GSA Fleet℠

Desktop Workshop

Diesel Maintenance and Management

Presented by: Justin Nye, John Hampson, and Peter Mielke

May 2021

Target Audience

Bus and medium/heavy trucks

Campus environments

Low speed or high idle duty cycle

Diesel Maintenance and Management

- Picking the right vehicle
- What are ideal and problematic use cases for diesel vehicles?
- How does diesel maintenance differ from vehicles of other fuel types?
- What is a DPF?
- What is a regeneration?
- What is DEF?
- Biodiesel
- Telematics Reports
- Recommended Drivers Training
- Summary

Picking the right vehicle

- Diesel engines are more efficient
  - Use them in your **high mileage applications** to **save fuel** and take advantage of **higher life expectancies**
- Torque requirements
  - Diesel offers better torque, particularly at elevation
- Make sure your requirements make sense
  - Pull a trailer across Colorado everyday = Diesel
  - Move some trailers on flatlands, limited mileage applications = Gas

Use the GSA Fleet Center of Expertise and the vendor to help research capabilities

Vehicle Selection - Diesel Vs Gas

Which fuel type meets the requirement?

- Availability of gas engines
- Parts availability and vehicle downtime
- Fuel availability
- Towing and payload
- Power take-off (PTO)
- Upfitting
- Biofuel use

Problematic Use Cases For Diesels

- **Avoid low speed operation**
  - Diesel vehicles perform better with higher speeds and longer duration
- **Diesels don’t like idling**
  - Today’s diesels will run into regeneration issues and DPF clogging with high idle scenarios
- Short trips and low mileage duty cycles **Do Not** take advantage of diesels inherent fuel efficiency and typical extended mile life-cycle

Diesel Maintenance Vs Other Fuel Types

The main difference is **Cost**

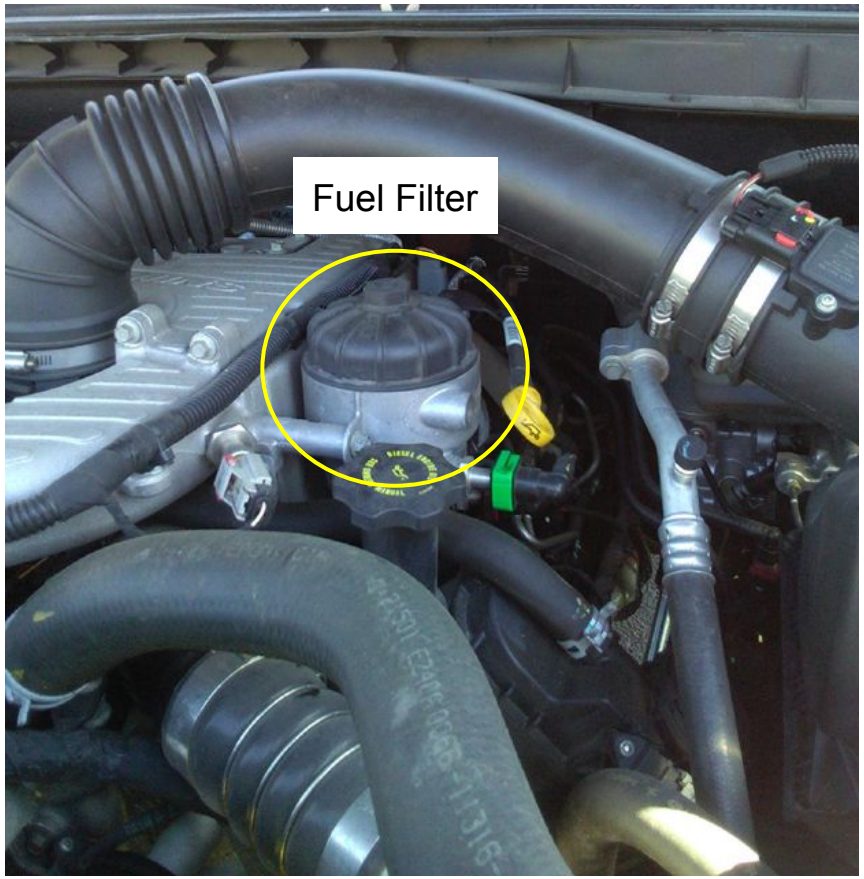
- Preventative Maintenance
  - Some engines hold upwards of 8.5 **gallons** of oil
  - Large oil and fuel filters are replaced more regularly
  - Exhaust systems that require regular maintenance
- Engine Parts
  - Have higher cost and lower availability
  - Examples: starters, alternators, water pumps, batteries
- Service
  - Shortage of qualified Diesel Technicians
  - Labor intensive
  - High hourly rates

Diesel Maintenance Vs Other Fuel Types

Diesel vehicles have systems that normal vehicles don't have or don't have to the same degree

- Exhaust Recirculation
- Diesel Particulate Filter (DPF)
- Diesel Exhaust Fluid (DEF) system
- Large Turbo systems
- Large fuel filtration systems

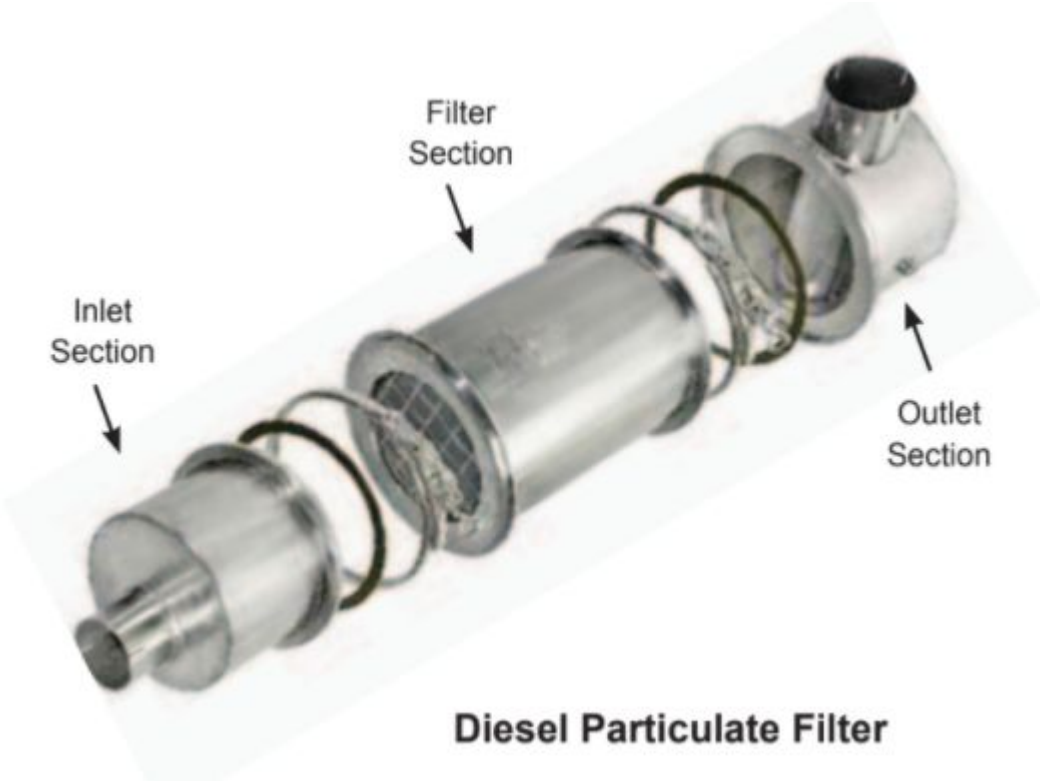
All of these systems require frequent maintenance and care, dramatically increasing the cost of ownership



What is a DPF?

Diesel Particulate Filter (DPF)

- Large filter added to the exhaust system of diesel vehicles in order to reduce vehicle emissions
- Traps and stores exhaust particulates such as soot and ash



EPA-420-F-10-029, May 2010

What is a DPF?

The DPF system is frequently cleaned through a process called regeneration

- A vehicle that operates at low speeds will not generate the heat necessary to regenerate
- A clogged DPF system will cause poor performance or shut down the vehicle completely

What is a regeneration?

Regeneration is the process to clean the DPF system

- Ash is not burned off and will eventually need to be physically cleaned from the DPF

Types of regeneration:

- Passive Regeneration
  - The engine in the vehicle is creating enough heat that the carbon (soot) in the DPF can combine with the oxidized exhaust gases, create carbon dioxide, and exit the filter
  - Occurs while a vehicle is being driven normally under load

What is a regeneration?

- Active Regeneration
  - Occurs when the engine is not creating the heat it needs to perform the chemical reaction changing soot to carbon dioxide
  - To create heat the vehicle will inject fuel into the exhaust stream, which will burn and raise the temperature of the exhaust

Both Passive and Active Regeneration happen without the drivers knowledge under normal operating conditions

What is a regeneration?

- Parked/Manual Regeneration
  - Operating conditions don't allow the DPF to be cleaned by passive or active regeneration
  - Operator-initiated using dash controls
    - 20 to 60 minutes to complete
    - Not available on all vehicles
  - Vehicle must be parked in a safe area away from other vehicles or combustible material due to the heat produced by the regeneration

What is a regeneration?

- Forced Regeneration
  - Used when all other forms of regeneration fail
  - Performed by a technician
    - Costs on average $150
    - 45 to 90 minutes to complete
  - Computer is used to force the vehicle to start the regeneration process
  - The DPF may need to be removed and cleaned or replaced if the Forced Regen fails to properly clean the system

Drivers Responsibilities

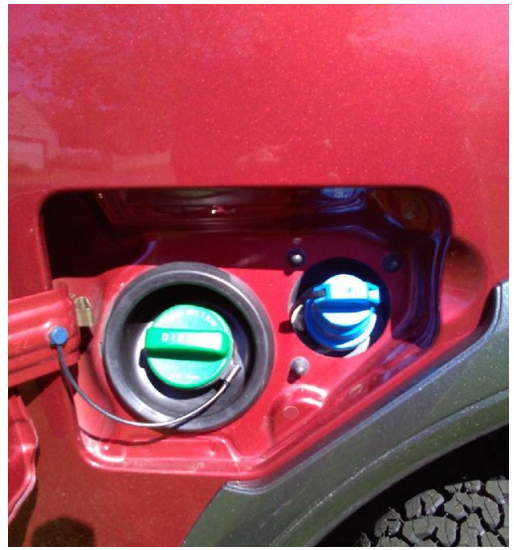
“Diesel Vehicles / Diesel Particulate Filters (DPF) / Regeneration. Most diesel vehicles require periodic regeneration of the DPF, which is the process of burning off excess soot from the filter. Drivers will be alerted to perform regeneration by a warning light and should follow the steps listed in the owner’s manual to complete the regeneration. Ignoring the warning light or performing incomplete regeneration may result in the engine shutting down and possible damage to the DPF and/or engine. Charges incurred for vendors to initiate a DPF regeneration and repairs resulting from improper or not performed regeneration will be the financial responsibility of the leasing agency.”

Guide to Your GSA Fleet Vehicle, October 2020

What is DEF?

Diesel Exhaust Fluid (DEF)

- Used to break down NOx emissions into nitrogen and water using Selective Catalytic Reduction (SCR) technology
- Should **NOT** come into contact with diesel
  - Has its own storage tank (Blue Filler Cap)
- Purchased at a fuel station or maintenance vendor
- Driver-managed
  - DEF usage rate is roughly 50 gallons diesel to 1 gallon DEF
    - Recommend having spare DEF on hand
  - Warning Lamps
    - When DEF is low a warning lamp will illuminate
    - When DEF is empty the vehicle will go into limp mode or shut off completely



Biodiesel

Pros

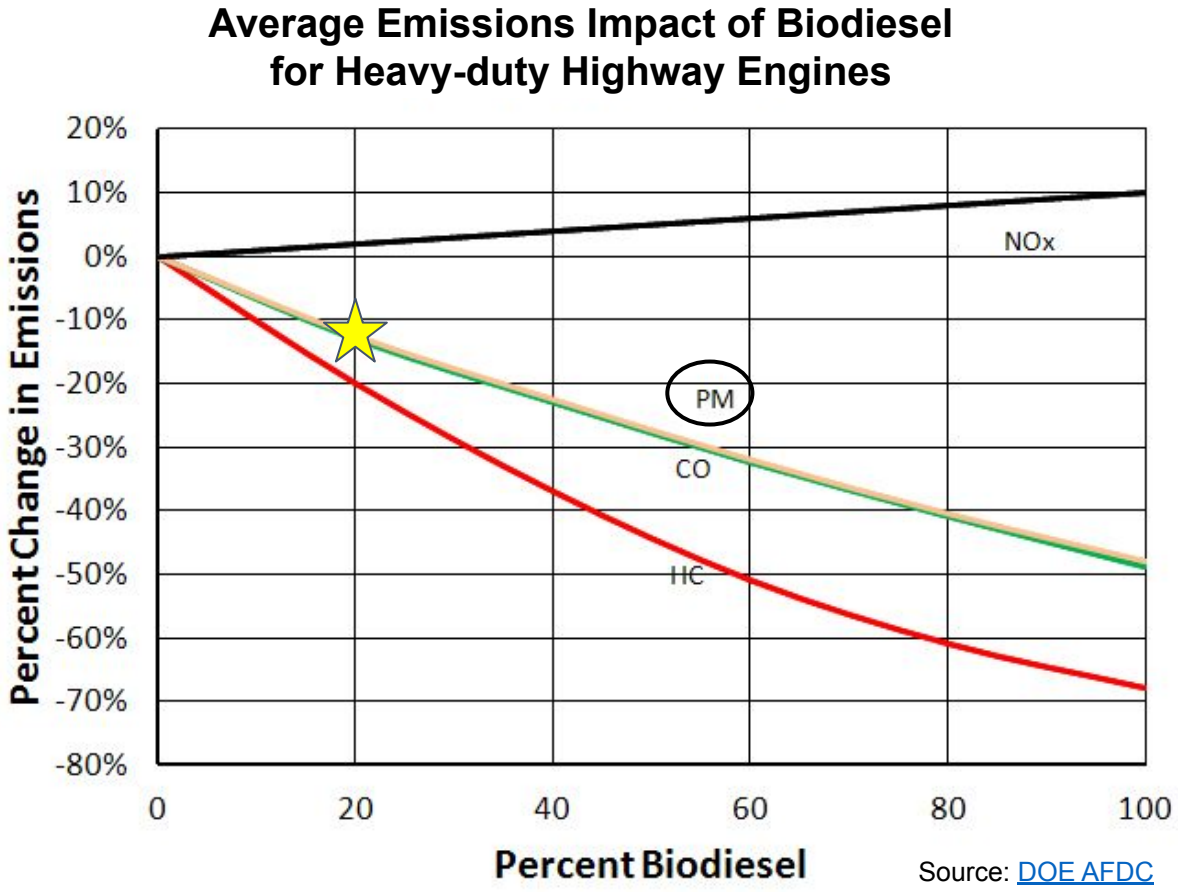
- AFV credit
- Lubricity
- Less particulate matter
- All diesels up to B5, commonly no modification up to B20

Cons

- Fuel stability
  - Storage
  - Water
- Cold temperatures
- Fuel filter life
- Availability

Biodiesel

B20 offers ~10% drop in particulate matter (PM)

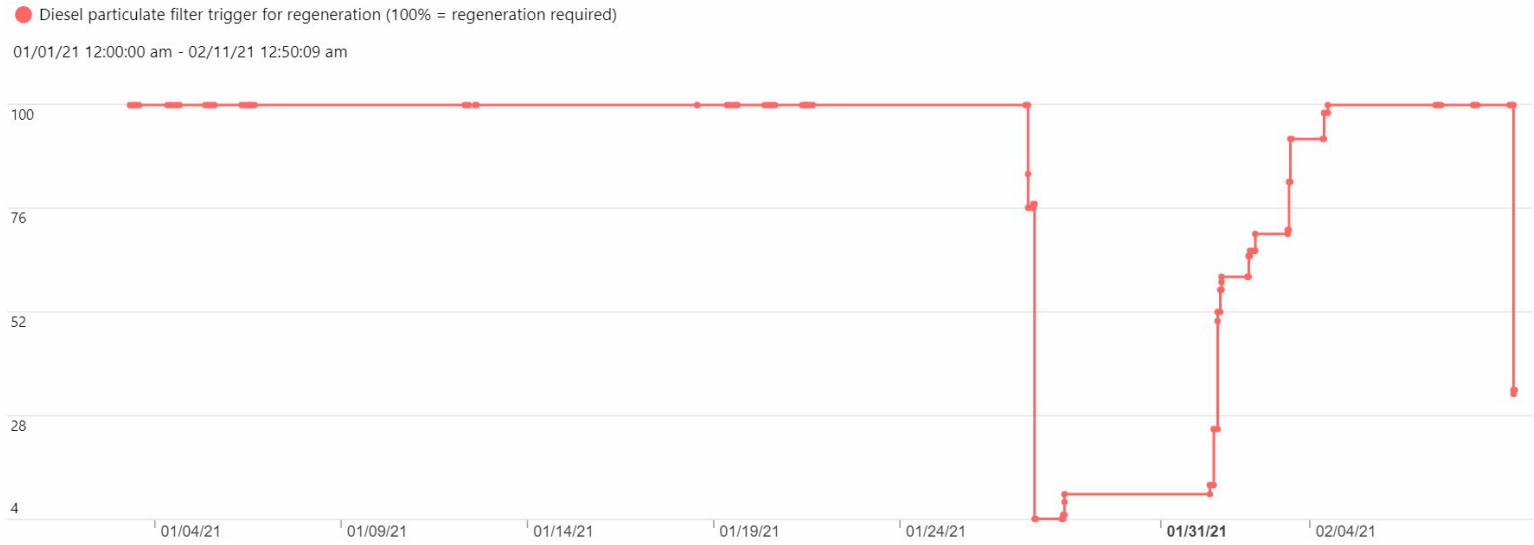


Source: DOE AFDC

Telematics

Exhaust System

- DEF level
- DPF warning lamps
- DPF soot levels



Vehicle Usage

- Engine hours
- Percentage Idle Time
- Speed Profile

Geotab Demo

Drivers Training

Required

- Commercial Drivers License (CDL)
  - Mandatory for vehicles over 26,000 GVWR (see state regulations)
  - Combined GVWR matters if the trailer is more than 10,001 lbs

Recommended

- Exhaust Aftertreatment Training
  - Cummins, Engine Lamp Guide
  - Ford
  - International
  - Ram/MOPAR
- Professional Truck Driving Course
  - Free for leasing customers

Summary

Maintenance

- Differs from other fuel types
- Engine and exhaust issues are preventable through proper fleet management and vehicle specification
- Biodiesel may be a better option for your requirement

Acquisitions

- More gas options available
- Industry still expects diesel to be a key player in certain segments

Resources

EPA Technical Bulletins

- DPF General Information
- DPF Operation and Maintenance

OEM Guides

- Cummins
- International

Articles

- DEF Overview
- Gasoline or Diesel
- Calculating Max Payload and Towing Capacity
- Biodiesel Technical Highlights
- Alternative Fuel Data Center
- 2018 U.S. Diesel Analysis

Thank you for attending today's Desktop Workshop

For additional information on this topic contact:

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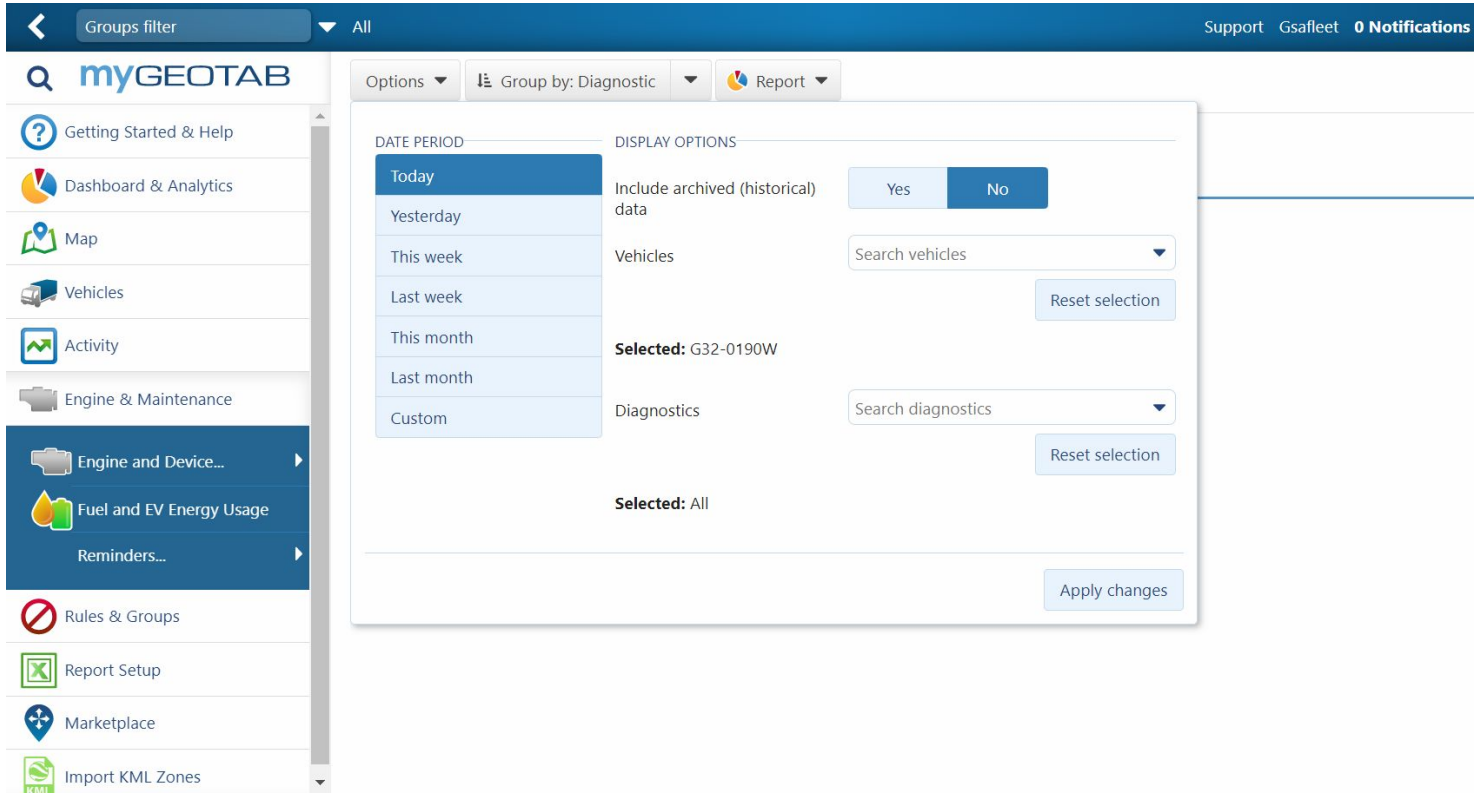
Looking for more federal fleet training?

- Check out the Federal Fleet Manager Certification Program - www.gsa.gov/ffmcp
- Register for future GSA Fleet Desktop Workshops - gsa.gov/gsa-fleet-training
- View pastDesktop Workshops at http:bit.ly/DtWRecordings

Fleet®

Geotab Demo


Groups filter
All
Support
Gsafleet
0 Notifications
myGEOTAB
Options
Group by: Diagnostic
Report
Getting Started & Help
Dashboard & Analytics
Map
Vehicles
Activity
Engine & Maintenance
Engine and Device...
Fuel and EV Energy Usage
Reminders...
Rules & Groups
Report Setup
Marketplace
Import KML Zones
DATE PERIOD
Today
Yesterday
This week
Last week
This month
Last month
Custom
DISPLAY OPTIONS
Include archived (historical) data
Yes
No
Vehicles
Search vehicles
Reset selection
Selected: G32-0190W
Diagnostics
Search diagnostics
Reset selection
Selected: All
Apply changes

Geotab Demo

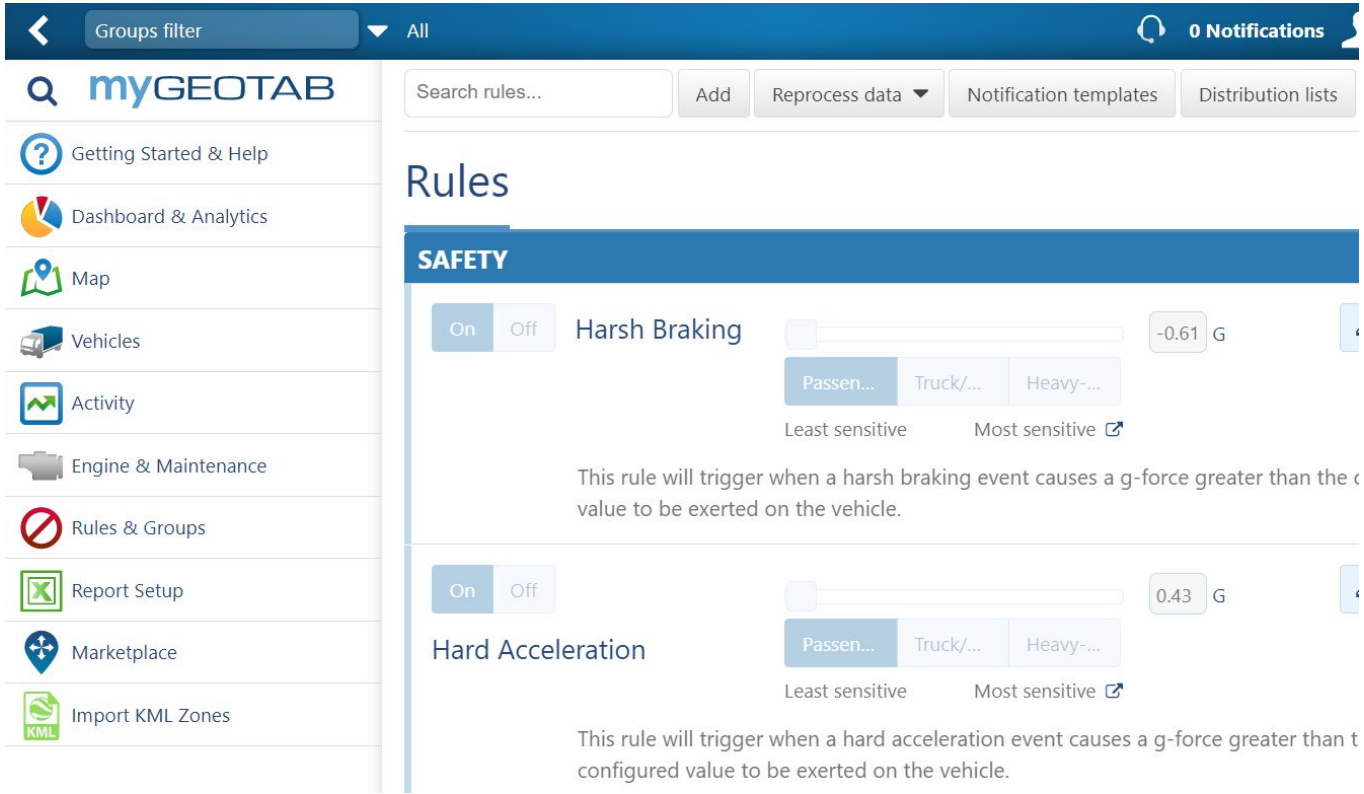
Engine Measurements

Total items 1896

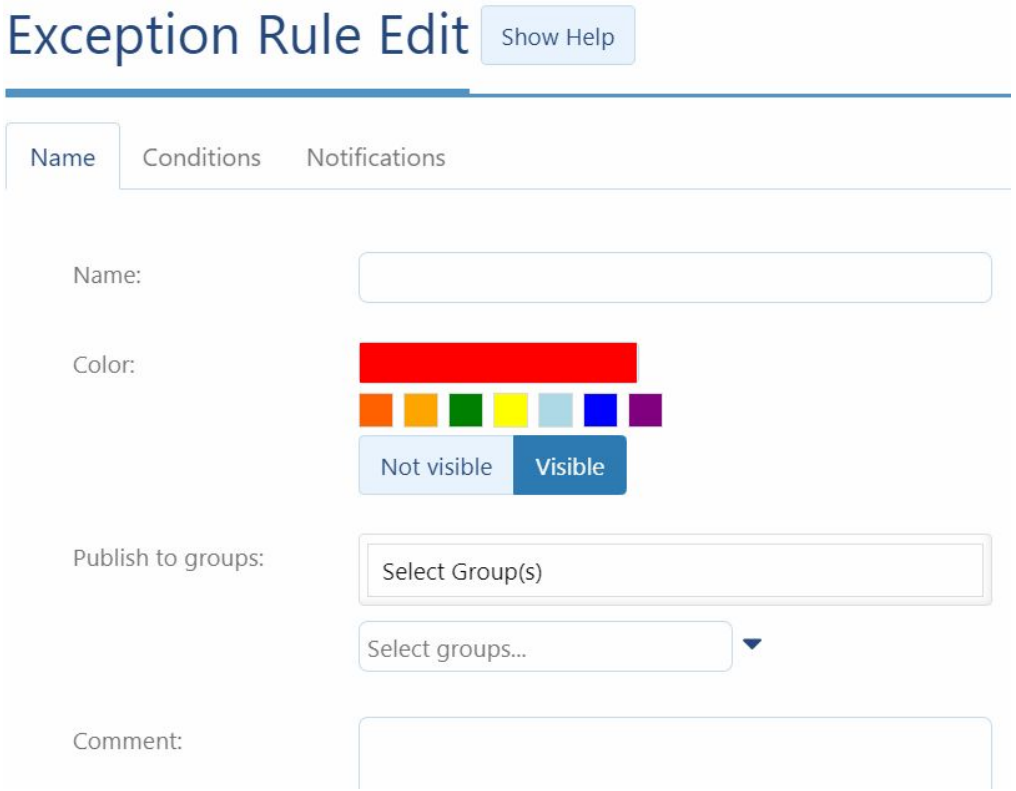
G32-0190W 03-02, Zone 1

Accelerometer calibrated (1 = calibrated)	1
Coolant level	98%
Cranking voltage	11.2...14.2V
Cruise control active	0
Cruise control enabled	0
DEF level	99.6%
Device power change (1 = powered)	1
Diesel engine detected	1

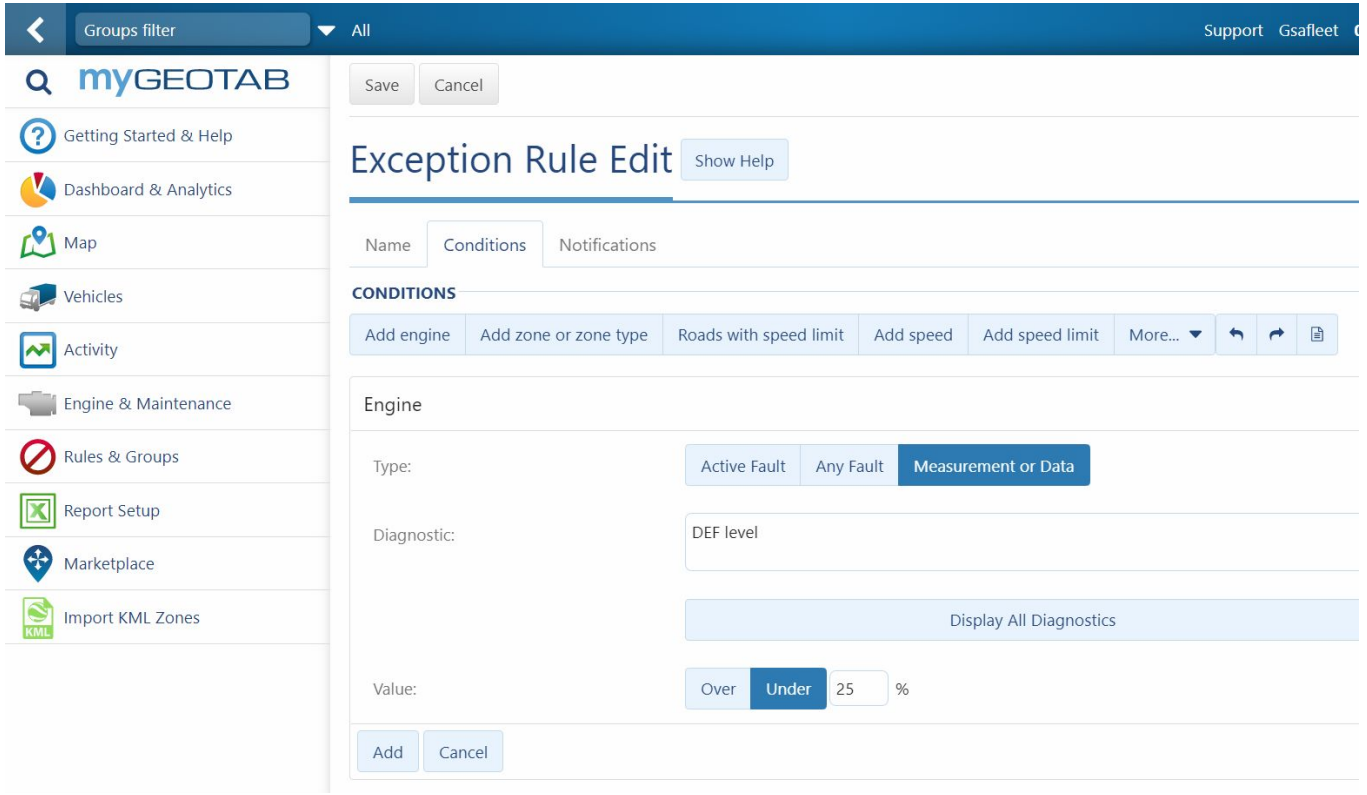
Geotab Demo


Groups filter
All
0 Notifications
myGEOTAB
Search rules...
Add
Reprocess data
Notification templates
Distribution lists
Getting Started & Help
Dashboard & Analytics
Map
Vehicles
Activity
Engine & Maintenance
Rules & Groups
Report Setup
Marketplace
Import KML Zones
Rules
SAFETY
On
Off
Harsh Braking
-0.61
G
Passen...
Truck/...
Heavy-...
Least sensitive
Most sensitive
This rule will trigger when a harsh braking event causes a g-force greater than the
value to be exerted on the vehicle.
On
Off
0.43
G
Hard Acceleration
Passen...
Truck/...
Heavy-...
Least sensitive
Most sensitive
This rule will trigger when a hard acceleration event causes a g-force greater than t
configured value to be exerted on the vehicle.

Geotab Demo


Exception Rule Edit
Show Help
Name
Conditions
Notifications
Name:
Color:
Not visible
Visible
Publish to groups:
Select Group(s)
Select groups...
Comment:

Geotab Demo


Groups filter
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Getting Started & Help
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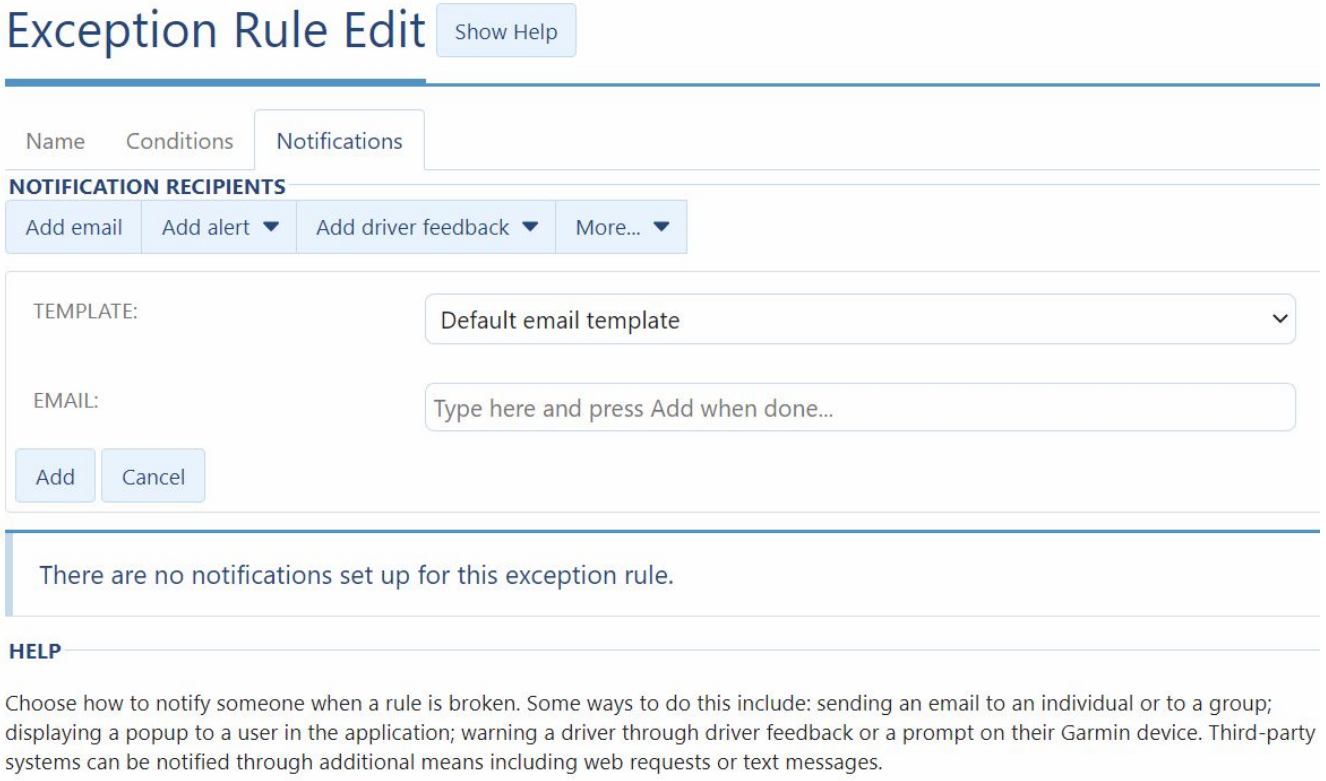
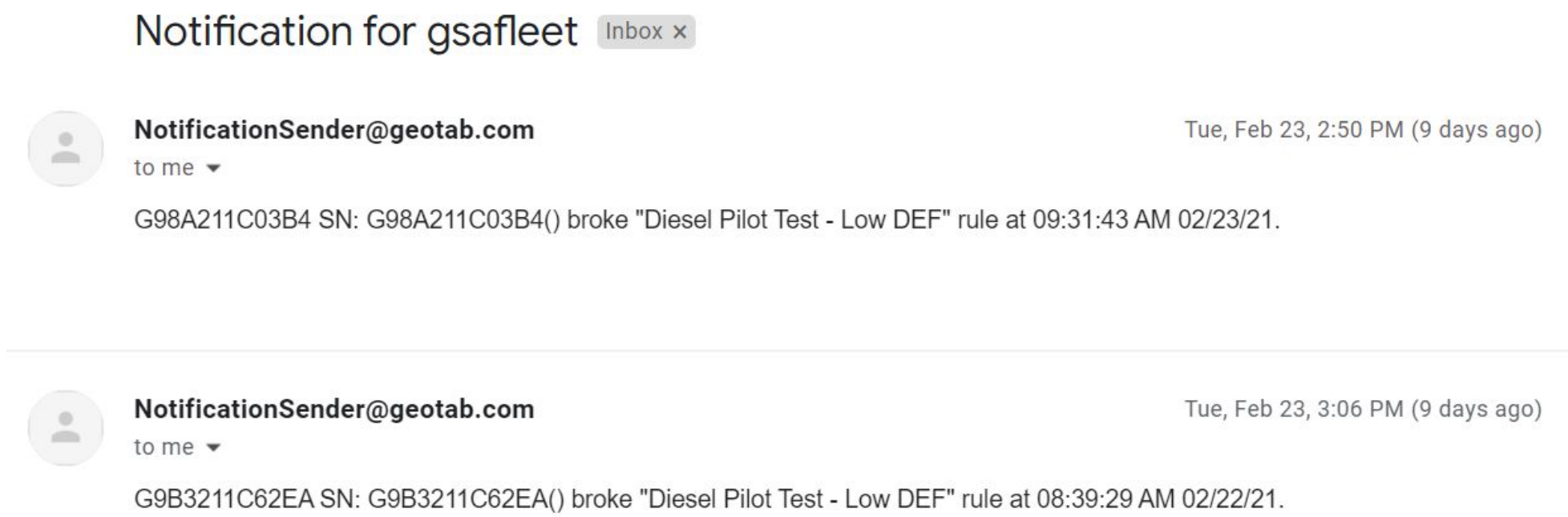
Map
Vehicles
Activity
Engine & Maintenance
Rules & Groups
Report Setup
Marketplace
Import KML Zones
Save
Cancel
Exception Rule Edit
Show Help
Name
Conditions
Notifications
CONDITIONS
Add engine
Add zone or zone type
Roads with speed limit
Add speed
Add speed limit
More...
Engine
Type:
Active Fault
Any Fault
Measurement or Data
Diagnostic:
DEF level
Display All Diagnostics
Value:
Over
Under
25
%
Add
Cancel

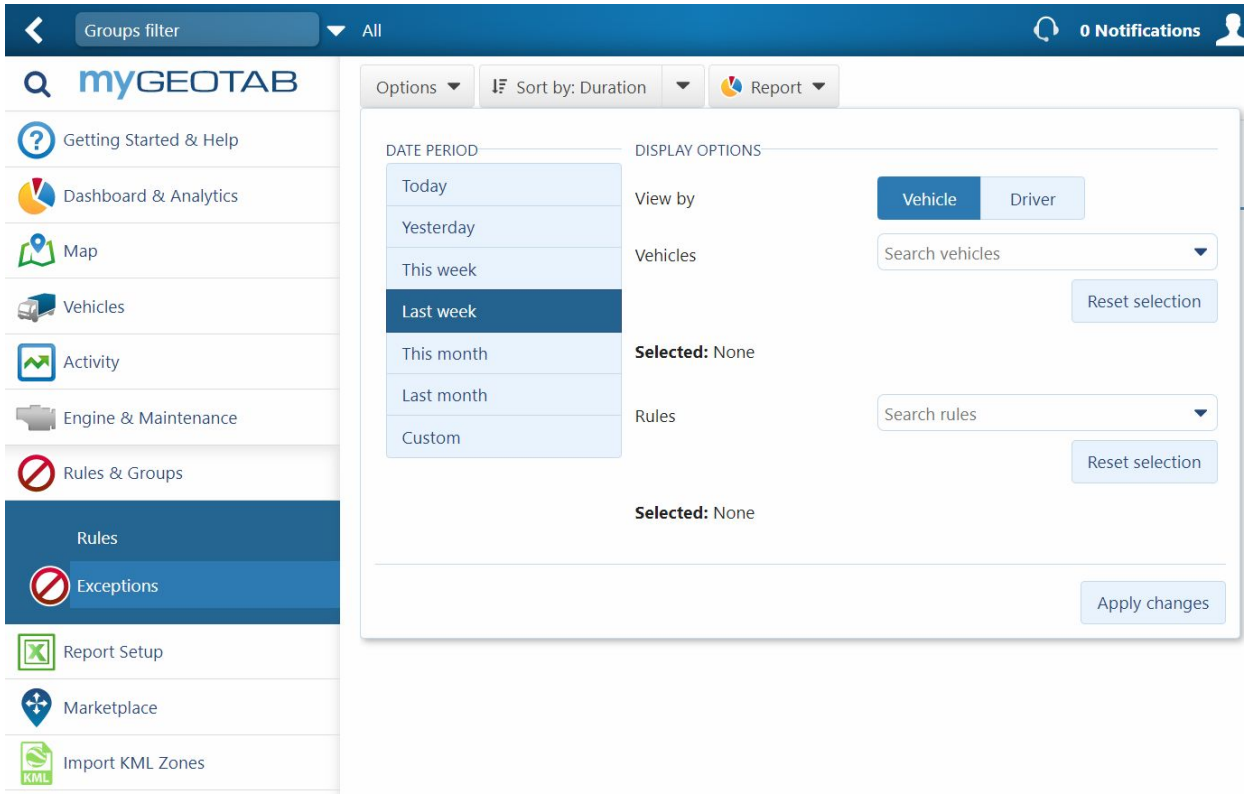
Geotab Demo


Exception Rule Edit
Show Help
Name
Conditions
Notifications
NOTIFICATION RECIPIENTS
Add email
Add alert
Add driver feedback
More...
TEMPLATE:
Default email template
EMAIL:
Type here and press Add when done...
Add
Cancel
There are no notifications set up for this exception rule.
HELP
Choose how to notify someone when a rule is broken. Some ways to do this include: sending an email to an individual or to a group; displaying a popup to a user in the application; warning a driver through driver feedback or a prompt on their Garmin device. Third-party systems can be notified through additional means including web requests or text messages.

Geotab Demo


Notification for gsafleet
Inbox ×
NotificationSender@geotab.com
Tue, Feb 23, 2:50 PM (9 days ago)
to me
G98A211C03B4 SN: G98A211C03B4() broke "Diesel Pilot Test - Low DEF" rule at 09:31:43 AM 02/23/21.
NotificationSender@geotab.com
Tue, Feb 23, 3:06 PM (9 days ago)
to me
G9B3211C62EA SN: G9B3211C62EA() broke "Diesel Pilot Test - Low DEF" rule at 08:39:29 AM 02/22/21.

Geotab Demo


Groups filter
All
0 Notifications
myGEOTAB
Getting Started & Help
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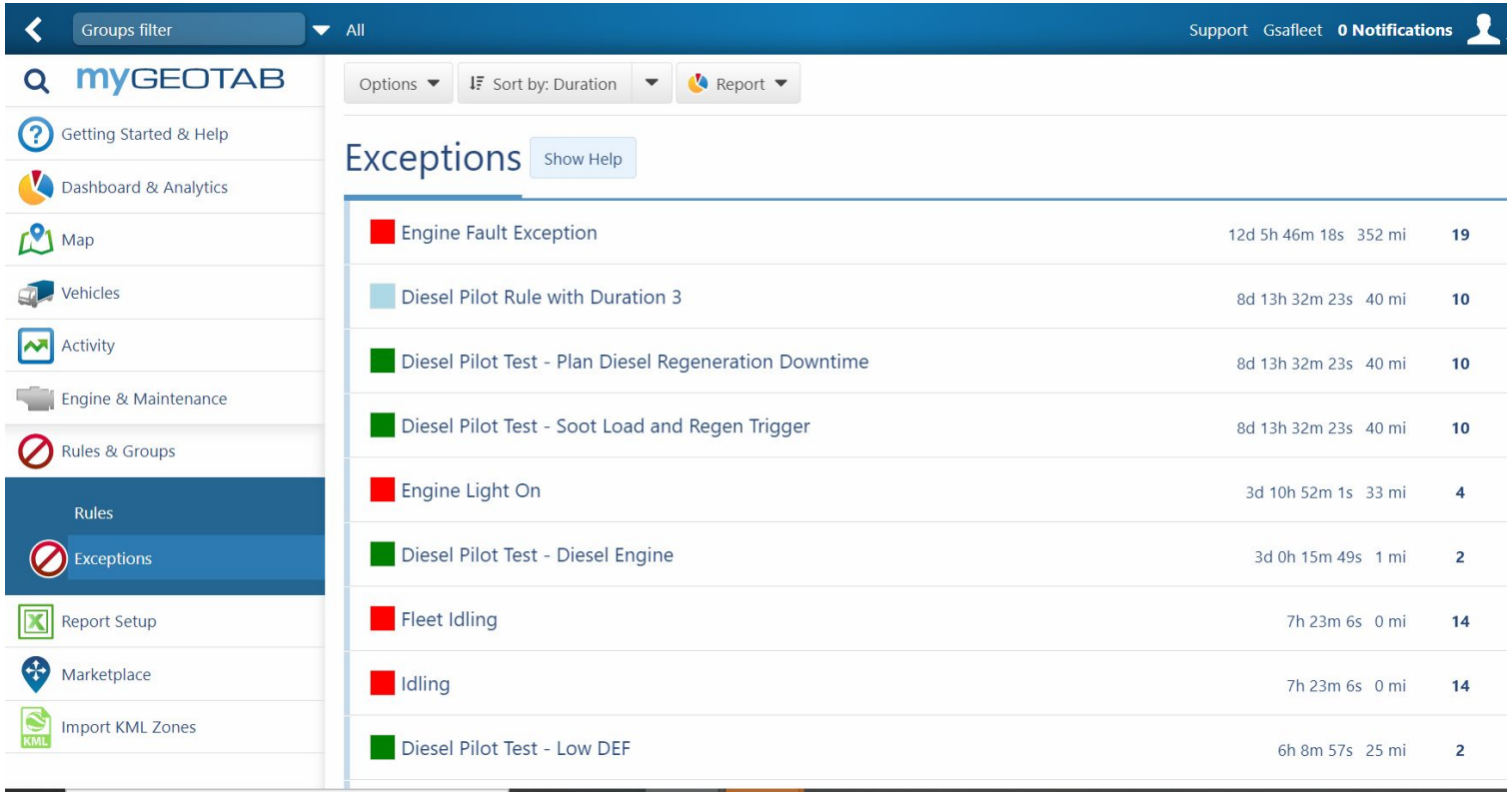
Rules
Exceptions
Report Setup
Marketplace
Import KML Zones
Options
Sort by: Duration
Report
DATE PERIOD
Today
Yesterday
This week
Last week
This month
Last month
Custom
DISPLAY OPTIONS
View by
Vehicle
Driver
Vehicles
Search vehicles
Reset selection
Selected: None
Rules
Search rules
Reset selection
Selected: None
Apply changes

Geotab Demo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Sort by: Duration
Report
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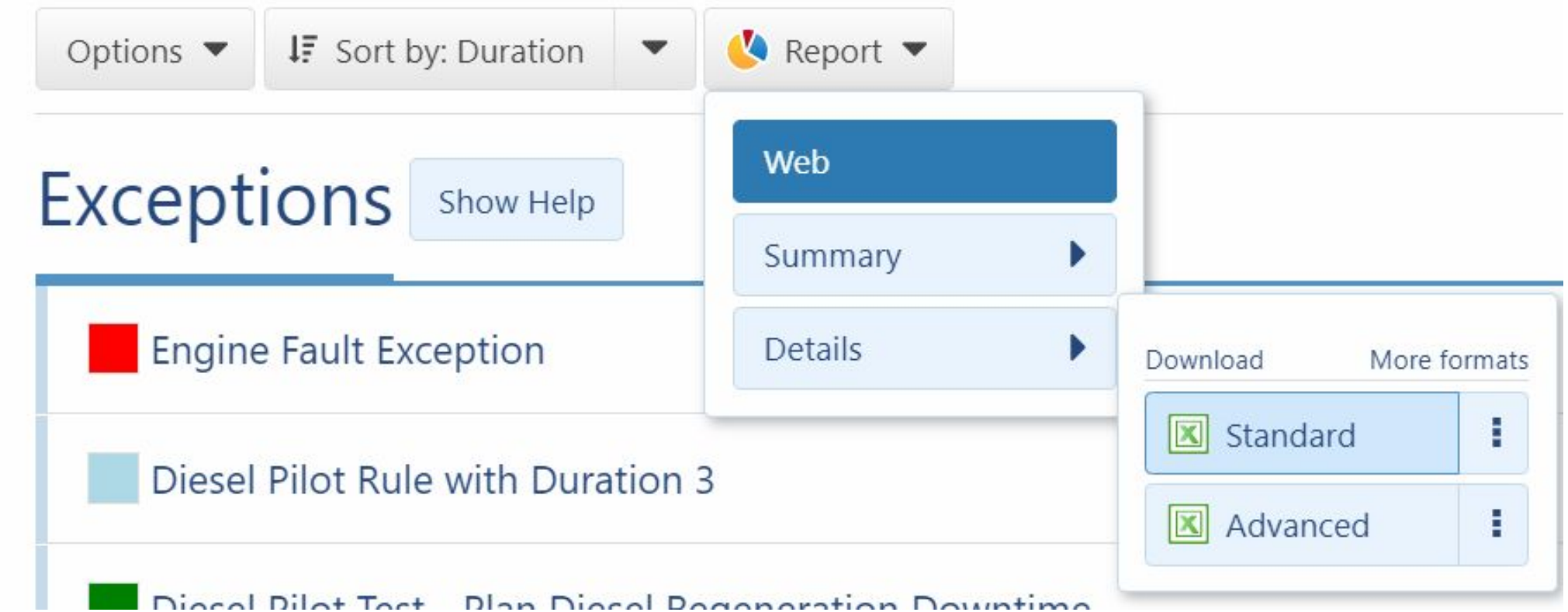
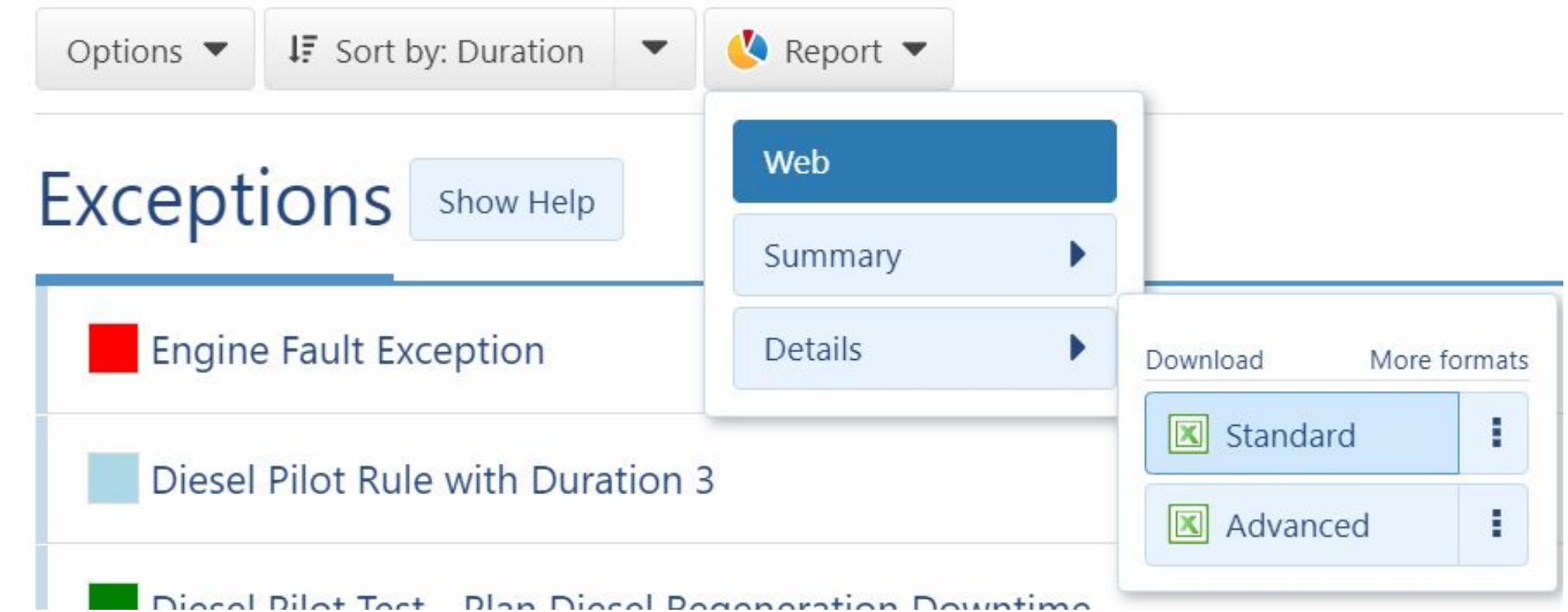
Map
Vehicles
Activity
Engine & Maintenance
Rules & Groups
Rules
Exceptions
Report Setup
Marketplace
Import KML Zones
Exceptions
Show Help
Engine Fault Exception 12d 5h 46m 18s 352 mi 19
Diesel Pilot Rule with Duration 3 8d 13h 32m 23s 40 mi 10
Diesel Pilot Test - Plan Diesel Regeneration Downtime 8d 13h 32m 23s 40 mi 10
Diesel Pilot Test - Soot Load and Regen Trigger 8d 13h 32m 23s 40 mi 10
Engine Light On 3d 10h 52m 1s 33 mi 4
Diesel Pilot Test - Diesel Engine 3d 0h 15m 49s 1 mi 2
Fleet Idling 7h 23m 6s 0 mi 14
Idling 7h 23m 6s 0 mi 14
Diesel Pilot Test - Low DEF 6h 8m 57s 25 mi 2

Geotab Demo


Options
Sort by: Duration
Report
Exceptions
Show Help
Web
Summary
Details
Download
More formats
Standard
Advanced
Engine Fault Exception
Diesel Pilot Rule with Duration 3

Geotab Demo


Options
Sort by: Duration
Report
Exceptions
Show Help
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Summary
Details
Download
More formats
Standard
Advanced
Engine Fault Exception
Diesel Pilot Rule with Duration 3

Geotab Demo

- Automate customized reports
  - Email
  - Dashboard
- Reports can be customized in Excel and uploaded for automation