

Frequently Asked Questions In-Use Off-Road Diesel Vehicle Regulation

Fleet Average FAQ Revised August 2014

Q – What is a fleet average index and how is it calculated for a fleet?

A – The fleet average index is an indicator of a fleet's overall emission rate for both NOx and PM, and is based on each vehicle's engine horsepower (hp) and model year, and whether it is equipped with a Verified Diesel Emission Control Strategy (VDECS). The fleet average index for a specific fleet is determined by the following equation:

[SUM of (max hp for each engine in the fleet multiplied by the emission factor multiplied by the VDECS factor for each engine in fleet) for all engines in the fleet] divided by [SUM of (max hp for all engine in fleet)]

The tables below list the emission factors by hp rating and the VDECS factors:

Emission Factors by Horsepower and Year (g/bhp-hr)								
Engine Model Year	Horsepower Group							
	25-49	50-74	75-99	100-174	175-299	300-599	600-750	Over 750
1900 – 1969	7.2	14.8	14.8	15.9	15.9	15.2	15.2	15.2
1970 – 1971	7.2	14.8	14.8	14.8	14.8	14.1	14.1	14.1
1972 – 1979	7.2	14.8	14.8	13.6	13.6	13.0	13.0	13.0
1980 – 1987	7.2	14.8	14.8	12.5	12.5	11.9	11.9	11.9
1988	7.1	9.9	9.9	9.3	9.3	8.9	8.9	8.9
1989 – 1995	7.1	9.9	9.9	9.3	9.3	8.9	8.9	8.9
1996	7.1	9.9	9.9	9.3	6.9	6.9	6.9	8.9
1997	7.1	9.9	9.9	6.9	6.9	6.9	6.9	8.9
1998	7.1	6.9	6.9	6.9	6.9	6.9	6.9	8.9
1999	6.2	6.9	6.9	6.9	6.9	6.9	6.9	8.9
2000	6.2	6.9	6.9	6.9	6.9	6.9	6.9	6.9
2001	6.2	6.9	6.9	6.9	6.9	4.2	6.9	6.9
2002	6.2	6.9	6.9	6.9	6.9	4.2	4.2	6.9
2003	6.2	6.9	6.9	4.3	4.3	4.2	4.2	6.9
2004	4.9	4.9	4.9	4.3	4.3	4.2	4.2	6.9
2005	4.9	4.9	4.9	4.3	4.3	4.2	4.2	6.9
2006	4.9	4.9	4.9	4.3	2.6	2.6	2.6	4.2
2007	4.9	4.9	4.9	2.6	2.6	2.6	2.6	4.2
2008	4.9	3.0	3.0	2.6	2.6	2.6	2.6	4.2
2009	4.9	3.0	3.0	2.6	2.6	2.6	2.6	4.2
2010	4.9	3.0	3.0	2.6	2.6	2.6	2.6	4.2
2011	4.9	3.0	3.0	2.6	1.5	1.5	1.5	2.6
2012	4.9	3.0	2.5	2.5	1.5	1.5	1.5	2.6
2013	3.0	3.0	2.5	2.5	1.5	1.5	1.5	2.6
2014	3.0	3.0	2.5	2.5	0.3	0.3	0.3	2.6
2015 and later	3.0	3.0	0.3	0.3	0.3	0.3	0.3	2.6

Tier 0 Engine	
Tier 1 Engine	
Tier 2 Engine	
Tier 3 Engine	
Interim Tier 4 Engine	
Final Tier 4 Engine	

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VDECS	VDECS Factor
No VDECS Installed or Level 1 VDECS	1
Level 2 PM VDECS, not highest level	0.82
Level 2 PM VDECS, not highest level, with NOx Reduction	1 Minus (0.18 + (Verified Percent NOx Reduction Divided by 170))
Highest Level PM VDECS	0.7
Highest Level PM VDECS with NOx Reduction	1 Minus (0.3 + (Verified Percent NOx Reduction Divided by 170))
NOx Reduction only	1 Minus (Verified Percent NOx Reduction Divided by 170)

The Diesel Off-road Online Reporting System (DOORS) automatically calculates the fleet average index for each fleet and displays it in the Compliance Snapshot, which is a page available in each fleet's DOORS account.

The examples below demonstrate how to calculate the Fleet Average Index with and without a VDECS installed and the effect a VDECS has on a fleet's average emissions.

Example 1: A fleet has 3 vehicles: one vehicle has been retrofitted with a Level 3 VDECS that achieves 60 percent NOx reduction, and two vehicles have no VDECS. The resulting VDECS factor for the vehicle with a Level 3 device and previously specified NOx reduction is calculated as follows:

$$\text{VDECS Factor} = [1 - (0.3 + 60/170)] = 0.35$$

Vehicle 1: 1998, 200 hp, Emission Factor = 6.9, VDECS Factor = 0.35

Vehicle 2: 2002, 300 hp, Emission Factor = 4.2, VDECS Factor (no VDECS) = 1

Vehicle 3: 2004, 400 hp, Emission Factor = 4.2, VDECS Factor (no VDECS) = 1

The Fleet Average Index is calculated as follows:

$$[(200 \times 6.9 \times 0.35) + (300 \times 4.2 \times 1) + (400 \times 4.2 \times 1)] / (200 + 300 + 400) = 3.8$$

If Vehicle 1 above did not have the VDECS installed, the fleet average index would be 4.8.

Example 2: A fleet has installed VDECS of varying types on all 4 of their vehicles. The table below shows the before and after emission factors for quick comparison.

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Example of Emission Factors Before and After VDECS

Engine Model Year	HP	PM VDECS?	NOx VDECS?	Emission Factor Before VDECS	Emission Factor After VDECS (Emission Factor x VDECS Factor)
1996	175	Yes, Level 3	Yes, 65% reduction	6.9	2.19
1998	200	No	Yes, 60% reduction	6.9	4.46
2000	250	Yes, Level 3	No	6.9	4.83
2003	300	Yes, Level 2 (not highest level)	Yes, 50% reduction	4.2	2.21

Q – What is a fleet average target rate and how is it calculated for a fleet?

A – The fleet average target rate is the fleet average that a specific fleet must meet each year in order to show compliance with the fleet average requirements. (In lieu of meeting the fleet average target rate, the fleet can elect to meet BACT requirements, as explained later in this document.) The fleet average target rate varies depending on a fleet’s hp distribution. The fleet average target rate for a specific fleet for each compliance year is determined by the following equation:

$$\frac{[\text{SUM of (max hp for each engine in fleet multiplied by the target for each engine in fleet) for all engines in fleet}]}{[\text{SUM of (max hp) for all engines in fleet}]}$$

The fleet average targets in g/bhp-hr are shown in the tables below (note that there are separate tables for large/medium fleets and small fleets). To find the target for each engine, read the value for the appropriate row based on the compliance year and the appropriate column based on the engine’s max hp.

**Large and Medium Fleet Targets for Each Max Hp Group
For Use in Calculating Fleet Average Target Rates [g/bhp-hr]**

Compliance Date: January 1 of Year	25-49 hp	50-74 hp	75-99 hp	100- 174 hp	175- 299 hp	300- 599 hp	600- 750 hp	>750 hp
2014 (Large Fleets Only)	5.8	6.5	7.1	6.4	6.2	5.9	6.1	7.2
2015 (Large Fleets Only)	5.6	6.2	6.7	6	5.8	5.5	5.6	6.8
2016 (Large Fleets Only)	5.3	5.8	6.2	5.5	5.3	5.1	5.2	6.5
2017	5.0	5.4	5.5	4.9	4.7	4.5	4.6	6.0
2018	4.7	5.0	4.8	4.3	4.1	4.0	4.0	5.5
2019	4.4	4.6	4.1	3.7	3.5	3.4	3.4	5.0
2020	4.1	4.2	3.4	3.1	2.9	2.8	2.9	4.5
2021	3.8	3.8	2.7	2.5	2.3	2.2	2.3	4.0
2022	3.5	3.4	2.0	1.9	1.7	1.7	1.7	3.5
2023	3.3	3.0	1.4	1.3	1.5	1.5	1.5	3.4

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**Small Fleet Targets for Each Max Hp Group
For Use in Calculating Fleet Average Target Rates [g/bhp-hr]**

Compliance Date: January 1 of Year	25-49 hp	50-74 hp	75-99 hp	100-174 hp	175-299 hp	300-599 hp	600-750 hp	>750 hp
2019	5.8	6.5	7.1	6.4	6.2	5.9	6.1	7.2
2020	5.6	6.2	6.7	6.0	5.8	5.5	5.6	6.8
2021	5.3	5.8	6.2	5.5	5.3	5.1	5.2	6.5
2022	5.0	5.4	5.5	4.9	4.7	4.5	4.6	6.0
2023	4.7	5.0	4.8	4.3	4.1	4.0	4.0	5.5
2024	4.4	4.6	4.1	3.7	3.5	3.4	3.4	5.0
2025	4.1	4.2	3.4	3.1	2.9	2.8	2.9	4.5
2026	3.8	3.8	2.7	2.5	2.3	2.2	2.3	4.0
2027	3.5	3.4	2.0	1.9	1.7	1.7	1.7	3.5
2028	3.3	3.0	1.4	1.3	1.5	1.5	1.5	3.5

DOORS automatically calculates the fleet average target rates for each fleet and displays them in the Compliance Snapshot, which is a page available in each fleet’s DOORS account.

Example Fleet Average Target Calculation:

The following small fleet has 3 vehicles totaling 600 hp:

Vehicle 1: 1998, 100 hp: Target for January 1, 2019 = 6.4

Vehicle 2: 2002, 200 hp: Target for January 1, 2019 = 6.2

Vehicle 3: 2004, 300 hp: Target for January 1, 2019 = 5.9

The Fleet Average Target for the January 1, 2019 compliance date is calculated as follows:

$$= [(6.4*100) + (6.2*200) + (5.9*300)] / (100 + 200 + 300)$$

$$= 6.1$$

For more information on emission factors and how fleet averages and fleet targets are calculated, please see the Emission Factors FAQ, which is available at <http://www.arb.ca.gov/msprog/ordiesel/documents/emissionfactorsfaq.pdf>.

Q – What are the fleet average requirements in the Off-Road Regulation, and how do I comply with them?

A – By each compliance date (annually on January 1st, beginning in 2014 for a large fleet, 2017 for a medium fleet, and 2019 for a small fleet), the fleet must either show that its fleet average index was less than or equal to the calculated fleet average target rate (see above), or that the fleet has met the BACT requirements, which are discussed later in this document. The fleet average targets and BACT requirements can be met through vehicle or engine turnover

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(such as retiring older vehicles, replacing older vehicles or engines with newer, cleaner ones, or designating vehicles as permanent low-use) or by installing VDECS. Additional information on low-use vehicles is available in the Low-Use FAQ document located in our off-road Knowledge Center at <http://www.arb.ca.gov/msprog/ordiesel/faq/lowusefaq.pdf>.

Q – What if I cannot meet the fleet average target by the January 1st compliance date?

A – If a fleet does not meet the fleet average target rate, it must demonstrate that during the calendar year prior to the compliance date, it has earned the necessary amount of Best Available Control Technology (BACT) credit (in hp) to meet or exceed the minimum BACT requirements specified for that compliance date. For more information on how to comply with the performance requirements using BACT credit, please see the BACT FAQ, which is available at <http://www.arb.ca.gov/msprog/ordiesel/faq/bactfaq.pdf>.

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