REPORT ON THE MOT TESTING OF EMISSIONS IN VEHICLE ENGINES AFTER TREATMENT WITH LOFRIX ECO GEL

BACKGROUND

Lofrix technology was developed some years ago to reduce the effects of friction in industrial plant and equipment and to combat the damaging effects of wear between moving metal parts in various types of machinery. It has been sold for use in plant and equipment in many industrial sectors and has around 18,000,000 million hours of successful use, where it has produced additional benefits such as reducing heat, noise, vibration and energy. By reducing the consumption of energy, the Lofrix technology helps to lower overall carbon dioxide emissions wherever it is used.

With the continuing global concern over climate change, and more recently the worrying health impacts of increasing levels of airborne pollution, particularly in towns and cities worldwide, it was decided to adapt the Lofrix technology to treat the engines of motor vehicles in order to lower fuel consumption and improve efficiency. This decision has led to the introduction of a product named Lofrix Eco Gel. Initial testing has shown that, when applied to vehicle engines via their normal existing lubricating oil, Lofrix Eco Gel improves fuel economy and engine efficiency, and dramatically lowers exhaust emissions.

The technology has the ability to remove engine deposits and then protect the internal surfaces against future deposits adhering, resulting in less friction within the engine, smoother operation and a cleaner and more efficient fuel burn – meaning significantly less emissions and unburnt fuel being ejected through the exhaust. To validate the initial findings, it was decided to undertake an extensive series of monitored tests using a UK Government approved Ministry of Transport (MOT) testing station and UK Government prescribed test equipment.

The results of the testing have been extremely impressive and it is the company's intention to offer the Lofrix Eco Gel technology to the public in an easy-to-apply package sufficient to treat one vehicle for a year for under £25 (excluding sales tax and postal delivery cost).

BASIS OF THE TESTING

A busy and long established MOT testing station in Greater Manchester was selected to undertake a series of tests on a random selection of petrol and diesel vehicles. For both types of vehicle, it was decided that a minimum of 30 tests each was necessary to ensure data that was statistically robust. There was no pre-selection of vehicles (the vehicles were selected entirely at the discretion of the testing station) nor was there any analysis of the condition of any engines prior to testing.

Standard approved MOT testing equipment was used to gain a baseline of emissions from the vehicles. Lofrix Eco Gel was then added to the lubricating oil in each vehicle's engine, via the oil filler, in a volume equal to approximately 1% of the volume of the oil within the engine / sump. The vehicles were then driven normally by the customer to allow the Lofrix Eco Gel to circulate around the engine and begin its work, and then returned for a second test to record any difference in emissions levels.

It was recommended that the customer drive a minimum of 200 miles to allow the Lofrix Eco Gel to reach a high level of performance (even though it will begin to reduce emissions immediately after application) – although in reality this was largely left to the driver. Hence the quite large disparity in many cases in the mileage driven between the initial test (when the baseline data was recorded prior to the Lofrix Eco Gel being applied), and the second test (when the effects of the Lofrix Eco Gel were measured and recorded).

The testing was handled solely by testing station staff who provided the test results shown in the tables below. Details of the vehicles were recorded and tabulated and set out in the attached tables, with the exception of the registration numbers, which have been retained by the testing station in order to comply with data protection requirements. No servicing was undertaken on the vehicles between tests, and no account was taken of the marginal effects of possible differences in weather, ambient temperature and atmospheric conditions at the time 'before and after' tests were undertaken. All the tests were carried out by the same MOT testing station using the same equipment to ensure consistency.

DIESEL TESTS

Clearly the biggest problem in terms of emissions comes from older domestic and commercial diesel vehicles. In the UK, around 40% of cars and almost all light goods vehicles are diesel, a very significant proportion having been registered when emissions restrictions were less stringent than the current Euro Standard 6. It was therefore decided to test a minimum of 50 diesel vehicles selected at random. In the event, 57 vehicles were treated and comparative tests undertaken.

A smoke test was undertaken on each vehicle which involved a sample of exhaust gas taken under rapid acceleration and analysed for light absorption. A laser light was shone through the sample and the amount of light absorbed by the smoke recorded as a light density value, which is an indication of the level of emissions. Lofrix Eco Gel was then added to the oil in the engine, and in each case the vehicle was driven and returned in due course for a second test to provide comparative values.

In all cases there was a significant lowering in the level of emissions after the Lofrix Eco Gel was applied to the diesel vehicles. In many cases these reductions were extremely high. The average emissions reduction can be seen from Table 1 to be in excess of 56%. This was an average of all vehicles tested, regardless of how low or high the baseline emissions were, what mileage was completed between tests, or the condition of the vehicles' engines.

The testing on the diesel vehicles also showed that Lofrix Eco Gel significantly reduces emissions regardless of whether the engines are clean and efficient or are in poor condition.

PETROL TESTS

The MOT tests on petrol vehicles consist of testing an engine for the level of carbon monoxide (CO) and hydrocarbons (HC) (soot, unburnt and partly-burned fuel) at an engine speed between 2,500 and 3,000 revolutions per minute.

It had been noted previously by the Lofrix team that, in the case of petrol engines, the beneficial effects of Lofrix Eco Gel take slightly longer to manifest themselves than is the case with diesel vehicles. It was therefore decided to analyse the results of the petrol tests in line with the post application mileages undertaken by the 36 vehicles involved. The results were therefore grouped by those vehicles undertaking more than 150 miles between tests, those undertaking between 75 and 150 miles between tests, and those undertaking less than 75 miles between tests.

This grouping was designed to explore how the effects of the treatment with Lofrix Eco Gel alter emissions levels with increased mileage. The results showed clearly that even with low mileages between tests there is a noticeable reduction in emissions of both carbon monoxide and hydrocarbons. This appears to improve as the mileage increases towards 150 miles or so, after which as the mileage increases further, both carbon monoxide and hydrocarbon emissions reduce very substantially. With the higher mileage group of tests, the average reduction in vehicle CO emissions exceeded 70% and the average reduction in HC emissions as over 33%.

CONCLUSIONS

The tests on both diesel and petrol vehicles showed extremely impressive reductions in emissions following treatment of the engines with Lofrix Eco Gel. The tests also showed that Lofrix Eco Gel reduces emissions even further as more mileage is undertaken.

The dramatic reduction in toxic emissions resulting from the application of Lofrix Eco Gel means that the technology can be used to tackle vehicle-generated airborne pollution, particularly in towns and cities. Used widely, Lofrix Eco Gel could also massively reduce carbon dioxide (CO2) emissions, thus helping in the fight against climate change, (as when CO is released from vehicle exhausts, it remains in the atmosphere for some weeks before eventually reacting with other compounds and being converted to CO2, which is a significant contributor to climate change).

Whilst the UK Government MOT testing is to check for regulated emissions to permit vehicles meeting these levels to be licensed for use on the roads, it is the belief of Lofrix staff, following internal tests, that highly significant reductions will also be evidenced in NOx emissions (a combination of elements of nitrogen and oxygen such as NO, NO2 and N2O), which, along with particulate matter, are a major cause of, and exacerbation of, debilitating health conditions, including chronic respiratory problems. It is estimated that between 28,000 and 36,000 people die as a result of air pollution every year in the UK*.

Most airborne pollution from motor vehicles is caused by older domestic and commercial diesels. In the UK, the average annual mileage travelled by private cars is around 7,500 miles, with company vehicle drivers averaging around 19,500 miles. Commercial large vans and goods vehicles can often travel distances of 50,000 to 150,000 miles per year. These commercial vehicles will almost all be diesels, and the impact of Lofrix Eco Gel in reducing emissions in this sector could be immense and immediate.

In addition, it is very probable that a reduction in diesel smoke and petrol hydrocarbons equates to an improvement in fuel consumption, due to less unburnt fuel being wasted through the exhaust. All the current feedback on the effects of Lofrix Eco Gel, together with extensive Lofrix in-house testing results, indicates that this is the case, which dramatically strengthens, the case for the use of the Lofrix technology.

In summary, the attached test results clearly demonstrate that Lofrix Eco Gel improves combustion in motor vehicle engines and dramatically lowers emissions levels. Considering that there are now significantly more than a billion motor vehicles on the planet, then if the Lofrix Eco gel could be widely used and emissions reduced anywhere near the levels shown in the extensive testing, then Lofrix is a technology that could be a major tool in reducing airborne pollution and significantly benefitting climate change in the future.

*UK Government's Committee on the Medical Effects of Air Pollutants (COMEAP) – August 2018.

Table 1

Diesel Vehicle Smoke / Opacity Tests using UK Government MOT Testing Equipment undertaken by Ainsdale MOT Centre, Oldham

	Vehicle Details				Pre-Lofrix Application		Post-Lofrix Application		Results		Emissions Reduction
	Make	Model	Year	Engine Size (L)	Mileage	Smoke Opacity	Mileage	Smoke Opacity	Emissions Reduction	Mileage Difference	Individual % change
1	Mazda	Mazda 6	2008	2.0	115,974	2.54	116,607	0.04	2.50	633	98.43
2	Vauxhall	Astra	2006	1.9	87,454	0.12	87,854	0.02	0.10	400	83.33
3	BMW	330	2005	3.0	205,154	0.42	205,352	0.12	0.30	198	71.43
4	Peugeot	308	2007	1.6	54,314	0.48	54,392	0.38	0.10	78	20.83
5	Citroen	Berlingo	2011	1.6	72,136	0.19	72,260	0.11	0.08	124	42.11
6	Ford	Fiesta	2014	1.4	41,072	0.02	41,083	0.00	0.02	11	100.00
7	Volkswagen	Golf	2010	2.0	61,027	0.03	61,109	0.00	0.03	82	100.00
8	Vauxhall	Vectra	1999	2.0	104,564	0.18	104,594	0.17	0.01	30	5.56
9	Citroen	C4	2013	1.6	95,254	0.42	95,466	0.22	0.20	212	47.62
10	Land Rover	Discovery	2012	2.7	97,432	0.48	97,623	0.28	0.20	191	41.67
11	Mercedes	C-Class	2012	3.0	43,496	0.27	43,536	0.17	0.10	40	37.04
12	Ford	Fiesta	2014	1.4	44,346	0.12	44,445	0.02	0.10	99	83.33
13	Vauxhall	Astra	2004	1.6	95,331	0.31	95,523	0.21	0.10	192	32.26
14	Renault	Clio	2003	1.5	44,214	0.09	44,264	0.07	0.02	50	22.22
15	Citroen	C3	2006	1.4	32,324	0.28	32,524	0.10	0.18	200	64.29
16	Vauxhall	Insignia	2012	2.0	77,188	0.18	77,272	0.08	0.10	84	55.56
17	Renault	Megane	2005	1.5	84,253	0.17	84,381	0.05	0.12	128	70.59
18	Mercedes	Sprinter	2010	2.1	142,252	0.35	142,542	0.05	0.30	290	85.71
19	Ford	Transit	2011	2.4	103,822	0.48	103,895	0.38	0.10	73	20.83
20	Audi	A5	2009	2.0	64,533	0.26	64,592	0.04	0.22	59	84.62
21	Toyota	Avensis	2007	2.0	152,536	0.37	152,603	0.26	0.11	67	29.73
22	Volkswagon	Caddy	2008	1.6	110,737	0.18	111,004	0.10	0.08	267	44.44
23	Volkswagon	Golf	2010	2.0	203,003	0.03	203,037	0.01	0.02	34	66.67
24	Volkswagon	Golf	2006	2.0	71,234	0.07	71,254	0.06	0.01	20	14.29

	Vehicle Details				Pre-Lofrix Application		Post-Lofrix Application		Results		Emissions Reduction
	Make	Model	Year	Engine Size (L)	Mileage	Smoke Opacity	Mileage	Smoke Opacity	Emissions Reduction	Mileage Difference	Individual % change
25	Seat	Ibiza	2004	1.9	83,446	0.10	83,586	0.02	0.08	140	80.00
26	Seat	Leon	2006	1.6	56,753	0.17	57,132	0.00	0.17	379	100.00
27	Nissan	NV200	2015	1.5	101,987	0.44	102.006	0.15	0.29	19	65.91
28	Mercedes	S Class	2012	3.0	98,765	0.24	98,831	0.18	0.06	66	25.00
29	Range Rover	Sport	2011	3.0	153,802	0.48	153,928	0.28	0.20	126	41.67
30	Ford	S Max	2007	2.0	105,422	0.28	105,502	0.18	0.10	80	35.71
31	Vauxhall	Vivaro	2007	2.0	198,767	0.41	198,943	0.37	0.04	176	9.76
32	Ford	Fiesta	2016	1.4	44,134	0.31	44,214	0.14	0.17	80	54.84
33	Peugeot	Partner	2014	1.6	77,382	0.44	77,427	0.18	0.26	45	59.09
34	Fiat	Ducato	2010	2.0	31,510	0.03	31,604	0.02	0.01	94	33.33
35	Jaguar	X-type	2004	2.0	88,143	0.24	88,939	0.16	0.08	204	33.33
36	BMW	5 Series	2008	3.0	92,452	0.18	92,534	0.07	0.11	82	61.11
37	Audi	A3	2012	2.0	34,265	0.03	34,289	0.00	0.03	24	100.00
38	Ford	Focus	2001	1.8	108,253	0.46	108,356	0.24	0.22	103	47.83
39	Ford	Fusion	2005	1.4	74,213	0.37	74,301	0.14	0.23	88	62.16
40	Vauxhall	Astra	2015	1.7	24,527	0.09	24,573	0.05	0.04	46	44.44
41	Ford	Transit	1998	2.0	127,446	0.62	127,768	0.38	0.24	322	38.71
42	Peugeot	Partner	2009	1.6	99,476	0.41	99,689	0.21	0.20	213	48.78
43	Vauxhall	Corsa	2011	1.3	29,821	0.09	29,863	0.01	0.01	42	88.89
44	BMW	3 Series	2006	3.0	176,597	0.15	176,782	0.12	0.03	185	20.00
45	Citroen	Berlingo	2004	1.9	118,277	0.33	118,391	0.15	0.18	114	54.55
46	Volkswagon	Golf	1999	1.9	132,973	0.22	133,147	0.09	0.13	174	59.09
47	Volkswagon	Passat	2013	2.0	52,722	0.12	52,846	0.03	0.09	124	75.00
48	Audi	A4	2009	2.0	79,211	0.04	79,355	0.00	0.04	144	100.00
49	Fiat	Ducato	1998	1.9	54,668	0.29	54,732	0.13	0.16	64	55.17
50	Ford	Transit	2015	2.4	28,370	0.03	28,415	0.01	0.02	45	66.67
51	Audi	A3	2001	1.9	106,410	0.09	106,512	0.03	0.06	102	66.67

Diesel Vehicle Smoke / Opacity Tests using UK Government MOT Testing Equipment undertaken by Ainsdale MOT Centre, Oldham											
Vehicle Details					Pre-Lofrix Application		Post-Lofrix Application		Results		Emissions Reduction
	Make	Model	Year	Engine Size (L)	Mileage	Smoke Opacity	Mileage	Smoke Opacity	Emissions Reduction	Mileage Difference	Individual % change
52	Vauxhall	Zafira	2013	1.9	56,019	0.27	56,123	0.15	0.12	104	**44.44**
53	Peugeot	Partner	2011	1.6	94,187	0.46	94,382	0.19	0.27	195	**58.70**
54	Vauxhall	Astra	2002	2.0	77,348	0.21	77,471	0.11	0.10	87	**47.62**
55	Volvo	S40	2009	1.6	119,832	0.16	120,021	0.11	0.05	189	**31.25**
56	Ford	Focus	2012	1.6	51,685	0.01	51,711	0.00	0.01	26	**100.00**
57	Mercedes	C Class	2015	2.0	88,351	0.11	88,442	0.04	0.07	91	**63.64**

Points to Note:

1. The engine condition of the vehicles was not assessed prior to the testing programme, so therefore the level of emissions reduction after treatment with Lofrix Eco Gel will be seen to vary dependent on how clean and efficient the engine is prior to that treatment.
2. **All vehicles tested** showed a reduction in emissions following treatment with Lofrix Eco Gel.
3. The average vehicle mileage between tests was **132 miles**. The mileages driven were decided between the MOT centre and the customer. Lofrix Associates normally recommends a minimum mileage of 200 miles between tests to gain a result representative of the potential emissions reduction of the technology, but this was not often possible with these tests. It is likely that the mileage to gain an optimum result is significantly higher than 200 miles.
4. As mileage increases, Lofrix Eco Gel continues to perform and will improve the emissions figures shown above. Greater mileage, particularly with those vehicles that have undertaken a low mileage between tests, will normally result in further emissions reductions.
5. Re-treatment is recommended annually, or when oil is changed.
6. Vehicle registration data has been withheld because of data protection considerations.
7. All data above is supported by copies of redacted MOT emissions certificates.

Based on the pre-Lofrix application emissions figures and the post-Lofrix application emissions figures, the average overall reduction in emissions from the diesel vehicles tested and shown above is 56.78%

Table 2
Petrol Vehicle Emissions Tests using UK Government MOT Testing Equipment undertaken by Ainsdale MOT Centre, Oldham

	Vehicle Details				Pre-Lofrix Application			Post-Lofrix Application			Results			Reductions	
	Make	Model	Year	Engine Size (L)	Mileage	CO	HC	Mileage	CO	HC	Reductions CO	Reductions HC	Mileage Difference	CO %	HC %
	Mileages between tests above 150 miles														
1	Vauxhall	Astra	2006	1.8	28,545	0.110	4	28,791	0.012	1	0.098	3	246	89.09	75.00
2	Nissan	Micra	2004	1.4	52,332	0.210	8	52,641	0.110	4	1.000	4	309	47.62	50.00
3	Suzuki	Swift	2006	1.2	71,218	0.103	77	71,498	0.051	28	0.052	49	290	50.49	63.64
4	Vauxhall	Corsa	2005	1.2	71,213	0.033	89	71,533	0.013	23	0.020	66	320	60.61	74.16
5	Toyota	Avensis	2008	1.8	141,213	0.980	12	141,401	0.041	1	0.939	11	188	95.82	91.67
6	Ford	Fiesta	2004	1.0	63,323	0.003	29	63,523	0.000	3	0.003	26	200	100.00	88.46
7	Vauxhall	Vectra	2008	2.0	107,824	0.004	3	108,019	0.002	1	0.002	2	195	50.00	66.67
8	Vauxhall	Astra	2015	1.4	34,332	0.021	77	34,498	0.017	53	0.004	24	166	19.05	31.17
9	Ford	Fiesta	2004	1.4	140,876	0.101	142	141,036	0.067	116	0.034	26	160	33.67	18.31
10	Ford	Focus	1999	1.6	113,446	0.144	121	113,724	0.131	118	0.013	3	278	9.03	2.48
11	BMW	3 Series	2003	2.5	148,263	0.128	162	148,424	0.104	137	0.024	25	161	18.75	15.43
12	Mercedes	C Class	2008	1.8	107,446	0.000	21	107,739	0.000	9	0.000	12	293	0.00	57.14
	Mileages between tests below 150 miles but above 75														
13	Peugeot	107	2014	1.0	44,779	0.013	48	44,867	0.002	23	0.011	25	88	84.62	52.08
14	Nissan	Micra	2000	1.2	122,747	0.020	15	122,831	0.000	10	0.020	5	84	100.00	33.33
15	Vauxhall	Astra	2005	1.8	131,668	0.138	198	131,752	0.117	161	0.021	37	84	15.22	18.69
16	Ford	Focus	2010	1.6	48,995	0.125	183	49.085	0.103	177	0.022	6	90	17.60	3.28
17	Volkswagon	Golf	2008	1.4	72,996	0.044	133	73,102	0.038	121	0.006	12	106	13.64	9.02
18	Audi	A3	2012	2.0	89,743	0.008	31	89,852	0.007	28	0.001	3	109	12.50	9.68
19	Seat	Leon	2009	1.4	64,973	0.082	134	86,075	0.077	124	0.005	10	139	6.10	7.46
20	Renault	Laguna	2006	2.0	73,591	0.131	166	73,679	0.091	149	0.040	17	88	30.53	10.24
21	Toyota	Aygo	2015	1.0	38,217	0.010	39	38,303	0.000	27	0.010	12	86	100.00	30.77
22	Nissan	Micra	2010	1.2	64,278	0.000	49	64,358	0.000	37	0.000	12	80	0.000	24.49
23	Ford	Focus	2006	2.0	129,849	0.090	14	129,963	0.011	9	0.079	5	114	87.78	35.71
24	Vauxhall	Astra	2007	1.8	126,826	0.149	177	126,949	0.131	144	0.059	33	123	12.08	18.64

Petrol Vehicle Emissions Tests using UK Government MOT Testing Equipment undertaken by Ainsdale MOT Centre, Oldham

	Vehicle Details				Pre-Lofrix Application			Post-Lofrix Application			Results			Reductions	
	Make	Model	Year	Engine Size (L)	Mileage	CO	HC	Mileage	CO	HC	Reductions CO	Reductions HC	Mileage Difference	CO %	HC %
	Mileages between tests below 75 miles														
25	Vauxhall	Astra	2005	1.4	54,352	0.032	43	54,394	0.030	41	0.002	2	42	6.25	4.65
26	Ford	Fiesta	2002	1.3	45,422	0.033	55	45,462	0.032	53	0.001	2	40	3.03	3.64
27	Vauxhall	Corsa	2003	1.2	67,431	0.031	49	67,502	0.029	48	0.002	1	71	6.45	2.04
28	Vauxhall	Corsa	2017	1.0	24,585	0.090	41	24,602	0.080	36	0.010	5	17	11.11	12.20
29	Renault	Clio	1997	1.4	54,277	0.078	163	54,312	0.071	144	0.007	19	35	8.97	11.66
30	Kia	Picanto	2007	1.0	35,538	0.070	58	35,563	0.011	56	0.059	2	25	84.29	3.45
31	Volkswagon	Golf	2014	1.6	43,667	0.144	101	43,721	0.133	61	0.011	40	54	7.64	39.60
32	Renault	Megane	2003	1.6	58,363	0.228	172	58,390	0.119	153	0.109	19	27	47.81	11.05
33	Volkswagon	Polo	2009	1.4	42,192	0.003	0	42,242	0.003	0	0.000	0	50	0.00	0.00
34	Vauxhall	Corsa	2015	1.4	26,791	0.000	11	26,851	0.000	6	0.000	5	60	0.00	45.45
35	Ford	Fiesta	1999	1.25	79,423	0.103	52	79,497	0.098	41	0.005	11	74	4.85	21.15
36	Peugeot	206	2001	1.4	62,275	0.000	3	62,349	0.000	0	0.000	3	74	0.00	100.00

Points to Note:

1. All tests were undertaken on the same UK Government approved MOT testing equipment at Ainsdale MOT Centre, Oldham.
2. The engine condition of the vehicles was not assessed prior to the testing programme, so therefore the level of emissions reduction after treatment with Lofrix Eco Gel will be seen to vary dependent on how clean and efficient the engine is prior to that treatment.
3. Almost all vehicles showed a reduction in emissions following treatment with Lofrix Eco Gel, even those with extremely low mileage between tests.
4. The tests were split into three groups – those with mileages between tests of over 150 miles; those with mileages between tests of 75 to 150 miles; those with mileages between test of less than 75 miles. This was to show the improvement that the Lofrix technology brings to emissions reduction as the mileage increases.

5. The average mileage for vehicles in the group above 150 miles between tests was **234 miles**.
6. The average mileage for vehicles in the group between 75 and 150 miles between tests was **99 miles.**
7. The average mileage for vehicles in the group below75 miles between tests was **47 miles.**
8. It is likely that the mileage to gain an optimum result is significantly higher than 200 miles.
9. As mileage increases, Lofrix Eco Gel continues to perform and will improve the emissions figures shown above. Greater mileage, particularly with those vehicles that have undertaken a low mileage between tests, will normally result in further emissions reductions, as the table below illustrates.
10. Re-treatment is recommended annually or when oil is changed.
11. Vehicle registration data has been withheld because of data protection considerations.
12. All data above is supported by redacted copies of MOT emissions certificates.

Based on the pre-Lofrix Eco Gel application emissions figures and the post-Lofrix application emissions figures for both Carbon Monoxide and Hydrocarbons, the average overall reduction in emissions is as shown in the table below for each mileage group:

Mileage between tests	Average CO Reduction %	Average HC Reduction %
150 +	**70.17**	**33.69**
75 - 150	**28.77**	**14.91**
Below 75	**25.37**	**14.57**
All tests above regardless of mileage	**49.96**	**20.04**

This demonstrates that as vehicle mileage increases after treatment with Lofrix Eco Gel, then emissions reduction continues and reaches an optimum figure after several hundred miles of running. This level is then maintained until the next scheduled oil change when it is recommended that re-treatment is undertaken again.