

THE DIESEL EMISSIONS QUANTIFIER

Introduction to the Diesel Emissions Quantifier/ Starting with Slide 9:

The purpose of this webinar is to provide users with information on how best to use the DEQ. We will briefly go over the background, talk about the process, go over the inputs and outputs, walk through a website overview, and finally talk about some future plans on the DEQ.

Background/ Slide 10

Before the DEQ existed, we did not have a tool geared specifically towards retrofit projects to calculate emissions. Tools did exist, but were somewhat cumbersome to extract the type of data we are looking for. So users were left to come up with their own calculations or had to run one of the modeling tools such as NMIM. Today, EPA has the DEQ to help people calculate their emission reductions.

Background / Slide 11

We created the DEQ back in 2006 for the reasons I just mentioned:

- There was a strong need for an easy method for determining emission reductions.
- We also needed a uniform tool so that we'd have consistency when calculating and reviewing reductions.

We built the DEQ based on the existing modeling tools like NMIM, Mobile 6.2 and the Nonroad Model, as well as the 2008 Locomotive and Marine Diesel Emission Standards.

DEQ Process Flow Diagram/ Slide 12

To use the DEQ, the user has two categories of inputs:

- Defining the Vehicle Group Information (or defining the fleet)
- And applying a new technology (or clean diesel strategy) to that vehicle group.

Then, using the equations built into the DEQ, the results will be calculated as emissions reduced for 5 pollutants NO_x, PM, HC, CO, and CO₂ over the annual and lifetime timeframes

If you are interested in reviewing the equations, they can be found in the Users Guide under Appendix B.

The DEQ can be accessed from EPA's National Clean Diesel Campaign website

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

How Do You Access the DEQ/ Slide 14

When you click on that you link you get to the DEQ homepage. There are a couple of links here that I'd like to point out.

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Basic Information:

Basic information provides more information about why and how we created the DEQ if you are interested in more background information.

Instructions:

The instructions link takes you to the step by step instructions as well as a link to the users guide in PDF and web format

Disclaimer:

The DEQ is intended as a helpful tool to prepare estimates, it should not be used for the calculation of any emission reductions to be incorporated in a State Implementation Plan (SIP) or conformity determination.

If you wish to calculate emission reductions for a SIP or conformity determination, you should review the appropriate SIP and conformity guidance document and consult with your EPA Regional Office.

The DEQ Start page / Slide 15

This brings us to the start page.

Log In:

Under the first Green header bar, you have the option to log-in (once an account has been created). We recommend that you register for an account. Registering for an account is not required to use the DEQ, but an account allows you to save up to three scenarios to work on at a later time, and allows you to produce a summary report.

Scenario:

There are two options: quantifying emissions and preparing data for the EPA

The difference between quantifying emissions and preparing data for EPA is the downloadable reports you have access to on the results page.

If you select preparing data for the EPA, you will have the option to select the summary report on the results page. This report is very helpful when applying for a grant.

Preparing data for EPA does require contact information, so if you don't have an account, you will be prompted to input this information.

We are in the process of adding marine vessels for C1 and C2, non ocean going vessels, which will change this screen slightly as marine vessels will be a separate component of the DEQ.

Please Select a State:

Finally, select the state the project occurs in. If the project spans across multiple states, select the state that will receive the majority of the benefits, then click continue to input information about the actual fleet.

The DEQ Input Page / Slide 16

This brings us to the page where we can input information about the actual fleet. Now lets walk through each field

Input: Enter New Vehicle Group – Select Type / Slide 17

The first field is to select either On Highway or Nonroad.

Input: Select Sector / Slide 18

Next we define the sector. The sector dropdown menu will vary based on the type selection.

Sectors / Slide 19

The DEQ supports a wide range of vehicles and equipment. With regard to On-highway vehicles, the DEQ supports vehicles designated as Class 5 or higher based on the gross weight of the vehicle, so that includes school buses, transit buses, refuse haulers, delivery trucks and others.

The DEQ, however, does not support gasoline engines or light-duty diesel engines like a pick-up truck or van.

On the Non-road side the DEQ supports a wide range of engines found in a variety of sectors such as construction and agriculture equipment. The DEQ also supports equipment found and ports and rail yards, including locomotive engines such as a line-haul, switch or passenger engine.

Select Application / Slide 20

Again we will be adding a marine component to calculate emission for C1 and C2, non-ocean going vessels

Moving on is the application field which is another dropdown menu to help define the vehicle.

Basically the first three fields are a series of dropdown menus that assist the user in selecting the vehicle or equipment they wish to model. A complete list of vehicles and equipment can be found in Table A-2 of the User's Guide.

Select Quantity / Slide 21

Next is the Quantity. This can be either the number of vehicles in your fleet or the number of vehicles you wish to retrofit.

If you are interested in retrofitting only a fraction of the vehicles in your fleet, but want to calculate the over-all benefits, enter the number of vehicles in your fleet.

If you are interested in seeing what the results are for just the vehicles retrofitted, enter the number of vehicles to be retrofitted in the quantity field.

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Please note for EPA funds, you should enter the number of vehicles being retrofitted.

Select Model Year/ Slide 22

The model year refers to the model year of the engine. In our example, we have 10 vehicles, the chance that all 10 vehicles are of the same model year are slim.

Most likely the model years will not all be the exact same. If the model years are close, then the user can combine all the vehicles into one DEQ run. For example if the model year for these 10 vehicles ranges from 1999 to 2003, you can select 2001 as the model year.

Select Retrofit Year / Slide 23

However, if the model year ranges from 1990 to 2006, I would recommend doing multiple DEQ runs.

Please note, as a general rule, we believe that it is cost prohibitive to retrofit anything older than 1990. For any vehicles older than 1990, select 1990 as your model year.

This refers to the year in which the retrofit occurs.

Select Fuel Type/ Slide 24

Fuel Type- This refers to the type of fuel you are currently using. The DEQ factors in the Diesel Fuel Regulations for Sulfur content. Thus, since our retrofit year is 2009, ULSD is required (15ppm). If the retrofit year were 2005, you would also have the option of low-sulfur diesel at 500 ppm before ULSD was required for all on-highway vehicles. This holds true for non-road applications as the regulations change for non-road equipment.

Select Fuel Volume / Slide 25

Fuel Volume- This is the amount of fuel the ENTIRE group of vehicles consume. Thus if each of the 10 school buses consume 1,597 gallons/year, the value to entire is 15,970.

Calculated Fuel Volume- If the fuel selected is something other than diesel, this field shows the calculated diesel equivalent. This allows for CO2 to be compared on an equal basis across the entire fleet should multiple types of fuel be used. Otherwise it will be the same value as entered by the user.

The value that I use here, as well as in subsequent slides, are based off typically reported values for the given type of vehicle as well as the MOBILE6.2 the NONROAD Model, and other documentations.

Vehicle Miles Traveled / Slide 26

VMT- This is the AVERAGE number of vehicles traveled per year per vehicle.

Idling Hours / Slide 27

Idling Hours- This is the AVERAGE number of hours a vehicle idles per year. This refers to the number of hours a vehicle idles per year, not including normal operations (i.e. stopped at a light). This field is required if you have an idle reduction project.

Below idling hours is a link to enter in funding information.

Optional Funding Information / Slide 28

You can use this section to input information about how much the project will cost or how much the grant is.

This is helpful if you are interested in determining what the TOTAL cost- effectiveness of the project based on the amount of the grant/project.

Please note: You can only use this field if you are modeling one project. You cannot combine projects in one DEQ run and calculate the cost-effectiveness based on the funding.

I'd also like to point out the buttons under the Vehicle Group Actions on this slide. At this point you have a couple of options. If you do not wish to apply a technology and do not have any other vehicles groups to enter, you can save and scroll down to the Quantify Button to see your results. If you do not wish to apply a technology, but have another vehicle group you wish to add, you can Save and Add Another, or if you wish to apply a technology to this vehicle group you can skip these buttons and move on to the Technology Section. You can always return to Save and Add Another if you have more vehicle groups you wish to add.

Please note: There is no limit to the number of vehicle groups applied to one DEQ run/scenario.

Select Technology / Slide 29

The next thing we have to do is select a technology.

Technology Types / Slide 39

The technology type (as well as the technology) will vary depending on what is applicable to the selected vehicle.

Now let's look at the "Apply technology to" field: In this field you would input the number of vehicles being retrofitted. Most likely it will be the same number that you previously inputted in the vehicle Information section, unless you are modeling your entire fleet and only retrofitting a portion.

The technology type (as well as the technology) will vary depending on what is applicable to the selected vehicle.

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With regards to what technologies are available, there are a variety of options under each Technology Type, so if you are new to using the DEQ, or even if you have used it a number of times, I recommended reviewing each Technology Type and then the Technologies listed under that group. Some technologies are not listed where you would instinctively think them to be. For example, a CNG Replacement is not listed under Fuels or Engine Replacement- It is listed under Emission Control Devices. This is because the calculation methods follow that of an emission control device. Another example is a combination of a DOC plus biodiesel. This too is listed under Emission Control Devices.

Percent Reduction / Slide 31

After selecting a technology, the percent reduction will automatically be populated for most cases. These numbers are based on results from EPA's verification program and trusted scientific reports/studies.

It is important to note that the percent reduction associated with a particular retrofit technology or cleaner fuel may vary by manufacturer and application and may change as more information becomes available. These percentages can be modified by the user by simply highlighting the field and typing in the new number. Please keep in mind that no technology can be credited over 100%.

Certain technologies are listed as an option however we have not yet verified and as a result, the percent reduction will show up blank. You can still use this technology but you will have to work with the manufacturer to determine what the percent reduction is. For fuels and replacements/repowers, while there are potential CO₂ reductions by using these strategies, the DEQ cannot support these calculations at this time.

Unit Cost / Slide 32

Unit Cost: This is field, along with the installation cost are provided as another means to calculate a cost-effectiveness number. While the funding amount which we discussed earlier was used to determine the cost-effectiveness based on the cost of the project, the unit cost plus the installation cost are used to determine the cost-effectiveness based on only the technology itself.

In the results section, this is called the Capital Cost-Effectiveness These fields are not required.

Please note that these fields do not apply to switching to alternative fuels.

Technology Actions / Slide 33

Buttons: After you've input all the information, click on the save button.

Quantify Emissions / Slide 32

After doing so you will see that the button changes to "Save to V1" V1—This refers to vehicle group one and to applying more than one technology to a vehicle group which we will get into later.

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After you've saved your information, you will see a brief description added to the Current vehicles and Applied Technologies Summary section. You can then click on the Quantity button to get the results.

Outputs—Emissions Results / Slide 35

This table is the overall results of all the vehicle groups and applied technologies.

On the next slide I'll show you how the results can be broken out by vehicle group.

Results are shown for NOX, PM, HC, CO, and CO2 in tons per year as well as over the remaining lifetime of the vehicle.

The last column is diesel equivalent in gallons per year. This is a function designed for SmartWay partners and goes beyond the scope of this webinar.

1. The first two rows show the baseline for the entire fleet and the vehicles being retrofitted. If the number entered for the count in the vehicle information section is the same for the number of vehicles retrofitted are the same, then the baseline numbers will be the same. Here you can see that the baseline value is: 03 tons/year
2. Percent Reduced values are the emission reduction percentages obtained after ALL control technologies are applied to THE FLEET.
3. Amount Reduced per Year values are the tons of pollutants reduced per year by applying controls. These values converted to kilograms per day are displayed in the Daily section of the table.

Lifetime Results-The Lifetime Emissions section of the Results table displays the emissions that are estimated to occur over the remaining lifetime of all vehicle groups in a fleet. For on-highway vehicles, the lifetime is set at 30 years. Thus if the vehicle is already 10 years old, you will only receive benefits for the remaining 20 years. For non-road equipment it is depends on the type of equipment and horsepower.

The Baseline of Entire Fleet, Baseline of Vehicles Retrofitted, Percent Reduced, and Amount Reduced values are analogous to the values in the Annual, Daily table.

1. The next two rows show the amount emitted after retrofit for both the vehicle retrofitted and the fleet, again if the number entered for the count in the vehicle information section is the same for the number of vehicles retrofitted are the same.
2. The last two rows show the cost effectiveness numbers. The Capital Cost Effectiveness is calculated by dividing the total unit and installation costs of all retrofits in the fleet by the Amount Reduced. These values are only calculated if the user enters unit and installation costs on the Fleet Information screen. Total Cost Effectiveness is calculated by dividing the total cost of the retrofit project (capital costs, administrative costs, etc.) by the Amount Reduced.

Outputs – Detailed Results / Slide 36

Results are also displayed in greater detail. This is useful if you are including multiple vehicles in each scenario. The Detailed Results section also shows what all of the inputs are.

Outputs – Reporting / Slide 37

The user has the option of saving the data as excel or CVS reports. There are two reports available: the detailed report and the summary report which can be found directly beneath the detailed results table.

Additional Examples to Try / Slide 38

The detailed report includes all inputs and outputs.

Example 1 – Inputs / Slide 39

The summary report is a condensed version of the detailed results.

Example 1 – Outputs / Slide 40

This report contains the relevant information that EPA needs to review a grant application and is the preferred method of reporting data to the EPA.

However, the summary report can only be accessed if you select the “quantifying emissions for EPA” option when selecting a scenario.

Now let’s go to the DEQ and actually look at these examples

Example 1 -- Outputs / Slide 41

I have already saved an example so let’s just go over that very quickly
So here we see we have an 85% reduction in PM from the filter we’ve applied and subsequent emissions reduced from HC and CO emissions.

Now let’s add a second vehicle group to this DEQ scenario

The overall results are as follows:

Looking at just the PM, you will see that the baseline value has changed from 0.44 tons to 1.26 tons to factor in the 5 new backhoes. You will also notice that the percent reduction has changed. This is the percent reduced over the entire DEQ scenario.

But I want to point out the percent reduction for the annual results versus the lifetime results. In the school bus example, they were the same, but now they are not. This is because the remaining life of the school bus and the backhoe are not the same.

Now, I would like to explain how the percent reductions are calculated:

For our filter, there is an 85% reduction and for the catalysts there is a 20% reduction. From the detailed table, we can see the emissions reduction calculations breakdown per technology. I know it looks a little funny for the first row- we will be increasing the significant figures in our next series of updates. If you look at the highlighted column,

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you will see that these two values equal the amount reduced on the overall summary results. We can then determine that the overall percent reduction is 34.8%.

Example 2 Inputs / Slide 42

Now let's look at an example where we apply multiple technologies to one vehicle group

Example 2 outputs / Slide 43

Now we need to get the results.

Future DEQ Improvements/ Slide 43

We plan to add marine vessels and health benefits to the DEQ in the near future.

Conclusion / Slide 45

The DEQ will evolve to meet your needs. For more information, go to the following sites:

Step by step instructions: <http://cfpub.epa.gov/quantifier/view/stepbystep.cfm>

User Guide: <http://cfpub.epa.gov/quantifier/view/UserGuide.pdf>