

# The downside of biodiesel fuel

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Up to 7 percent biodiesel is added to all diesel sold in Norway. Credit: Thinkstock

The oil industry believes biodiesel is not to blame for problems that Norwegian car owners are experiencing. But the nature of the fuel means that it has to be handled differently than regular petroleum-based diesel, a Norwegian researcher says, especially in colder climates or if it is

stored for longer periods.

Can diesel made from a [biodiesel](#) blend be blamed for clogged car filters and nozzles, reduced or lost engine power and costly visits to the garage by Norwegian car owners? No, says the oil industry. But Professor Terese Løvås from the Norwegian University of Science and Technology (NTNU) doesn't want to dismiss biodiesel concerns so easily.

"We know that biodiesel behaves differently than petroleum-derived diesel. Biodiesel is a 'living' substance that can change and deteriorate over time. This can create problems that are not addressed adequately by the current European Union (EU) product standards. We may need to review all the relevant standards, and look at what needs to be done to prevent these problems," says Løvås, from NTNU's Department of Energy and Process Engineering.

All auto diesel [fuel](#) sold in Norway contains as much as 7 per cent biodiesel. The blend is intended to help reduce CO<sub>2</sub> emissions, because in principle biofuels are climate neutral. The biodiesel/petrodiesel fuel blend requirements are based on EU product standards that stipulate detailed fuel characteristics under various conditions.

## **Clogged filters**

However, Norwegian car owners regularly report that they have problems where biodiesel is suspected to be the cause. Following a sharp increase in clogged diesel filters a few years ago, the British Department for Transport asked the [oil industry](#) and regulatory authorities to solve the problem. Auto filters became plugged by a waxy substance in cold weather, and cars lost engine power. The BBC reported that the biodiesel additive was the probable cause of the problems. A possible explanation was the use of recycled cooking oil, which clumps readily in the cold.

The Norwegian television programme "TV 2 hjelper" reported the woes of a car owner who earlier this winter struggled with repeated engine problems and expensive repairs. The auto repair shop said that her car could not tolerate diesel with the biofuel additive. The program also interviewed a repair shop owner who said his shop serviced one to two cars a week that had clogged filters and nozzles, probably caused by biodiesel.

## **A familiar problem**

According to Løvås, we don't know the full extent of the problem or how much it has increased since biodiesel has been blended into petrodiesel, but it is quite clear that it is a growing problem. "It's a well-known issue among researchers and the subject of a lot of research," she says.

The main problem is that biofuels are less stable than petrodiesel, and they deteriorate over time. Light, temperature and humidity increase the rate of deterioration.

"Biofuels contain oxygen compounds, which can lead to oxidation if the fuel is not processed and stored properly. The fuel then forms waxy substances that can clog filters and nozzles," says Løvås.

The EU product standard EN590 summarizes the product requirements for [diesel fuel](#). The standard contains detailed requirements for cetane numbers (corresponding to octane in gasoline), density and viscosity, for example. Scientists, governments, engine manufacturers and oil companies have collaborated to develop and periodically update the standard over many years.



## **Standards inadequate**

Løvås believes that the current diesel fuel standard does not adequately address the problems that stem from biofuels changing over time.

"Right now, there are clear requirements for the fuel quality when it leaves the production site. Perhaps we also need standard requirements for fuel storage and handling, for example how long the fuel can be stored, and under what conditions, without changing character," she says.

But more tests cost more money, as do technical measures such as extra fine filtration to remove wax particles before filling the tank with fuel.

"If new requirements are imposed on oil companies, they want be sure that the new demands solve the problem. More research is needed to be able to say for sure what the cause of the problem is," says Løvås.

## "Biodiesel is safe"

The Norwegian Petroleum Institute (NPI) represents companies that sell petroleum products, gas, electricity and bio-energy in Norway. NPI's Secretary General Inger-Lise Nøstvik, who graduated with a chemical engineering degree from the Norwegian Institute of Technology, NTNU's predecessor, is puzzled by the assertion that [biodiesel fuel](#) blends are causing problems for car owners.

"NPI members account for 98 per cent of fuel sales in Norway and sell nearly 3 billion litres of diesel annually. Questions about problems with fuel grades are few and far between," she says.

"It's obvious that some biodiesel components solidify faster in extreme cold. But there are big differences between various components. The fuel sold in Norway meets the EU product standard and official requirements for fuel quality. In addition, the diesel fuel sold in the winter is called arctic diesel, which can withstand extreme cold. Diesel fuel, both with and without added biodiesel, meets this requirement," says Nøstvik.

She notes that engine manufacturers and [oil companies](#) are collaborating on developing the European diesel standard. The Norwegian Petroleum Institute is also involved with this ongoing effort.

New requirements may mean that biofuel must provide real reductions in carbon emissions, and that production of the fuel will not compromise biodiversity or displace food production. (Photo: Thinkstock)



The current product standard allows for the incorporation of up to 7 per cent biodiesel, and Nøstvik says that she does not know of any imminent plans to increase this limit.

## **Perishable goods**

The Norwegian government increased the blending of biodiesel from 5 to 7 per cent in 2009, and increasing this percentage further is a political objective. The transport company DB Schenker in Norway tried it a few years ago, when biodiesel was free of fuel surcharges.

Einar Spurkeland, Communications Manager at DB Schenker in Norway says, "In 2007, we pioneered running cars on B30, i.e. a blend of 30 percent biodiesel. That led to many people having to rebuild engines and replace hoses and nozzles. Some people also experienced problems at very low temperatures."

The high percentage of biodiesel also reduced fuel stability. "The more

life there is in the fuel, the shorter its lifespan. B30 diesel had to be treated like perishable goods," says Spurkeland.

The trial run with B30 was short-lived. That same year a tax on biofuels was introduced, and with that the motivation dropped off.

## **Faith in biofuels**

Environmental regulations for biofuels have intensified greatly in recent years. The so-called sustainability criteria require that the biofuel must provide tangible reductions in CO<sub>2</sub> emissions, and that production of the fuel will not affect biodiversity or displace food production.

Stricter environmental and technical issues notwithstanding, Løvås has faith that biofuels will remain an important element in the mix of climate solutions.

"These are challenges that must and will be overcome. If the EU is to achieve its goal of a renewable energy share of 20 per cent by 2020, wind and sun are not enough. Biofuels must also be part of the equation. Within parts of the transportation industry, especially heavy transport, I cannot imagine options other than biofuels," says Løvås.

Provided by Norwegian University of Science and Technology

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