

Rubber technology important in reducing CO₂ emissions

September 23 2014, by Jochem Vreeman



Despite numerous measures taken by manufacturers, the worldwide level of CO₂ car emissions is still increasing at an alarming rate. The automotive sector is working hard to develop lightweight constructions, which is the best way to reduce fuel consumption and therefore also the greenhouse effect. At the same time, tyre manufacturers are also

developing organic car tyres with the lowest possible rolling resistance. New kinds of natural rubber have been discovered for this purpose. Anke Blume, Professor at the University of Twente, is working closely with the industry in this field. Blume has unique knowledge in the field of polymers with rubbery characteristics (elastomers). She will give her inaugural lecture on 25 September.

"Emissions of CO₂ in the transport sector have more than doubled since 1970 and cars are responsible for almost three quarters of this", outlines Blume in her inaugural address. "Although car manufacturers are working hard to reduce CO₂ emissions, it still does not seem to be enough to achieve the maximum emissions target for 2020 as set by the EU. Reductions in CO₂ emissions can only be achieved through a reduction in the [fuel consumption](#) of cars. Tyres play a significant role in this."

Heavier cars

A good solution for the CO₂ problem is lightweight constructions for cars. A reduction of one hundred kilograms in the weight of the car results in a saving of up to 12.5 grams of CO₂ emissions per kilometre. Nevertheless, the weight of passenger vehicles has almost doubled in Europe over the past forty years. This is closely related to the steadily increasing standards of luxury and safety.

As such, the Mini Cooper has become 420 kilos heavier in 47 years and the same is true for the Volkswagen Golf since 1974. "Luckily we now see that the new Golf 7 has actually lost one hundred kilos", says Blume. "Only very recently has there been, on average, a declining growth in this development. New, lightweight materials and new construction techniques have led to this."

In her address, Blume describes that the amount of thermoplastic

materials and rubber in cars is directly related to the reduction in vehicle weight. This has undergone a sharp increase. The first Golf in 1973 contained 'only' 93 kilograms of plastic, while the Golf 6 contains around 250 kilos. The percentage of rubber (not only in the tyres) in cars has grown from two per cent in 1970 to six per cent in 2010. During the same period, the proportion of plastic increased from six to sixteen per cent. Thermoplastic materials have both advantages (such as sustainability, reduction in noise and cost) and disadvantages (sources are exhaustible, very harmful in a fire, difficult to paint).

Car tyres

Another way of reducing the CO₂ emissions of cars is to use tyres with low rolling resistance. In 2012 the EU put pressure on the automotive industry with the introduction of tyre labels. A tyre with the highest label (A) saves 7.5% more fuel than a tyre with the lowest label (G). The savings are even higher with lorries. Tyre manufacturer Goodyear calculated that a lorry weighing forty tons could save around 15% on fuel with A label tyres. For every 100,000 kilometres driven every year, this category of tyres provides more than 7000 Euros in fuel savings and obviously much lower CO₂ emissions.

New natural rubber

There is, however, also a downside. Blume: "The increase in thermoplastic materials and rubber in cars also leads to greater oil consumption." With exhaustible resources and the ever-increasing price of crude oil in mind, Blume is carrying out research into [natural rubber](#), the only biopolymer with commercial applications, which is still mostly extracted from rubber trees in Asia.

"This rubber has many advantages, such as great elasticity, water

resistance and resilience. But it is also increasing sharply in price, which has made manufacturers explore other options. The Mexican guayule (a shrub) and Russian dandelion also prove to be suitable sources of bio-rubber. The resulting interest from the tyre industry is huge. Apollo already has produced prototypes of tyres made from guayule and the dandelion. Testing has begun and production will not be far behind. An alternative for the Asian rubber monopoly is expected to be achieved soon. The first completely environmentally-friendly tyre will be available on the European market in the near future.

For many manufacturers, Blume's research group Elastomer Technology and Engineering (faculty CTW) forms the scientific link to this rapidly developing market. The department has a strong industrial focus and works together with the biggest names from the car tyre industry. As such, all doctoral candidates from the department and several on-going PDEng-projects are financed by the industry.

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Provided by University of Twente

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