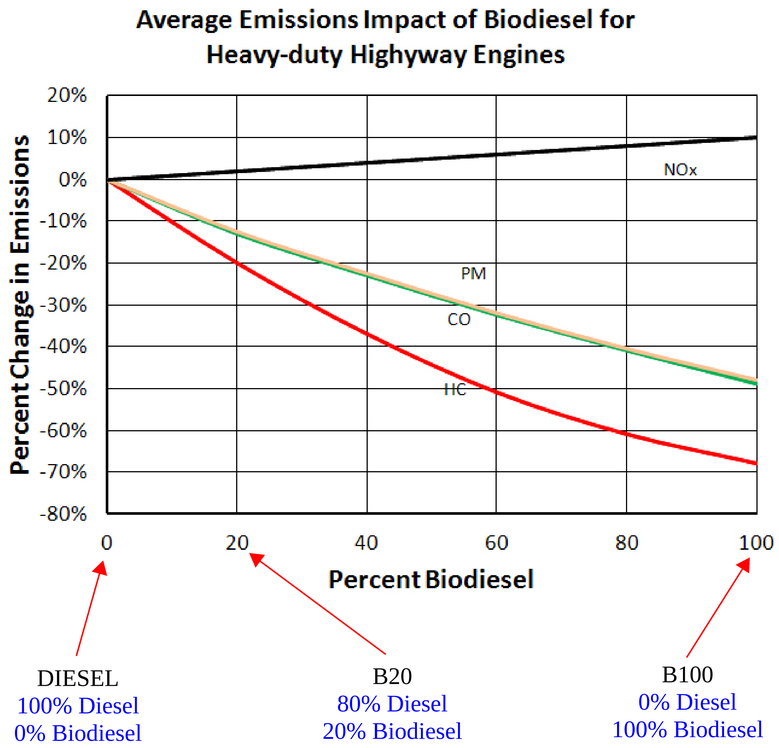
Alternative Options to Diesel Fuel in Construction Equipment

Biodiesel

Emissions



Costs

Table 1

National Average Retail Fuel Prices - Conventional and Alternative Fuels, January 2021
Source: Alternative Fuel Data Center, 2021

Fuel Type	Price (USD)	Units of Measurement
Gasoline	$2.32	per gallon
Diesel	$2.64	per gallon
Biodiesel (B20)	$2.42	per gallon
Biodiesel (B99/B100)	$3.18	per gallon

B20 costs less on average than Diesel!

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Abstract

The construction industry is a major contributor to the environmental emissions due to the extensive use of construction equipment, which is responsible for greenhouse gas emissions and harmful substances such as carbon monoxide, nitrogen oxide and particulate matter emissions. The goal of this paper is to analyze the current equipment and fuel used and to compare to the new fuels that are said to be better for the environment. There have been studies in which companies have employed a portable emission measurement system (PEMS) for real time measurement of emissions from construction equipment including carbon dioxide (CO2), carbon monoxide (CO), as well as nitrous oxide (NO). The alternative fuel options were analyzed based on differences in costs and emissions while also examining the costs and benefits of Tier 4 engines. An interview with a construction professional lead to more insight on Tier 4 engines and their use in the industry. Biodiesel is indeed better in terms of cost and emissions when compared to standard diesel. Tier 4 is an option that can greatly reduce emissions by 95 percent. The reduction of these emissions and pollutants is necessary to reduce the impact of the construction industry on our precious planet.

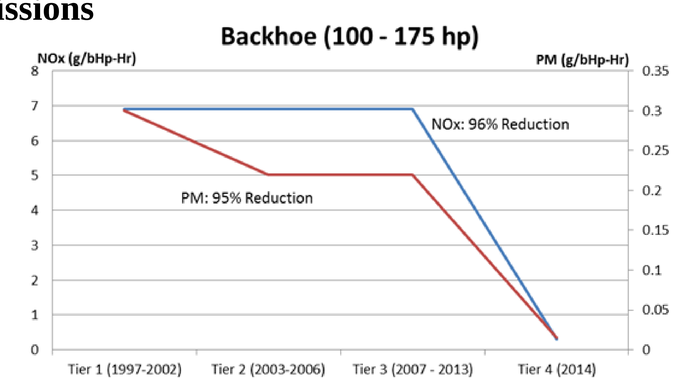
Key Words: Construction Energy, Energy Reduction, Biodiesel, Equipment, Heavy Civil

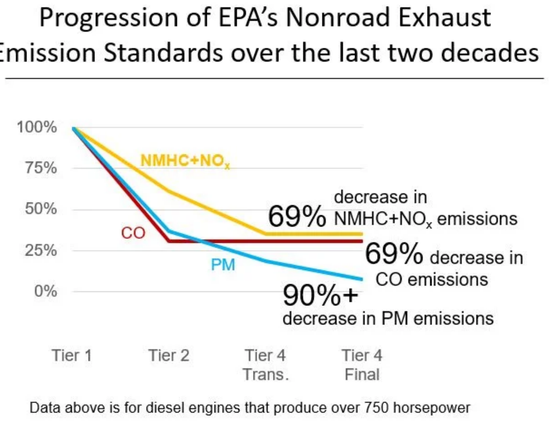
Conclusion and Future Research

Tier 5 Engines and regulations are being developed and are meant to reduce all tailpipe emissions to absolute zero!

Tier 4 Engines

Emissions





Data above is for diesel engines that produce over 750 horsepower

Cost Example

Table 2

Tier 4 Equipment Upgrades of Jilk Heavy Construction
Source: Personal interview with Sr. Project Manager of Jilk Heavy Construction, May 27, 2021

Equipment Type	Equipment Model	Engine Upgrade
Crawler Crane	Manitowoc 3900W	Cummins QSL9.380
Truck Crane	P&H 440TC	Carrier: Cummins B6.7 Upstairs: Cummins QSF 3.8
Excavator	Caterpillar 335FL	CAT C7.1
Reach Forklift	Caterpillar TL1255C	CAT C4.4
Vibratory Hammer Powerpack	HPSI 300	CAT C13
50 kW Generator	Caterpillar XQ60	CAT upgrade

Cost to upgrade Manitowoc 3900W: $415,000

When asked if the upgrade was worth it, the Joshua Jilk (Senior Project Manager and Partial Owner) responded with:

"From a bottom-line standpoint, it is a mixed bag. If the regulations were not in place, we could have utilized the money we spent to upgrade working engines with Tier 4 engines on other new Tier 4 equipment instead. That might have had a bigger impact on profitability. As far as the environment goes, it was worth it. We, as a company and an industry have to be working towards a cleaner, more environmentally friendly operation."