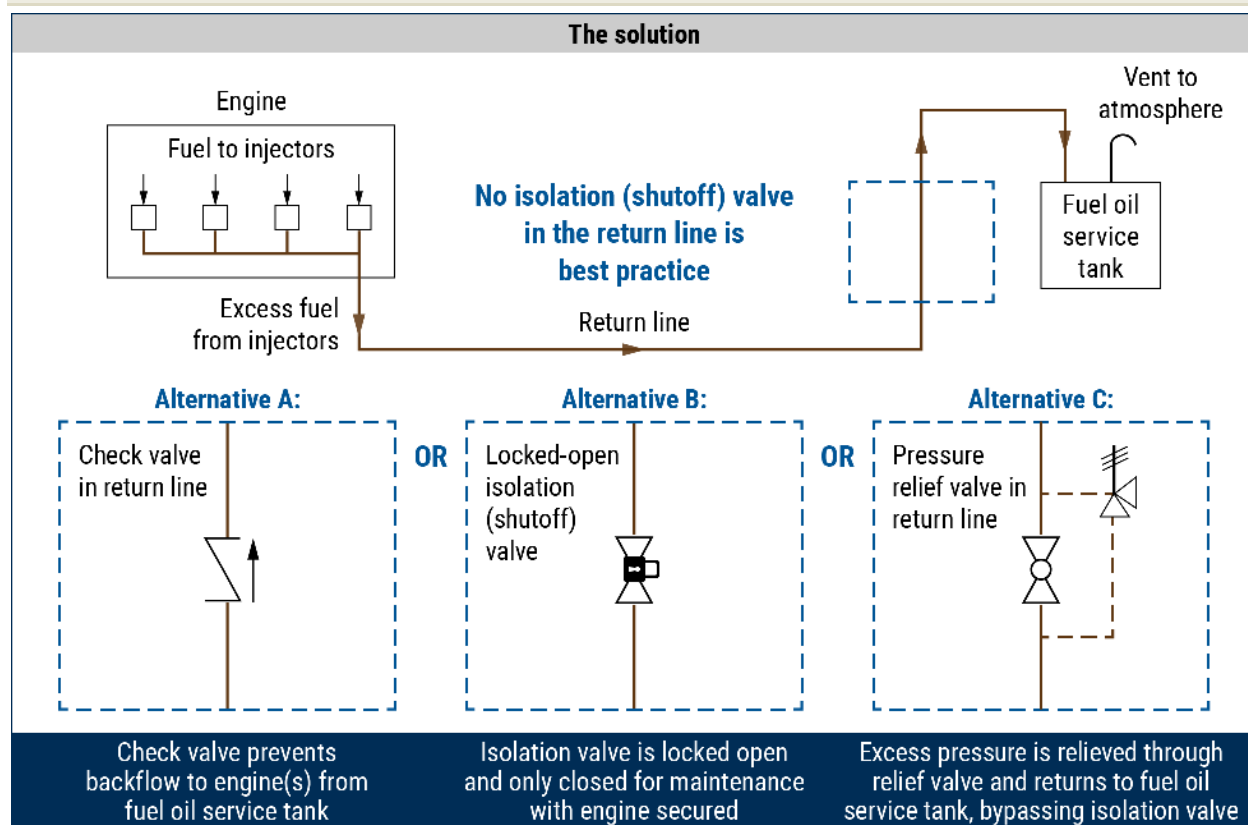
- In 2021, a fire broke out in the engine room of a towing vessel that was transiting the Upper Mississippi River in Missouri. **Because the vessel's fuel oil day tank did not have an independent vent and a crewmember had inadvertently left the tank's overflow valves closed, the tank, main engine fuel oil return line, and supply fuel system became overpressurized, causing a system sight glass bowl to fail and diesel fuel to spray onto an uninsulated engine component, thus igniting a fire.** ([DCA21FM028](#))
- In 2022, a fire broke out in the engine room of a passenger vessel (ferry) while it was underway in New York Harbor in New York. **In the time leading up to the fire, engine crewmembers closed**

both port and starboard day tank fuel oil return isolation (shutoff) valves, causing the return and then supply fuel oil system to overpressurize. Fuel sprayed from an overpressurized filter onto the hot exhaust manifold of a running engine, igniting a fire. ([DCA23FM010](#))

What can you do?

Vessel owners and operators can enhance the safety of their vessels and mitigate the risk of engine room fires resulting from the overpressurization of diesel engine fuel systems by considering the following:

- Identify all valves in the return piping of vessels' fuel systems and share with crewmembers the consequences of closing these valves with an engine running—critically, a potential buildup of pressure in the piping.
- Ensure that the return lines leading to the service tank(s) are unimpeded, with no valves in the lines—as diesel engine manufacturers recommend.
- If it is necessary to install isolation (shutoff) valves in the return line, install a pressure relief valve to bypass the isolation valve and discharge to a tank (in the event the isolation valve is closed while an engine is running).
- Provide crewmembers training on diesel engine fuel system design and operations.



Simplified diagram showing diesel engine fuel system with no isolation (shutoff) valve in return line, and, alternatively, with a check valve, locked-open isolation valve, or pressure relief valve in return line.

Interested in more information?

[Coast Guard Marine Safety Alert 06-17](#) discusses fuel spray fires and the importance of inspecting machinery spaces and fuel and lubricating systems for vulnerabilities.

NTSB Safety Alerts can be accessed from the [Safety Alerts](#) page at www.nts.gov. For additional information on the NTSB investigation in this alert, access the [public docket](#) using the investigation numbers cited above. Use the [CAROL Query](#) to search NTSB safety recommendations and investigations.

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