



29 October 2014

Emulsified diesel:

MEETING EMISSION STANDARDS FOR OLDER URBAN BUSES

The revised Requirements for Urban Buses (RUB) being issued by the NZ Transport Authority are moving towards minimum emissions standard for existing buses in urban fleets. The proposal is to require Euro 3+ in Auckland, Wellington and Christchurch and Euro 2+ in other urban centres (in both cases excluding buses used for school or rural services).

In the end you will need to upgrade your fleet to eliminate buses below these levels, but this will involve a major cash flow and capital commitment. It also carries risks. Some funders are looking at requiring alternative technologies (e.g. hybrids, electric buses) within the life of new investments. If you invest now you may end up with stranded assets.

We can offer operators a relatively low cost transitional alternative: emulsified diesel.

In older buses this will give a 3 – 5% efficiency improvement, and reduce tailpipe emissions of PM by ~50%, NOx by 10-15% and CO2 by ~3%. It has been shown to be sufficient to lift Euro 1 -3 buses one level, so a Euro 2 bus running on emulsified diesel would meet the RUB for Auckland, Wellington and Christchurch, and a Euro 1 bus the RUB for other urban areas.

The way it works is the diesel and water forms an emulsion aided by an additive (surfactant). The emulsion has ~1.5% additive, ~5.5% water and ~ 93% diesel. In the emulsion the diesel coats the water droplets. In this form the water won't cause problems like corrosion in the fuel.

However in the hot combustion space the water rapidly turns to steam scattering the droplets. This creates much smaller droplets of diesel, so more fuel burns with less waste and emissions.

The system is well-known internationally and is used commercially with fuel oils in ships and power station as well as road diesel. We have demonstrated its performance in New Zealand with a 4 month trial with Uzabus on its Otaki fleet.

However when used with diesel buses the efficiency gains don't pay for the cost of the additive and the extra processing required. However if your only option is to buy new buses to comply with the RUB it is quite likely emulsified fuel will be a lower cost option, at least until the buses reach their normal replacement life.

In what follows we give some idea of the costs of emulsified fuel. If we assume the bus travels 70,000km per annum and uses 30l per 100km, total fuel annual consumption will be 21,000l or around \$30K (ex GST) of fuel (at ~\$1.40/l). The additional cost of the additive is ~\$0.30/l, giving a bit over \$6K per annum direct additional cost per bus. Against that there is an efficiency gain of (say) 5%, giving a reduction of ~\$1.5K, so a net increase in the fuel bill of \$4.5K per annum per bus.

To this cost we need to add the cost of the equipment and labour required to blend the fuel. The costs and benefits will be site and fleet specific. If there is a reasonable sized low Euro fleet being refuelled at a single location (~10+) and there is on-site diesel then for an investment of around \$50K in-line blending and dispensing equipment would be the best solution. Apart from this capital cost little if anything would be added to the daily operating cost of refuelling the fleet, just the cost of ensuring a supply of surfactant on site.

Batch blending for smaller fleets and where fuel isn't otherwise on-site is possible, but would have a higher capital and operating cost. Each case would need to be considered on its merits.

Regardless these costs are considerably lower than the additional financing costs of a new bus. There are other benefits from a newer fleet, e.g. passenger experience, lower costs of maintenance. However if you don't need to replace your lower Euro rated buses for other reasons we believe emulsified fuels will give you good opportunities to manage your cash flow and investment programme.

We'd welcome the opportunity to discuss individual cases in more detail.

Kind regards

Leigh Ramsey
Managing Director