

# Steven C. Smyth

Thesis

Evaluating the Air Quality Impacts of Biodiesel Fuel

Abstract

Biodiesel is a renewable fuel that can be manufactured from a variety of sources, including soybeans, canola, rapeseed, used-restaurant grease and animal fats. Consequently, the term **biodiesels** may be more appropriate when referring to the fuel. It is commonly blended with petroleum diesel to form B20, which comprises 20% biodiesel and 80% petroleum diesel by volume. A literature review of biodiesel emissions from diesel vehicles was performed with the US EPA and SwRI reports providing quantitative emissions data used in preparing the inputs required for emissions and air quality modeling. An average B20 fuel reduces emissions of hydrocarbons by 20.1%, carbon monoxide by 12.3%, sulfur oxides by 20.0% and particulate matter by 12.0%, while it increases emissions of nitrogen oxides by 2.0%. New PM and HC speciation profiles were developed for B20 and B100 as well as for diesel fuel using the SwRI data. Emissions analysis for the Lower Fraser Valley (LFV) showed that even if all diesel vehicles use B20, the above reductions in diesel vehicle emissions result in small overall reductions with respect to total emissions from all sources, including point, area, on-road mobile, off-road mobile and biogenic sources. Use of an average B20 fuel in the LFV domain results in a 0.051% reduction in total HC emissions, a reduction of 0.2% in total CO emissions, 0.51% reduction in total PM and an increase in total NO<sub>x</sub> emissions of 0.5%. These emission reductions, although small, directly benefit regional air quality. The indirect effect of changes in emissions, such as ground level ozone and secondary PM formation, are not presented in this report, but are investigated and presented in an external report. As a result of the small changes in total emissions, it is unlikely that there will be a discernible change in ground level ozone concentration or particulate levels in the LFV domain. If diesel vehicles made up a larger portion of the vehicle fleet, an air quality benefit from biodiesel fuel would likely be noticeable.

Degree

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Completion

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Supervisor

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