COMMITTEE OF THE WHOLE - MARCH 3, 2003

USE OF BIO-DIESEL IN CITY VEHICLES

Recommendation

The Commissioner of Engineering and Public Works and the Commissioner of Community Services in consultation with the Director of Purchasing Services recommends:

1. That notwithstanding the City's Purchasing Policy, the City undertake a pilot project with Canada Clean Fuels Inc., using bio-diesel in selected City vehicles; and,

2. That a further report be presented to a Committee of the Whole meeting in the Fall of 2003 with the results of the pilot project.

Purpose

To report on the potential use of an alternative fuel in the City's diesel powered vehicles.

Background - Analysis and Options

On December 11, 2002, staff from Public Works, Community Services, and Hydro Vaughan met with Mayor Di Biase and representatives from Big K Fuels Inc., a company that supplies bio-diesel to a number of municipalities in Ontario. The representatives put on a small presentation to staff on the benefits of using bio-diesel in their operations. As a result of that presentation, the following report is presented to Council, seeking authorization to implement a pilot project using bio-diesel in selected City vehicles. Please note that effective January 31, 2003 the name of the company supplying bio-diesel was changed to Canada Clean Fuels Inc. to better reflect the product being sold.

Bio-Diesel

The City uses approximately 435,000 litres of diesel fuel per year. Although diesel engines are the most economical for powering large pieces of equipment, when burned, diesel fuel does produce a number of pollutants linked to smog creation and particulate matter. While manufacturers have improved the operating systems of the diesel engine to improve efficiency and reduce pollutants, diesel engines burning conventional diesel fuel still produce high levels of pollutants.

In an attempt to reduce the pollutants created by the burning of conventional petroleum based diesel fuel, various formulations of, and changes to, diesel fuel have been tried. The latest formulations are called bio-diesels.

Bio-diesel fuels are created from renewable domestic products such as canola oil, soybean oil, animal fats, and even cooking oil. These fuels are either used in their pure form (B100), or blended with conventional diesel fuel, with 20% being the most common percentage (B20).

The proponents of bio-diesel point out that the use of bio-diesel will reduce our dependence upon foreign petroleum products. Bio-diesel can be produced within Canada from agricultural oils and from waste fats and oils. Bio-diesel also extends the limited supplies of fossil fuels. The use of oil and natural gas is limited to the amount of natural resources available. Greenhouse gases, such as carbon dioxide, are reduced through the use of bio-diesel. They also point out that bio-diesel can help reduce the amount of air pollution. The main reductions come in the form of Particulate Matter (PM), carbon monoxide (CO), hydrocarbons (HC), sulfur oxides (SOx), and nitrogen oxides (NOx). Another benefit cited to the use of bio-diesel is the impact on the economy.

Proponents indicate that there can be a significant financial gain to our economy if fuel is produced domestically instead of being imported from foreign sources.

Life Cycle Comparisons

A number of studies have been performed on these alternative diesel products, and the results are all similar as to the overall benefit of their use.

For example, a joint study prepared by the U.S. Department of Agriculture and the U.S. Department of Energy, uses total life cycle inventory and energy flows to and from the environment for both petroleum based diesel and bio-diesel and its blends. The results are summarized as follows:

- The benefits of using bio-diesel are proportionate to the blend ratio of the fuel used. Using B100 reduced the life cycle consumption of petroleum by 95%. Using B20 causes a life cycle consumption reduction of petroleum by 19%.

- Bio-diesel yields 3.2 units of fuel product for every one unit of fossil energy consumed in its life cycle.

- B100 bio-diesel reduces life cycle carbon dioxide emissions by 78.45% compared to petroleum based diesel fuel. Using B20 reduces life cycle carbon dioxide emissions by 15.66%.

- B100 reduces life cycle emissions of Particulate Matter (PM) by 32%.

- B100 reduces life cycle carbon monoxide emissions by 35%.

- B100 reduces life cycle sulfur oxides emissions by 8%.

The study also looked at the direct impact of bio-diesel when strictly measured at the tailpipe. Using B100, they found that:

- PM smaller than 10 microns were 68% lower for buses that run on bio-diesel.

- Tailpipe carbon monoxide emissions are 46% lower, and tailpipe emissions of sulfur dioxide are eliminated.

Nitrogen oxides are one of the three main pollutants implicated in the formation of ground-level ozone and smog. Bio-diesel increases the amount of life cycle NOx emissions by 13.5%. Measured at the tailpipe, NOx emissions are 8.89% higher than the levels produced by the burning of conventional diesel fuel. To address this problem, researchers are looking at improving the fuel management systems of diesel engines, as well as trying to better formulate the fuel itself.

The study also found that the life cycle of bio-diesel also results in an increase of hydrocarbon emissions compared to the life cycle of conventional diesel fuel. Most of these emissions are not produced by the end use, but in the farming and processing of the soybeans. Emissions measured at the tailpipe are actually 37% lower than conventional diesel fuel.

Operational Considerations

B100 cannot be used in the colder seasons due to its problem with clouding and gelling. Accordingly, municipalities and utilities are either using a blended mix of B20 all year long, or use B100 during the summer months only and switch to B20 for the other times of the year.

The use of any bio-diesel can cause some problems with older engines. Bio-diesel acts somewhat like a solvent, and will remove and clean deposits from fuel tanks and fuel systems. These deposits get trapped in the fuel filters. Depending upon the severity of the build up, users have indicted that they have had to change fuel filters frequently during the first few tanks of bio-diesel. This is an important fact to remember considering that many of the City's uses are for emergency and routine repair vehicles. Clogged fuel lines would have a serious impact if they occurred on a vehicle responding to an emergency situation.

Original Equipment Engine Manufacturers (OEEM's), are somewhat unified on its use. For example Cummins Inc. has a standard disclaimer that they send to anyone regarding the use of bio-diesel. They state that, "Elastomer compatibility with bio-diesel is still being monitored. The condition of seals, hoses, gaskets and wire coatings should be monitored regularly." They also state in their disclaimer that, "Concentrations beyond 5% by volume could have an adverse effect on the engine's performance and fuel system integrity/durability."

Detroit Diesel Inc. Corporation also mentions bio-diesel in their literature. They indicate that, "Detroit Diesel permits the use of biodiesel derived from virgin soy methyl ester and rapeseed methyl ester when blended up to 20% maximum in diesel fuel. Use of recycled feedstocks is not recommended." Detroit Diesel goes on to state that although there is a specification for bio-diesel prepared by the American Society of Testing and Materials (ASTM PS 121), this standard does not include all the properties necessary to ensure trouble-free operation of their engines.

Caterpillar Engines also has a similar position with respect to the use of bio-diesel in their engines. They state that any bio-diesel must meet either ASTM PS121 or DIN 51606 standards. They also mention the concerns with elastomer compatibility, as well as concerns with microbial growth in fuel tanks containing bio-diesel.

Current Users of Bio-Diesel

Currently, there are a few municipalities and utilities in the GTA that are using some form of bio-diesel in their operations. These include the City of Brampton and Toronto Hydro. Staff spoke with representatives from these two organizations to determine if there were any concerns that the City should be aware of if bio-diesel is to be used. Brampton currently uses bio-diesel in all their vehicles except their transit and fire vehicles. The switch to bio-diesel was made after their test vehicles showed a 24.4% reduction in emissions when undergoing the Drive Clean testing.

Toronto Hydro started used bio-diesel in their vehicles about a year and a half ago. They started with a pilot project with 80-100 vehicles and as of July last year, have over 400 vehicles using bio-diesel. Both the City of Brampton and Toronto Hydro indicated that they have had no adverse effects with bio-diesel provided the correct product is used during colder weather, and that the proper mixing of the fuels takes place. B20 is the highest mix that is recommended for the colder months, with B50 or B100 being used in the summer months.

Options for Vaughan

The City currently supplies diesel fuel to York Region, Hydro Vaughan, Vaughan Fire and Rescue Services, as well Public Works' winter maintenance contractors. The age of the equipment varies from brand new to fairly old. Engine makes also vary from vehicle to vehicle. While bio-diesel's use in the newer vehicles may not pose a problem, bio-diesel may cause problems in the older vehicles.

Should the City wish to experiment with the use of bio-diesel, Canada Clean Fuels Inc. have indicated that they would supply 500 gallon above-ground storage tanks at no charge. This would allow the City to have the opportunity to try bio-diesel, while still having the option of using petroleum based diesel fuel for its fire, emergency and winter operations.

Alternatively, the City could investigate the possibility of designating a specific yard for providing bio-diesel, and leave the other yards with petroleum based diesel.

Financial Impact

As was stated earlier, the City uses approximately 435,000 litres of diesel fuel on an annual basis. The users include City operations, as well as Hydro Vaughan, Vaughan Fire & Rescue Services, some of the City's contractors, as well as York Region Operations.

Fleet staff have indicated that the January cost for diesel fuel is approximately $0.5882 per litre, plus GST. Bio-diesel costs more than conventional diesel fuel. The quoted price for January of 2003 for B20 is $0.725 per litre, plus GST. The higher price is partially due to the fact that this fuel is being imported into Canada from the United States.

It is important to note that the prices of fuel do fluctuate from month to month, and will need to be adjusted accordingly. The total cost to use bio-diesel would be dependant upon the supplied price, and the total amount of litres used. As such, it is hard to predict the annual cost to switch over to using bio-diesel.

The representatives from Canada Clean Fuels Inc. indicated that the present demand for bio-diesel does not justify a plant being built in Canada at this time. However, they indicated that they are looking at building a plant in Canada in the near future.

At present Canada Clean Fuels Inc. is the sole supplier of bio-diesel to this area. As such, there is no point in going out to tender for the trial period. However, a "bio-diesel" section will be included in the next York Public Buyers Co-operative fuel tender. This may allow the City to benefit from a lower price, if other municipalities in York Region start using bio-diesel. Purchasing Department staff indicated that this tender is due to go out in February or March of this year.

Conclusion

Bio-diesel provides an opportunity to reduce the emissions of carbon monoxide, carbon dioxide, sulfur oxides, and particulate matters in comparison to petroleum based diesel fuels. However, based on life cycle analysis by the U.S. Department of Agriculture and the U.S. Department of Energy, bio-diesel increases the amount of overall hydrocarbons and nitrogen oxides.

The large truck engine manufacturers have not come out in full support of bio-diesel in their engines, but do state that small amounts of bio-diesel may be used without significant problems.

There may be a concern with a total changeover to using bio-diesel, as the City not only supplies fuel to its own departments, including Vaughan Fire and Rescue Services, but to Hydro Vaughan, York Region Operations, and the City's winter maintenance contractors. There have been problems with the use of bio-diesel in older vehicles, and it may not be appropriate to convert all fuel stations to bio-diesel. However, Canada Clean Fuels Inc. has indicated they will supply separate above-ground storage tanks for bio-diesel. Alternatively, staff can further investigate the option of having one yard set up as a bio-diesel filling station, to eliminate these concerns.

The cost for bio-diesel is much more than the current price for petroleum based diesel fuel. However, the total annual cost of using bio-diesel is hard to predict, as it is dependant upon the monthly supply prices and the total number of litres used.

Should Council wish to undertake a pilot project utilizing bio-diesel in selected City of Vaughan vehicles, it is recommended that a pilot project employing temporary above-ground tanks and bio-diesel fuel supplied by Canada Clean Fuels Inc. be undertaken.

It is recommended that B20 fuel be purchased initially, and that consideration be given to utilizing a richer blend (B50 or B100), in the summer months. A report on the experience and pilot project results would be brought to a Committee of the Whole meeting in the Fall 2003.

Attachments

N/A

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