by Martin Cassini

NO IDLE MATTER

SIGNAL-CONTROLLED OR SIGNAL-FREE?

It's bad enough that we burn a quarter of our fuel and emit a quarter of our CO_2 as we idle in traffic getting nowhere fast, but fuel use and emissions are boosted to the hilt by the stop-start drive-cycle cultivated by traffic lights

Illustration by Anna Davie

Why do we get CO_2 figures for g/km (grams per kilometer) but not for g/min (grams per minute idling)? According to Professor David Begg, idling accounts for 40% of vehicle journey times, so the absence of separate figures for idling suggests an incomplete picture. Would it not be useful to know how much fuel is used and CO_2 produced while vehicles are idling? What is the case for and against publishing those figures?

CO_2 expressed in g/km includes periods of idling, acceleration and deceleration – known as the drive cycle, over which emissions factors are measured. "We see traffic moving at a low average speed rather than intermittently stationary or moving," says Simon Davies, a senior engineer at the Department for Transport (DfT) in the UK. "The share of idling in CO_2 emissions is identical to its share in fuel consumption." Therefore, if idling accounts for 25% of fuel consumed – which broadly speaking it does – it will produce 25% of CO_2 emissions.

WASTE OF ENERGY

"Idling is a waste of energy and exacerbates climate change," says Shermann Fong of Hong Kong's environment office, "but we do not think that figures for emissions per minute of idling would be helpful, as the knowledge that emissions are lower might lead some drivers to feel justified in leaving their engine idling." Davies agrees: "Publishing separate figures for fuel and CO_2 while idling would assist very few drivers."

Citroën – with its stop-and-start engine which cuts out after a few seconds of idling and springs back to life when the brake pedal is released – sees idling as an issue. A spokesperson for the car-maker says that with petrol engines, the air intake closes when an engine is idling, so it has to work harder to function, whereas diesels simply use less fuel when idling, making them more efficient. Useful knowledge, surely?

It's worth mentioning that CO_2 is the main greenhouse gas, but is not an air pollutant. Pollutants that damage health are mainly nitrogen oxides (NOx), particulate matter (PM), and hydrocarbons. Unlike CO_2, these are not directly proportional to fuel consumption.

"Reducing the time that vehicles spend idling saves a significant amount of fuel," says Davies. "We advise that drivers turn off their engine if they are likely to be stationary in traffic for as long as a minute, although fuel economy is usually improved by turning off for stops as short as 30 seconds." At the UK's Transport Research Laboratory (TRL), Dr Ian McCrae says: "The normal advice is that if you are stationary for more than two minutes, you should turn off your engine."

Apart from the number of times you would have to switch on and off at lights, not knowing how long the delay might be, there is another drawback, as James Tate of Leeds University's Transport Department points out: "Once at operational temperature [after two minutes], a modern engine's three-way catalytic converter at idle will reduce oxides of nitrogen, while oxidizing CO and HC compounds effectively to zero. But stopping the engine causes the catalytic converter to cool. At restart, a burst of air-polluting emissions is generated before the converter reattains operational temperature."

So switching on and off isn't such a good idea. Moreover, there is the risk of obstructing traffic as you start up again and get into gear. You could be responsible for traffic behind you having to endure another entire signal change cycle. What's the advice for avoiding incidents of road rage?

Davies has no comment on that, but he has other advice: "Air conditioning can double idling fuel consumption, and even the use of headlights will increase it measurably." It turns out that an average engine idling in a mixed traffic stream uses about a quarter of the fuel of an engine working, and produces about a quarter of the emissions – i.e. a ratio of about 1:4 (engine idling:engine working).

All in all, idling seems to be no idle matter, so why are we kept in the dark about it? If you could reduce fuel consumption and CO_2 emissions by up to a quarter, wouldn't you want to know?

Hong Kong's Environmental Protection Department does analyze idling separately, but for NOx and PM, not for CO_2. Its measurements confirm the ratio of 1:4 – i.e. an engine idling uses about a quarter of the fuel and produces about a quarter of the emissions of an engine pulling. That ratio translates for mass of CO_2 into an average of 2kg per vehicle per hour for idling to 8kg per vehicle pulling.

In 2005, the *GLA Atmospheric Emissions Inventory Report* stated that London traffic produced no less than 7,724,738.9 tonnes of CO_2 (a tonne = 1,000kg or about 2,200 lbs). If idling accounts for 40% of journey times, could the isolation of idling from the drive cycle focus minds to reduce that monumental output of emissions?

"But it's the acceleration after a delay," says Dr Roy Colvile of Imperial College, London, "that uses the most fuel, from simple Newton's Law that chemical energy in the fuel is transferred to kinetic energy in the car." In other words, every time an engine has to move a ton of metal from a standing start, fuel use and emissions rocket.

SHARED SPACE

Part of the reason for asking why g/min is subsumed into the drive cycle and not analyzed separately is to explore the idea that signal-controlled junctions are less efficient than signal-free ones. In the shared space model – which does away with traffic lights – rather than having to stop and restart, drivers use common sense and common courtesy to filter at junctions. By eliminating full stops, full restarts and needless delay, shared space cuts journey times, fuel use and greenhouse gas emissions dramatically. In the Dutch town of Drachten where lights were removed by Hans Monderman, journey times halved and accidents ceased.

As Colvile says, "a car moving at constant low speed uses very little more fuel than it does when idling." In the shared-space model, as vehicles filter at virtual tick-over revs, they are getting somewhere. But in the standard traffic management model, as they idle and get nowhere fast, they use a quarter of the fuel and emit a quarter of the CO_2. When they restart, engine revs – along with fuel use and CO_2 – reach a peak.

Imagine how much fuel and CO_2 would be saved if traffic across the world were free to go on opportunity. Could shared space be the answer to many of our problems on the road, including our immediate climate change problems? Let's not forget the carbon footprint made by the manufacture, delivery, installation, maintenance and powering of the galaxy of 24-hour traffic lights.

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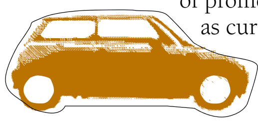
At junctions without controls, traffic enters and leaves at low speeds, with minimal stopping and restarting. The flow is organic and efficient. Insistence on contrived rights of way is replaced by good-natured filtering. Pedestrians are seen as fellow road users rather than obstacles in the way.

At signal-controlled junctions, by contrast, high approach speeds are common, as are sudden stops, aggression, idling and 'accidents' (a euphemism for events arising from contrived conflicts). Stefan Langeveld in Holland estimates that, off peak, out of every 10 cars, one speeds through and two get through unhindered, while seven have to stop, idle and restart. When the lights change, drivers accelerate away to release tension and make up lost time. Moreover, 13% of every minute is lost in reaction times alone: the average driver takes eight seconds to react and get moving again, so if an average signal phase is 60 seconds, that's a time loss of 13%.

If the aim is to maximize CO_2 emissions from traffic, the conventional traffic control system is highly efficient. But if the aim is to minimize emissions, it is in urgent need of reform. In restoring responsibility and freeing humans to use their innate skills and common sense, shared space kills several birds with one stone. It cancels out wasteful stopping and restarting, reduces needless delay, civilizes towns and cities, and makes roads safe. It represents the perfect marriage of psychology and engineering.

By definition, the stop-start drive cycle required by traffic lights is inefficient. Yet, despite its in-built inefficiencies, it's that very cycle which provides the basis for the CO_2 g/km figures published. Instead of promoting efficiency, the figures as currently produced are reactive. Perhaps distinguishing traffic idling from traffic in motion will highlight this weakness, and spark reform.



As yet, the authorities are showing no appetite for reconsidering their current stance. But there are hints from Sean Beevers at the ERG (Environment Research Group, King's College, London) and from TRL that isolating idling from emissions analysis could provide a clearer picture of the impact of motoring and traffic controls.

Not only is there practical benefit in knowing about the drive cycle, but pedestrians should be aware that by letting a vehicle glide by, instead of making it stop short, they will be helping reduce the burden of CO_2 emissions threatening the planet. Also, isn't it time for a shift in other priorities, too? Instead of punitive parking controls, how about a ban on engines left idling while drivers are parked up? ■

Martin Cassini is a writer/producer and road user who sees a defective traffic control system that could be transformed for the good of all. Log on to www.goodfun.tv for more information