

Ultra Low Sulfur Diesel Information and Guidelines



Marathon
Petroleum Company LLC

Ultra Low Sulfur Diesel Implementation Guidelines Highway Diesel Fuel

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Defined terms highlighted in blue throughout the brochure

Introduction

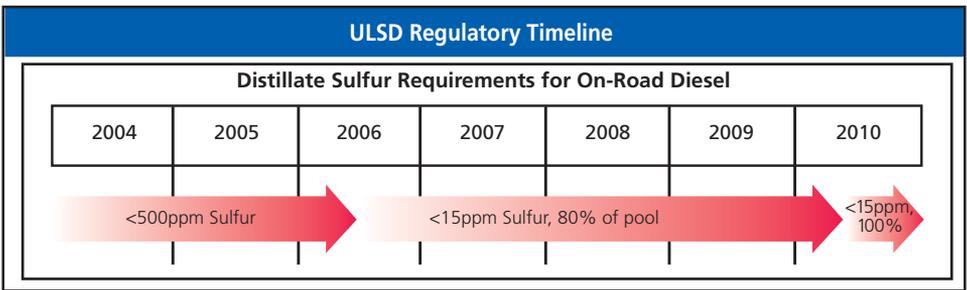
Why do we need Ultra Low Sulfur Diesel (ULSD)?

The U.S. Environmental Protection Agency (EPA) has passed regulations that require reduced sulfur in diesel fuel.

- **ULSD** is required for 2007 highway model engines.
- 80 percent of highway diesel fuel must be ULSD (15 ppm sulfur or less) beginning June 1, 2006.
- Use of fuel other than ULSD in 2007 highway model engines may cause damage to the Catalyzed Diesel Particulate Filter.
- Catalyzed Diesel Particulate Filters (CDPFS) can eliminate 99% of solid particles (soot and metals) and can eliminate greater than 90% of semi-volatile hydrocarbons.



By June 2010, all highway diesel fuel must meet the 15 ppm standard.



All produced and imported highway diesel must meet the 15 ppm standard on June 1, 2006. In recognition of the time it takes to turn tanks, EPA has extended the transition period allowed for pipelines, terminals and retail outlets to convert facilities.

2006 Deadlines for Highway ULSD			
Refineries	June 1	Terminals	September 1
Pipelines	September 1	Retail	October 15

Converting Facilities to ULSD

In 2004, Marathon Petroleum Company LLC (MPC), tested its ability to deliver **ULSD** from refineries to retail facilities. This section of the brochure discusses observations made during that testing.

Sulfur in ULSD increases as it moves through each part of the transportation system. Pipelines and terminals will require the sulfur content of ULSD they accept to be below a specified amount. This will enable fuel reaching the customer to meet the 15 ppm ULSD standard.

These **receipt specifications** may vary between facilities. Major pipeline carriers are considering a 7 to 9 ppm sulfur limit on ULSD. Many terminal operators have set a 12 to 13 ppm sulfur limit. In order to meet these limits, refineries will have to produce ULSD with sulfur levels as low as 5 to 7 ppm.

Terminals and Bulk Plants

Minimizing **sulfur contamination** of **ULSD** as it moves through terminal facilities can be challenging.

- Sulfur content may increase if ULSD moves through **dead leg piping** that previously contained higher sulfur products.
- Due to a **product layering** effect, a single tank sample may not represent the overall sulfur level of product in the tank.
- **Heel mixing** may not be effective for converting tanks to on-spec ULSD.

When converting above ground storage tanks to ULSD, careful planning can minimize sulfur contamination.

- Check each facility thoroughly for possible dead leg piping contamination.
- Consider emptying the tank two or more times before testing to ensure ULSD conversion is complete.
- Take several samples at different liquid levels to obtain an accurate sulfur reading.

Transports

MPC's test observations in the use of trucks to transport **ULSD** include:

- Transports should be completely drained when switching from higher sulfur products to ULSD.
- Sloped-bottom transports should contribute little, if any, **sulfur contamination** to ULSD.
- Flat-bottom transports can cause significant sulfur contamination to ULSD.
- Sulfur contamination from flat-bottom transports can be reduced by draining compartments prior to loading ULSD.



It only takes a small amount of higher sulfur product to contaminate ULSD.

Increase in Sulfur Resulting from Contamination of ULSD *			
	Amount added to 7,500 gallons of ULSD		
	7 gallons	37 gallons	75 gallons
80 ppm Gasoline	+ 0.1 ppm	FLASH CONCERN	FLASH CONCERN
500-ppm Diesel Fuel	+ 0.5 ppm	+ 2.5 ppm	+ 5 ppm
3000-ppm Jet Fuel	+ 3 ppm	+ 15 ppm	+ 30 ppm
5000-ppm Heating Oil	+ 5 ppm	+25 ppm	+ 50 ppm

½% of gasoline can lower flash of distillates by 30° F.

*For illustration purposes only, actual results may vary.

Retail Marketing / Jobber Facilities

When MPC delivered ULSD to underground storage tanks (USTs) during its 2004 test program, the tanks showed signs of product layering.

When converting USTs to ULSD:

- Product mixing will occur across manifolded tanks.
- Make multiple deliveries of ULSD into each tank to reduce product layering.

The relationship of the amount of ULSD delivered to the total final volume of product in the UST appears to have an effect on product layering.

Product layering did not occur if the ULSD delivered was 60% or more of the total fuel inventory in the tank after the delivery.

- Minimize tank inventories prior to receiving ULSD.
- Maximize the amount of ULSD dropped into tanks.

Example – Station Drop Volume Correlation					
$\% \text{ Drop Volume} = \frac{\text{Volume of Load Delivered}}{\text{Total Inventory After Delivery}}$					
	%Drop Volume	Product Layering		%Drop Volume	Product Layering
Truck Stop A			Truck Stop C		
Tank 1*	70%	No	Tank 1*	58%	Slight
Tank 2	66%	No	Tank 2	49%	Yes
Tank 3	70%	No	Truck Stop D		
Truck Stop B			Tank 1	63%	No
Tank 1	86%	No	Tank 2	62%	No
Tank 2*	77%	No			
Gas Station					
Tank 1*	25%	Yes			

* Indicates the drop tank

When planning conversion of USTs, the number of loads necessary to convert a station can be **estimated** by using historical sulfur content, tank inventories, and site sales. See pages 8 and 9 for an example. This estimation MAY NOT BE used to establish compliance with EPA sulfur standards. For more information, contact your territory manager.

Other Things to Consider

Blending additives may lead to **sulfur contamination**.

- Customers must know the sulfur content of additives used in **ULSD**.
- If the additive contains more than 15 ppm sulfur, it is the blender's responsibility to make sure it does not increase the overall sulfur level of ULSD above 15 ppm.

The removal of sulfur in diesel lowers its lubricating qualities.

- Marathon is currently adding a **lubricity agent** to ULSD in order to meet ASTM specification D975.
- All diesel fuels will meet ASTM specification D975.
- Biodiesel blending may also improve ULSD lubricity.

The process to produce ULSD lowers its **conductivity**. This increases the potential for static build-up.

- Precautionary steps should be taken to reduce static electricity during fuel handling.

Designate and Track

Distillate products going into and out of a **designated facility** must be tracked.

The EPA defines a designated facility as any place where distillate fuel is produced, imported or where custody is maintained until the product is dyed or taxed.

A facility could be a:

- Pipeline (or pipeline segments)
- Marine transportation facility
- Terminal facility
- Rail transportation facility
- Pipeline breakout tankage
- Any combination of these

A retail station or a bulk plant that receives transport truck deliveries that have been taxed or dyed are not a facility under the EPA guidelines and are not required to register.

The volumes handled must be reported to the EPA by **product designation**. Product designations include the sulfur content and the intended use of the fuel. Intended use is classified as motor vehicle (highway), **NRLM**, heating oil, jet fuel, kerosene, No. 4 fuel, export, or exempt fuel.



Facilities must have registered with the EPA by December 31, 2005. Visit the EPA website for facility registration forms: <http://www.epa.gov/otaq/regs/fuels/rfg/3520-20a.pdf>. Instructions for completing the forms can be found at <http://www.epa.gov/otaq/regs/fuels/rfg/inst-20a.pdf>.

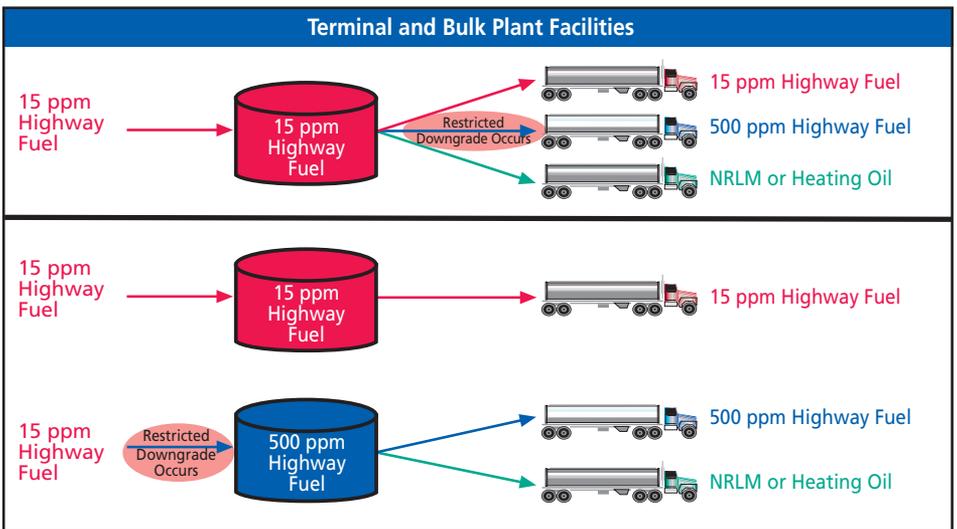
Downgrading Limits

A downgrade occurs when one product is sold as a product of lesser quality or value. Examples are premium gasoline downgraded to regular gasoline or low sulfur diesel downgraded to high sulfur diesel.

The only **restricted downgrade** is highway **ULSD** to highway **LSD**. This restriction does not apply to retail facilities that sell both ULSD and LSD highway fuel.



For terminals and bulk plants, no more than 20% of highway ULSD can be downgraded to highway LSD at each **designated facility**.



ULSD Conversion Worksheet

Station: Filler-Up Express #10

Station Manager: I. M. Best

Product: ULSD

Phone: 501-555-1212

Address: 539 Main St., Anywhere, USA

Tanks

Normal Fill 7,892

Low Suction 562

1) Enter sulfur content of the fuel in the tank prior to ULSD deliveries

Tank #	Expected Product Receipts						Tank Inventory (gallons)	Tank Sulfur (ppm)	Calculated Tank Sulfur After Delivery (ppm)	Actual Sample Sulfur Content ¹		
	Product	Date	Source	Volume (gallons)	Sulfur (ppm)					Top (ppm)	Bottom (ppm)	Date
Tank	ULSD	6/17/06	Nashville	5,001	14.00	1,865	500.00	146.01				
Sample Point	ULSD	6/20/06	Nashville	4,503	14.00	1,542	146.01	47.67				
	ULSD	6/24/06	Bordeaux	5,502	14.00	1,325	47.67	20.54	21.21	18.25	7/2/06	
	ULSD	7/1/06	Nashville	4,504	14.00	1,201	20.54	15.38				
	ULSD	7/5/06	Bordeaux	5,002	14.00	1,501	15.38	14.32	14.76	13.27	7/5/06	
							14.32					

2) Enter estimated delivery volume.

3) Enter estimated sulfur content of delivered fuel.

4) Enter tank inventory volume prior to delivery.

Estimated sulfur content of fuel in the tank is then calculated. GREEN indicates when estimated sulfur content of the tank is calculated to be 15 ppm or less.

Repeat steps 2, 3 and 4 until "Calculated Tank Sulfur After Delivery" is less than or equal to 15.

¹Due to product layering effect, a single tank sample may not represent the overall sulfur level of product in the tank. Take several samples at different liquid levels to obtain a more accurate sulfur reading.

For further information:
Contact your Territory Manager

**** This worksheet is provided to customers of Marathon Petroleum Company LLC to assist in estimating the sulfur content of diesel fuel in their tanks during the process of conversion to ultra low sulfur diesel. Customers are advised that they may be obligated to comply with a variety of laws and regulations concerning the sulfur content of diesel fuel, and this worksheet MAY NOT BE USED to establish compliance with these laws and regulations.**

Compliance

Other compliance concerns include:

- Liability for **misd deliveries**.
 - To reduce this liability:
 - Check **product transfer documents** and reject improper fuel deliveries.
 - Ensure the fuel is dropped into the proper tank.
 - If an improper fuel delivery occurs, immediately stop sales of the contaminated product and correct the sulfur level.
- Liability for **misfueling**.
 - Occurs when greater than 15 ppm fuel is put into an engine that requires 15 ppm fuel.
 - Occurs by allowing anyone to put greater than 15 ppm fuel into an engine that requires 15 ppm fuel.
 - Can occur if retail pumps are not labeled properly.
- Missing information that is required on product transfer documents.
- Keeping records and making timely reports to the EPA.

Enforcement

EPA inspectors may:

- Perform retail inspections, take samples and perform testing (tank and nozzle samples).
- Inspect and take samples at other points (terminals and transports).
- Review Designate and Track reports – check for non-matching hand-offs and failure to meet balances.
- Review refiner/importer reports, records.
- Conduct desk, field, and spot audits.

Potential violations include:

- violation of 15 ppm sulfur standard for **ULSD**.
- violation of 500 ppm sulfur standard for **LSD**.
- dye violation.
- heating oil marker violation.
- additive violation.
- **product designation** or volume balance violation.
- 20% downgrade violation.
- **misfueling** violation.
- retail pump labeling violation.



EPA options for collecting penalties include:

- Notice of violation and payment of penalty by informal agreement.
- Administrative Complaint and hearing before an Administrative Law Judge.
- Civil Complaint and trial in United States District Court.
- Clean Air Act authorizes maximum penalties of \$32,500 per violation, per day, plus economic benefit or savings, for every day the non-compliant product remains any place in the distribution system. Twenty-five days is presumed unless other evidence is presented.

Who is liable?

- Anyone who directly or indirectly causes the violation.

What defense is available?

- ULSD regulations include a presumptive liability defense as found in other EPA fuels programs.

For further explanation of these enforcement topics, visit EPA's National Clean Diesel Campaign website: <http://www.epa.gov/cleandiesel/>

ULSD Checklist

The following checklist may help you prepare for **ULSD** regulation and facility conversions. It does not include everything required for compliance.

✓ = Terminal Facility ✓ = Retail Location

- ✓ Register your facility with the EPA if necessary.
- ✓ Check your facility for **deadleg piping** and make necessary changes.
- ✓ Set up tracking procedures for Designate and Track as required.
- ✓ Add **lubricity agent** where required (ASTM D-975 specifications).
- ✓✓ Minimize tank inventories prior to ULSD deliveries.
- ✓✓ Plan for multiple ULSD deliveries to convert tanks.
- ✓✓ Take several samples of ULSD in tanks to obtain sulfur reading.
- ✓✓ Consider draining and/or flushing transport truck compartments prior to ULSD usage.
- ✓✓ Set up procedure to monitor 20% Downgrade Limit on highway diesel.
- ✓✓ Ensure additives contain less than 15 ppm sulfur.
- ✓✓ Ensure **Product Transfer Documents (PTD)** contain required information.
- ✓ Clearly label pumps with required statements.
API is considering the use of standardized labels.



Frequently Asked Questions (FAQs)

What are the requirements for a diesel marketer who picks up fuel at a terminal and delivers it to a retail or wholesale purchaser/consumer site?

If the fuel has already been dyed, taxed, and/or marked, there are no Designate and Track requirements for the marketer. The diesel marketer does not need to register with EPA and meet the D&T requirements, unless they intend to distribute:

- **MVNRLM** 500 ppm diesel fuel for which taxes have not been assessed.
- **NRLM** fuel that is undyed.
- Heating oil or **LM fuel** that is not marked (in those areas of the country where the marker is required, per 40 CFR 80.597(c)(1)). In either case, the marketer has **Product Transfer Documents (PTD)** requirements and needs to maintain the integrity of the fuel and, for defense purposes, should have an adequate quality control and sampling and testing programs.

The marketer also is subject to the anti-downgrading provisions of 40 CFR 80.527.

Is there a minimum amount of each product that a marketer must carry and sell to qualify for the 20% downgrade exemption?

If a retailer makes 15 ppm diesel fuel available to its customers in the same way he markets other fuels, the retailer is not subject to the anti-downgrading requirements for highway diesel fuel. Typically, this means that the retailer needs to provide a fuel dispenser(s) and sufficient volume of 15 ppm highway diesel fuel so that it is no more difficult to purchase 15 ppm diesel fuel than 500 ppm diesel fuel.

At retail locations, will the diesel dispenser have a different size nozzle to prevent a customer from misfueling?

EPA does not require unique dispenser nozzles for 15 ppm diesel. The non-road diesel rule includes labeling requirements for fuel dispensers and vehicles to help prevent **misfueling**. The fuel dispenser labeling requirements are now found in the non-road diesel rule (40 CFR 80.570, 80.571, 80.572, 80.573, and 80.574).



What is the liability in the event of misfueling by a driver?

The trucking company is liable for misfueling but will be able to meet defense if it can demonstrate that the violation was not caused by the fleet operator or its employees (fueled from a retail pump labeled as containing the appropriate fuel for the vehicle). If it is from the company's own pump, the company also needs to show PTDs account for the fuel and demonstrate how it complied with the requirements.

Does ULSD have any affect on the engines in older equipment?

Generally, **ULSD** will benefit engine operation and durability. The only known concern is the lubricity of ULSD, which will be ensured through the use of lubricity additives in the fuel. ASTM has adopted a lubricity specification for diesel fuel to assure proper fuel lubricity.

What is the impact of running 500 ppm fuel in a new engine?

If a **new truck** is misfueled once, it will have significantly higher PM emissions during operation on that fuel. There should be no significant long-term emissions or engine durability concerns, as long as the vehicle is then fueled with the proper fuel. Constant misfueling will damage the after-treatment/emission controls on these newer vehicles.

Will companies with bulk fuel for use in their own equipment be subject to testing?

EPA will inspect **wholesale purchaser/consumer** facilities and take samples from fuel pump stands and from vehicle fuel propulsion tanks.

Will existing tanks currently containing 500 ppm fuel be suitable for storage of ULSD?

ULSD can be stored in tanks currently storing other fuels, including 500 ppm fuel and high sulfur fuel. However, care must be taken when transitioning the tank to avoid contamination of the ULSD. For a rapid turnover you can purge and clean the tank; however, this is not required.

Will EPA test terminals or retail outlets?

EPA conducts sampling and testing of fuel at all points in the distribution system.

How will the end-user know whether they are refueling with fuel in excess of 15 ppm sulfur?

The regulations require labeling of all fuel pumps to inform the user of the type of fuel they are dispensing into their vehicle. These labels will state the engines/vehicles in which the specific fuel is suitable for use. These labels will match comparable labels on **new highway vehicles**. Distributors will likely test fuel batches at retail to make sure that the fuel meets the applicable standard listed on its pump label.

A trucking company stores ULSD at its terminal for use in its own truck fleet. Does it have any registration or reporting requirements?

No, but there are recordkeeping requirements and such an arrangement may be considered a wholesale purchaser/consumer.

Do Product Transfer Documents (PTD) have to list the sulfur amount?

The product codes on product transfer documents must list the numeric designation of 15, 500 or greater than 500. In addition, if the PTD is to be given to a truck carrier, retailer, wholesale purchaser/consumer, or mobile refueler, then the PTD must include the exact language required by 40 CFR 80.590.

Will EPA be testing diesel for compliance at the retail/vehicle level?

Yes, EPA will be testing diesel for compliance at the retail/vehicle level.

What frequency of testing is required at the retail level?

Retailers are not required to perform testing in order to have a defense to presumptive liability. However, to establish a defense to a violation, distributors must, among other things, conduct a periodic sampling and testing program. For a truck distributor, the best place to take samples may often be the tanks of retail outlets where it delivers. Retailers should sample and test after tank transition from a higher sulfur product to 15 ppm product, to confirm that the fuel in the tank is meeting the 15 ppm standard. Otherwise, if a violation is detected for some time after a tank transition, it may be difficult for the retailer to demonstrate that it did not cause the violation.



Do terminals need to test every batch?

Terminals are not required to test terminal tanks after every receipt of product. However, to establish a defense to presumptive liability to a violation, a terminal must establish each defense element. One such defense element is that the terminal had a quality assurance program, including a periodic sampling and testing program. Since terminals receive large volumes of product in each receipt, an appropriate quality assurance program might require sampling and testing after each receipt of 15 ppm product. Note that terminals have to test every batch in order to establish a defense if adding greater than 15 ppm sulfur content additives (or conduct the VAR approach under 40 CFR 80.614, if the additive is a static dissipater additive).

For more information

<http://www.epa.gov/cleandiesel/>

<http://www.epa.gov/cleandiesel/presentations/>

http://www.access.gpo.gov/nara/cfr/waisidx_04/40cfr80_04.html

<http://api-ep.api.org/environment/index.cfm?bitmask=002008007000000000>

<http://api-ep.api.org/printerformat.cfm?ContentID=E2D33972-A89B-46AC-85CCF7F99212B4DB>

Questions? Please contact your territory manager, or visit <http://www.MPCOneStop.com> or <http://www.eMpowered.com>.

Glossary

- conductivity** – the ability to transmit electricity
- dead leg piping** – piping that does not have a delivery outlet
- designated facility** – any place distillate fuel is produced, imported, or custody is maintained until the products are dyed or taxed
- heel mixing** – combining current tank bottoms with product in the tank
- LM** – diesel fuel designated for use in locomotive or marine engines
- LSD (Low Sulfur Diesel)** – diesel fuel containing no more than 500 ppm sulfur
- lubricity agent** – additive injected into ULSD in order to improve the lubricating properties of ULSD in compliance with ASTM D-975 lubricity specifications
- manifolded tanks** – tanks that are connected by a common pipe
- misdeliveries** – occurs when fuel is delivered to the wrong tank
- misfueling** – occurs when the wrong fuel is put into an engine
- MVNRLM** – diesel fuel designated for use in motor vehicles or non-road, locomotive or marine engines
- New truck/engine** – 2007 model year or later truck or engine
- NRLM** – Non-road, locomotive and marine fuel
- product designation** – labeling the product transfer document of a distillate by its intended use and sulfur content in accordance with EPA regulations
- product layering** – layers of various products in a tank such that the physical characteristics do not mix
- product transfer document (PTD)** – document used to transfer custody of fuel
- receipt specifications** – the specifications of fuel when it is delivered to the custody owner, including its sulfur content
- restricted downgrade** – not more than 20% of ULSD highway fuel can be downgraded to highway LSD
- sulfur contamination** – an increased sulfur content of ULSD due to unintentional mixing with a higher sulfur product
- ULSD (Ultra Low Sulfur Diesel)** – diesel fuel containing no more than 15 ppm sulfur
- UST** – underground storage tank
- Wholesale purchaser/consumer** – An ultimate consumer of diesel fuel that stores purchased diesel fuel into a storage tank of at least 550-gallon capacity

Disclaimer

“Marathon provides this as a courtesy to its customers and colleagues and does not hereby provide nor intend to provide legal counsel of any type. Marathon recommends you consult your environmental legal counsel regarding applicability and impact to your organization, if any, of the new ultra low sulfur rules.”

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