



LONDON BUS MUSEUM

A LIVING HERITAGE

**A Report on a remarkable exhaust emission reduction on
London Bus Museum's 55-year old 1959 Routemaster, RM140,
in a private trial of an innovative new eco-diesel fuel emulsion
at Brooklands, 9th January 2014.**



*by David Kinnear
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3rd February, 2014*

Observations from David Kinnear, Curator and Trustee of the London Bus Museum on a comparative fuel trial by SulNOX on one of the Museum's historic double deckers.

Some Background to this Report

Our London Bus Museum at Brooklands, near Weybridge in Surrey, exhibits the world's largest collection of working historic London buses anywhere in the world. We get many requests of all sorts for our beautifully restored buses - attendances at rallies, for community events, schools and colleges, through to location work for media, film and TV companies in productions such as *Downton Abbey*, *The King's Speech* and *Foyle's War*.

In recent weeks, I received one of our more unusual enquiries - an approach by a company called SulNOX wanting to measure the exhaust pollution of one of our buses in a comparative fuel trial. SulNOX explained to me that they are developing an advanced new eco fuel technology designed to massively cut pollution from diesel engines, large and small.

They wanted to trial SulNOX on a vehicle with an engine with a really filthy, polluting exhaust emission to see how well their new fuel technology would work in a worst case scenario. Their scientists were keen to see if their new fuel could even clean up the exhaust of one of our smoky, old buses.

Furthermore, SulNOX wanted to show that this could be done without any expensive modifications to the bus's engine or fuel pump

As none of our fleet of heritage vehicles dating from the 1920's to the 1970's, would be allowed to venture in public service anywhere near the London Low Emissions Zone on pain of a huge fine, this was an intriguing proposition. After consultation with engineering colleagues, I gave permission for one of London Bus Museum's vintage buses to take part.

I recommended to SulNOX that they should test our immaculately preserved 1959 early Routemaster, because all over the world this big red double decker bus is one of the most easily recognised icons of London. Long before environmental pollution became an issue, this

bus had travelled hundreds of thousands of miles in our Capital - and although very advanced for its era, in today's world it is regarded as environmentally unacceptable. Those Routemasters seen running in London today, have long since been extensively modified with new eco-friendly, much more modern engines than the original AEC AV590 unit in our Museum's bus.

Observations of the Trial

Myself and our engineers were invited by SulNOX to assist with the trial and witness what happened. I agreed that SulNOX should make an attempt to achieve a world record in reducing diesel pollution

Thus, as Curator of The London Bus Museum with no "axe to grind", I assumed the role of "independent adjudicator" in which I observed all stages of the procedure. I was specially interested with our engineers to check that absolutely no expensive modifications to our Routemaster's engine or fuel pump were required. None were, apart from a simple clean line connection to run in the SulNOX fuel.

To create the comparative data for the record attempt, we were asked first to run our bus with standard diesel from our usual local Shell pump for a length of time. SulNOX technicians would then take the readings.

The bus was then started, running on ordinary unmodified standard diesel, then, when everyone was satisfied that a series of exhaust emissions readings had been gathered, the engine of the bus was stopped. As can be seen from the meter readings in the picture, the NOx reading was high at over 205ppm rising to around 230ppm. The diesel particulates in the exhaust smoke readings were frankly terrible, off the scale, beyond 9 on the test card.



" Smoky exhaust pollution of London Bus Museum's 55-year Routemaster, RM140, drastically reduced by new eco-diesel fuel emulsion in initial trial at Brooklands"

I then watched the SulNOx technicians preparing a batch of SulNOx ECO Diesel™ in an orange fuel container. This consisted of about 12 litres of ordinary pump diesel (I was informed 86%), then to my surprise 12.5% **water** - and finally 1.5% SulNOx emulsifier, rather less than an egg cupful was added.

This fuel container was placed beside the Routemaster's engine and secured. Fuel pipes were re-routed so that only the SulNOx Eco Diesel could enter the engine. We also changed the Routemaster's fuel filter for a clean one.

The engine was then restarted and allowed to run for approximately ten minutes, because, I was informed, the initial running on SulNOx ECO Diesel would have the effect of a cleaning agent on the inside of the engine, a beneficial bi-product.

In exactly the same format as for the running on standard diesel fuel, the probes of the Testo gas analyser were now replaced in the exhaust pipe and a further set of readings were taken.

These showed that NOx gases were reduced to around 118 ppm, i.e by an average of 50%. Exhaust PMs (particulate matters) were reduced by an astonishing 90%,



....as can be seen by the pictures taken by myself, shown here, taken of the readings on the Testo professional gas analyser and the exhaust particulates test card. I can therefore confirm that this was what I witnessed. The SulNOx fuel appeared to have produced an enormous improvement.



Exhaust smoke test card for RM140:

Top left: "after" ...using SulNOx ECO diesel

...and bottom right "before" ...using ordinary pump diesel fuel.

I also noticed that the running note of the engine sounded "softer" using SulNOx ECO Diesel and commented on this to those present.

A temperature reading of the Routemaster's exhaust manifold using SulNOx ECO Diesel showed 7 degrees C below that of standard unmodified diesel. Less heat can mean less wear, less maintenance and cleaner emissions .

The reductions in exhaust emissions were so striking that those present observed that *"if they had not seen it for themselves, they would not have believed it"*. Once all the readings were taken, the engine was shut down and the "world record" attempt appeared to have been achieved.

One of our Museum's engineers suggested that if the bus had reached full working temperatures in service on a route with a full load of passengers - i.e. in usual PCV operating conditions, the results might be slightly less dramatic than what we all saw, and this might need further scientific appraisal .

After witnessing this remarkable result we took The SulNOx Team for a celebratory ride around the Brooklands Museum in our Routemaster, RM140, to use up the remains of the SulNOx ECO Diesel, stopping for photos in front of another legend of British engineering – the BAC Concorde.

Later in the day, I understand the results were downloaded onto a computer at SulNOx's HQ. A full report is available on request to the them.



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Conclusions

The modus operandii and results of this trial at The London Bus Museum at Brooklands by SulNOX have been endorsed by me as a correct account of the proceedings in our Workshop on 9th January 2014.

SulNOX have pointed out that the trial itself was not intended to be a full-scale laboratory test, for example of the kind that might be carried out by an international oil corporation, or a big potential buyer, but merely provides a pilot demonstration of the effectiveness of SulNOX ECO Diesel.

Nevertheless, in a world where reduction of diesel pollution is high on agendas everywhere, the trial did clearly present some very interesting results for those seeking to reduce the pollution of diesel engines for both commercial vehicles and marine use.

Disclaimer

This report is simply an independent observation of SulNOX's fuel comparison trial in the Workshops of London Bus Museum.

As a registered charity we are of course not allowed to make any endorsements, representations or recommendations for this product. It must be for others to do that.

The London Bus Preservation Trust and London Bus Museum cannot take any responsibility for any action of others for any consequence arising out of this report. Those interested in following up on this report should satisfy themselves as to the veracity of any claims by SulNOX.

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