

Fuel Economy & Emission Reduction Study



Data Accumulated By:

Arriva PLC
At Arriva (Portugal) facility

Purpose of Testing

To Track Fuel Economy & Emission Reduction With The
Rentar Fuel Catalyst

Type of Testing

10 Buses – Baseline Vs. Buses
With Rentar Fuel Catalyst

Dates of Testing

Sep 6, 2006 – Nov 30, 2006

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Arriva (Portugal) Services

(Formerly , AMI Transportes, Joao Carlos Soares, Abilio da Costa Moreira, and 51% of TST)



The nature of services rendered presents diversified characteristics according to the area where they are inserted. Here are some examples:

- Suburban services which due to their characteristics assume a more relevant position in the global context of the activity, especially in the Almada, Seixal, Sesimbra, Setúbal, Barreiro and Montijo areas.

- Urban services, circumscribed to the areas of larger population agglomerates, the urban network of Setubal being the most important.

- Rapid lines linking the main population centers of the Peninsula to Lisbon.

- Pendular connection services to the railway stations, the development of which is accompanying the growth of the Fertagus line.

- Occasional rental services for transport of groups on leisure activities

- Fixed rental services rendered to companies situated within the Peninsula, for regular transport of workers, on their trips (home-company.)



Mercedes Bus (463) with O408 Engine Equipped with Rentar Fuel Catalyst (RFC)



1. The fuel supply line was removed from the fuel pump and attached to one end of the RFC
2. The RFC was then connected to the fuel pump with a short flexi hose with a banjo type fitting.
3. Total installation time is less than 30 minutes (when all fittings are prefabricated)

Summary of Findings

Arriva conducted fuel economy studies. The data was collected by Arriva (Portugal) and the results are reported below.

Arriva managed the creation of a baseline, installation of the RFC and collection of the “post” installation data on 10 buses

The ten buses selected for the test had similar fuel consumption rate. The Rentar Fuel Catalyst’s was installed on the five (5) buses. The buses ran their normal routes during the time frames shown above.

Data was collected over three months during which a total of approximately 155,000 Km were accumulated on the 10 buses.

The fuel consumption was reduced by 4.40%, Soot was reduced by 50% and carbon footprint was reduced by 4.40%

Effect On A Fleet Of 10,000

The effect of using the RFC on Arriva’s bus fleet based on each bus averaging 70,000 Km per year at 33 L/100Km, and purchasing fuel price at an average of €1.0 per liter would be a fuel cost reduction of €1,016 per bus or €10,164,000 per 10,000 buses annually.

	Gross Annual Fuel Cost	Gross Fuel Savings	Accumulated Fuel Savings	Avg. Monthly Savings
Year 1	€231,000,000	€10,164,000	€10,164,000	€847,000
Year 2	€242,550,000	€10,672,200	€20,836,200	€889,350
Year 3	€254,677,500	€11,205,810	€32,042,010	€933,818
Year 4	€267,411,375	€11,766,101	€43,808,111	€980,508
Year 5	€280,781,944	€12,354,406	€56,162,516	€1,029,534

Return On Investment

At 4.40% fuel saving rate the return on investment (ROI) of the RFC could be more than 80% annually. (usually considered very high for any capital expenditure.) The ROI may exceed 100% when reduction in maintenance cost is factored in as well as expected future fuel price increases.

The fact that the RFC can function without maintenance may make the proposition even more attractive

Greenhouse Gas CO₂ Emissions (fleet of 10,000)

In addition to fuel savings the RFC will reduced various emissions such as Nox, PM and soot. It will reduce CO₂ emission by 2.5 metric tons per bus/year with current offset value of €30 or €300,000 fleet wide.

(http://www.climatecare.org/calculators/car_calc.cfm)

These numbers are based on an EPA standard which states that for every 100 gallons of diesel fuel burned results in 1 metric ton of CO₂ released into the atmosphere.

Being A Green Company

Being a "green company" has its own inherent value in protecting the environment and the health of its employees and clients. A positive public image is created by being "Green".

Arriva's currency (share price) may benefit by being pro active , environmental friendly, and using cutting edge technology to tackle these issues. The impact of the public perception of a public company as environmentally pro active can not be underestimated. Reducing carbon footprints could also result in various tax credits program from EU member states and local government/municipalities.

Maintenance cost reduction (fleet of 10,000)

Based on similar application, it is estimated that the intervals between oil changes could be increased by 25-30% through the use of RFC. The current annual cost of oil change (material, labor, none productive time) is about €1,600,000/year and a 25-30% reduction is an additional contribution to the bottom line.

Test Protocol

Controlled Comparison Testing

Arriva selected 10 similar buses with as follows:

1. All buses had the same engine make and model (Mercedes O408).
2. All buses had odometer reading of over 400,000 Km
3. All buses were of similar age.
4. All odometer reading were rounded to 1 km
5. All refueling data was recorded with 2 decimal accuracy.
6. All buses were refueled to full capacity at each refueling

The 10 buses were randomly separated to two groups. A test group consisting of 5 buses equipped with RFC, and 5 buses as a comparison (Control Group)

The test consisted of four phases:

Baseline Phase: 10,000 Km prior to test (Historical data)

Break-in Phase: 10,000 Km with data not factored in.

Comparison Phase: 10,000 Km to establish rate of saving.

Confirmation Phase: 10,000 Km to establish consistency of savings.

Monthly updates as to fuel consumption were provided to Rentar by Arriva.

The testing was conducted over a period of 120 days so that variables such as driver influence, loading, weather and terrain would flatten out and the results would be meaningful and representative of the complete fleet of buses

Testing Timeline

Phase 1 (Baseline) June 5-August 30, 2006

Historical computerized data was provided by Arriva for all 10 buses

Phase 2 (Break-in Period) Sep 6 – Oct 30, 2006.

The RFC were installed. Data was collected to ensure similarity of use between all buses. However, data was not used as a comparison data. On average it takes 10,000 Km for the RFC to reach full utilization. The break-in period usually shows a slight increase in consumption followed by gradual improvement .

Phase 3 (Comparison Phase) Oct 3 – Nov 30, 2006

Data was collected from the 10 buses of which 5 were now operating at full utilization following the break-in period.

Phase 4 (Confirmation Phase) Nov 30- Current

Data is collected to confirm the differential results between the test group and the Control group

Analysis of data from the Comparison Phase shows that fuel consumption was reduced by 4.40%

Analysis of Results:

The fuel consumption data (Table 1) shows an increase in fuel consumption during the Comparison period vs the Baseline period. This increase was due to seasonal change in weather and road condition (rain). However, the comparative analysis shows that the Control Group fuel consumption increase was 16% compared with only 9% in the Test Group. **On a comparative basis, the RFC reduced the fuel consumption by 4.4% .**

The performance of the RFC has been consistent in as much as **each** of the buses equipped with the RFC showed a better fuel economy than the Control Group average. In fact, with the minor exception of bus 483, **every** bus equipped with RFC performed **better** than **any** bus in the control group. This fact is significant because it clearly demonstrates that the **RFC always reduces fuel**, and only the rate of reduction is dependent upon the application, its use, and the fuel quality. (These results are below the average of savings experienced with the RFC world wide which are between 6% - 10% based on the age of the engines and the specific application).

Analysis of the CO₂ emission (Table 3) which was conducted only on the Test Group, shows an average increase of 9.5% which confirms the fuel consumption data of Table 1 (the ratio¹ of fuel consumption to CO₂ is about 1:1). This confirmation is significant because the data for Table 3 was derived through different means (not extrapolated from the fuel consumption data).

As expected the RFC reduced soot within 72 hours of operation, and the data of Table 4 (opacity) shows a substantial reduction in soot (over 50%). This substantial change had also been observed by the drivers, and corroborates the effectiveness of the RFC².

1) Arriva conducted the emission measurement without load, and road conditions (garage measurement facility). These conditions, and the temperature skew the ratio from the normal 1:1 ratio)

2) The reduction in soot is an additional confirmation of the efficacy of the RFC and explains the deferential fuel consumption results between the test and control group. A reduction in soot level is a by product of improved combustion.

Data Table – Summary of Results

Fuel Consumption

Table 1								Change	Change
Fleet N°	Group	Phase	Km's	Lt/100Km	Phase	Km's	Lt/100Km	Lt/100Km	%
463	Test	Baseline	600,797	34.63	Comparison	617,614	37.98	3.35	9.7%
478	Test	Baseline	736,094	32.61	Comparison	745,600	35.63	3.02	9.3%
483	Test	Baseline	770,423	31.37	Comparison	785,723	36.10	4.73	15.1%
486	Test	Baseline	597,468	32.83	Comparison	611,100	35.67	2.84	8.7%
487	Test	Baseline	823,354	33.41	Comparison	839,442	34.64	1.23	3.7%
Avg				32.97			36.00	3.03	9.2%
470	Control	Baseline	523,646	30.71	Comparison	538,583	35.98	5.27	17.2%
474	Control	Baseline	487,710	32.51	Comparison	504,344	38.80	6.29	19.3%
480	Control	Baseline	781,422	30.17	Comparison	799,332	35.34	5.17	17.1%
481	Control	Baseline	664,648	33.68	Comparison	680,328	37.06	3.37	10.0%
482	Control	Baseline	598,933	34.99	Comparison	612,576	40.44	5.45	15.6%
Avg				32.41			37.52	5.11	15.8%

Emissions

Table 2						Change	Change
		% vol CO		% vol CO			
463	Baseline	0.01		Comparison	0.03	0.02	200%
478	Baseline	0.02		Comparison	0.03	0.01	50%
483	Baseline	0.02		Comparison	0.04	0.02	100%
486	Baseline	0.02		Comparison	0.04	0.02	100%
487	Baseline	0.02		Comparison	0.01	-0.01	-50%

Table 3						Change	Change
		% vol CO2		% vol CO2			
463	Baseline	1.42		Comparison	1.59	0.17	12%
478	Baseline	1.42		Comparison	1.57	0.15	11%
483	Baseline	1.45		Comparison	1.54	0.09	6%
486	Baseline	1.4		Comparison	1.65	0.25	18%
487	Baseline	1.37		Comparison	1.38	0.01	1%

Table 4						Change	Change
		Opacity (m ⁻¹)		Opacity (m ⁻¹)			
463	Baseline	0.29		Comparison	0.11	-0.18	-62%
478	Baseline	0.17		Comparison	0.13	-0.04	-24%
483	Baseline	0.23		Comparison	0.09	-0.14	-61%
486	Baseline	0.04		Comparison	0.13	0.09	225%
487	Baseline	0.07		Comparison	0.01	-0.06	-86%

Table 5						Change	Change
		ppm vol HC		ppm vol HC			
463	Baseline	11.25		Comparison	8.50	Down	24%
478	Baseline	9.75		Comparison	9.00	Down	8%
483	Baseline	10.25		Comparison	8.50	Down	17%
486	Baseline	9.50		Comparison	8.50	Down	11%
487	Baseline	9.25		Comparison	6.50	Down	30%

Break in

Comparison

Data Table - Detailed logs

Bus No		463		Test Group			
Km		5,804					
Fuel (liters)		2,204.16					
Liter/100Km		37.98					
Date	Odometer (Km)	Daily Km	Refueling (liter)	Date	Odometer (Km)	Daily Km	Refueling (liter)
9/8/2006	600,797		0.00	10/31/2006	611,810		
9/9/2006	601,223	426	161.22	11/1/2006	612,018	208	84.06
9/10/2006	601,492	269	92.36	11/2/2006	612,218	200	67.45
9/12/2006	601,916	424	143.04	11/4/2006	612,584	366	120.00
9/14/2006	602,301	385	145.13	11/5/2006	612,825	241	105.83
9/16/2006	602,722	421	145.24	11/7/2006	613,247	422	153.19
9/17/2006	602,900	178	67.00	11/9/2006	613,699	452	168.95
9/18/2006	603,109	209	79.37	11/11/2006	614,067	368	130.01
9/19/2006	603,327	218	82.12	11/12/2006	614,313	246	104.91
9/21/2006	603,660	333	165.21	11/14/2006	614,735	422	159.71
9/23/2006	604,123	463	109.64	11/20/2006	615,181	446	154.77
9/24/2006	604,363	240	108.55	11/21/2006	615,537	356	133.00
9/26/2006	604,787	424	146.91	11/22/2006	615,869	332	121.85
9/28/2006	605,231	444	177.07	11/23/2006	616,130	261	135.58
9/30/2006	605,594	363	131.73	11/25/2006	616,493	363	122.00
10/1/2006	605,838	244	97.01	11/26/2006	616,740	247	110.62
10/4/2006	606,123	285	82.03	11/28/2006	617,173	433	157.01
10/5/2006	606,413	290	124.07	11/30/2006	617,614	441	175.22
10/7/2006	606,667	254	110.00				
10/8/2006	607,070	403	98.01				
10/9/2006	607,213	143	68.03				
10/10/2006	607,433	220	94.12				
10/12/2006	607,803	370	125.00				
10/14/2006	608,175	372	143.00				
10/15/2006	608,411	236	95.00				
10/17/2006	608,840	429	155.27				
10/19/2006	609,278	438	166.13				
10/21/2006	609,641	363	125.00				
10/22/2006	609,945	304	100.01				
10/23/2006	610,090	145	76.00				
10/24/2006	610,322	232	88.16				
10/26/2006	610,774	452	170.10				
10/28/2006	611,132	358	125.00				
10/29/2006	611,382	250	108.16				
10/30/2006	611,584	202	69.01				
10/31/2006	611,810	226	88.69				

Bus No 478 **Test Group**
Km 3,421
Fuel (liters) 1,218.84
Liter/100Km 35.63

Date	Odometer (Km)	Daily Km	Refueling (liter)	Date	Odometer (Km)	Daily Km	Refueling (liter)
9/7/2006	736,094		0.00	10/31/2006	742,179		
9/8/2006	736,351	257	110.98	11/1/2006	742,395	216	72.62
9/10/2006	736,643	292	88.82	11/3/2006	742,647	252	85.83
9/12/2006	736,932	289	98.93	11/7/2006	742,929	282	86.88
9/14/2006	737,299	367	126.21	11/9/2006	743,273	344	129.00
9/15/2006	737,546	247	85.68	11/10/2006	743,511	238	80.00
9/18/2006	737,926	380	115.06	11/12/2006	743,743	232	77.01
9/20/2006	738,214	288	105.93	11/14/2006	743,994	251	90.01
9/22/2006	738,500	286	98.48	11/16/2006	744,281	287	92.70
10/3/2006	738,806	306	120.02	11/20/2006	744,529	248	104.16
10/4/2006	739,017	211	73.43	11/21/2006	744,753	224	69.26
10/5/2006	739,231	214	68.84	11/23/2006	745,043	290	108.00
10/9/2006	739,544	313	113.01	11/24/2006	745,318	275	98.37
10/10/2006	739,785	241	75.58	11/30/2006	745,600	282	125.00
10/12/2006	740,074	289	105.00				
10/13/2006	740,347	273	95.40				
10/17/2006	740,646	299	106.94				
10/19/2006	740,932	286	95.00				
10/23/2006	741,144	212	96.00				
10/25/2006	741,485	341	115.78				
10/27/2006	741,825	340	120.00				
10/31/2006	742,179	354	121.59				

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Bus No**483****Test Group****Km****5,223****Fuel (liters)****1,885.55****Liter/100Km****36.10**

Date	Odometer (Km)	Daily Km	Refueling (liter)	Date	Odometer (Km)	Daily Km	Refueling (liter)
9/7/2006	770,423		0.00	10/31/2006	780,500		
9/7/2006	770,476	53	46.96	11/2/2006	780,822	322	100.00
9/9/2006	770,650	174	69.22	11/3/2006	781,090	268	104.46
9/11/2006	771,085	435	160.53	11/4/2006	781,266	176	70.16
9/12/2006	771,286	201	73.56	11/5/2006	781,508	242	77.00
9/13/2006	771,492	206	81.07	11/7/2006	781,783	275	110.00
9/14/2006	771,752	260	90.57	11/9/2006	782,217	434	161.94
9/16/2006	771,984	232	100.00	11/10/2006	782,498	281	114.08
9/18/2006	772,138	154	57.47	11/11/2006	782,688	190	63.00
9/19/2006	772,329	191	63.11	11/12/2006	782,896	208	67.03
9/20/2006	772,618	289	94.92	11/15/2006	783,347	451	154.18
9/22/2006	772,971	353	118.13	11/16/2006	783,582	235	94.17
9/23/2006	773,144	173	70.00	11/17/2006	783,841	259	106.92
9/25/2006	773,487	343	97.06	11/18/2006	784,035	194	62.23
9/26/2006	773,558	71	40.00	11/20/2006	784,418	383	110.71
9/27/2006	773,937	379	115.00	11/22/2006	784,713	295	112.77
9/28/2006	774,318	381	126.00	11/23/2006	784,912	199	77.00
9/29/2006	774,659	341	116.36	11/24/2006	785,225	313	110.90
9/30/2006	774,833	174	71.48	11/25/2006	785,427	202	93.00
10/2/2006	775,261	428	141.01	11/27/2006	785,723	296	96.00
10/4/2006	775,638	377	141.00				
10/5/2006	775,838	200	85.00				
10/6/2006	776,081	243	64.55				
10/9/2006	776,587	506	159.01				
10/11/2006	776,944	357	125.51				
10/12/2006	777,177	233	80.30				
10/14/2006	777,386	209	80.13				
10/16/2006	777,765	379	107.01				
10/18/2006	778,066	301	96.29				
10/20/2006	778,390	324	124.12				
10/21/2006	778,563	173	66.84				
10/23/2006	778,878	315	118.09				
10/25/2006	779,310	432	154.63				
10/26/2006	779,485	175	74.24				
10/28/2006	779,914	429	145.10				
10/30/2006	780,272	358	115.02				
10/31/2006	780,500	228	110.00				

Bus No **486** **Test Group**
Km **5,820**
Fuel (liters) **2,075.94**
Liter/100Km **35.67**

Date	Odometer (Km)	Daily Km	Refueling (liter)	Date	Odometer (Km)	Daily Km	Refueling (liter)
9/7/2006	597,468		118.98	10/31/2006	605,280		
9/7/2006	597,521	53	69.90	11/2/2006	605,714	434	145.00
9/9/2006	597,886	365	82.36	11/3/2006	605,975	261	91.74
9/9/2006	597,962	76	25.97	11/4/2006	606,148	173	63.76
9/12/2006	598,362	400	128.29	11/5/2006	606,362	214	76.03
9/13/2006	598,513	151	60.02	11/7/2006	606,697	335	100.78
9/16/2006	598,851	338	168.54	11/8/2006	606,964	267	96.40
9/16/2006	599,134	283	51.10	11/10/2006	607,301	337	120.01
9/18/2006	599,429	295	93.34	11/11/2006	607,559	258	89.23
9/20/2006	599,713	284	105.45	11/12/2006	607,722	163	60.00
9/23/2006	600,249	536	52.17	11/13/2006	608,028	306	103.01
9/26/2006	600,667	418	156.31	11/15/2006	608,291	263	105.72
9/27/2006	600,917	250	92.10	11/16/2006	608,517	226	86.00
9/30/2006	601,408	491	155.01	11/17/2006	608,747	230	92.63
10/12/2006	601,610	202	74.55	11/18/2006	608,855	108	37.00
10/13/2006	601,819	209	69.35	11/19/2006	609,030	175	62.00
10/14/2006	602,045	226	70.00	11/21/2006	609,488	458	145.19
10/15/2006	602,261	216	52.82	11/23/2006	609,894	406	152.12
10/17/2006	602,554	293	108.82	11/26/2006	610,266	372	145.00
10/18/2006	602,809	255	85.72	11/28/2006	610,638	372	127.32
10/20/2006	603,136	327	116.58	11/30/2006	611,100	462	177.00
10/21/2006	603,358	222	70.01				
10/22/2006	603,548	190	69.00				
10/24/2006	603,949	401	117.71				
10/26/2006	604,373	424	138.53				
10/27/2006	604,600	227	77.34				
10/28/2006	604,759	159	62.74				
10/29/2006	604,917	158	55.23				
10/31/2006	605,280	363	107.13				

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Bus No **487** **Test Group**
Km **5,549**
Fuel (liters) **1,922.17**
Liter/100Km **34.64**

Date	Odometer (Km)	Daily Km	Refueling (liter)	Date	Odometer (Km)	Daily Km	Refueling (liter)
9/7/2006	823,354		0.00	10/31/2006	833,893		
9/8/2006	823,452	98	103.65	11/2/2006	834,340	447	148.00
9/9/2006	823,756	304	102.06	11/3/2006	834,586	246	105.00
9/11/2006	824,222	466	152.80	11/4/2006	834,742	156	40.00
9/12/2006	824,337	115	55.00	11/5/2006	834,936	194	52.45
9/13/2006	824,705	368	124.81	11/6/2006	835,122	186	80.00
9/15/2006	825,046	341	119.00	11/10/2006	835,590	468	151.48
9/16/2006	825,274	228	89.00	11/11/2006	835,812	222	75.01
9/17/2006	825,546	272	74.00	11/12/2006	836,074	262	68.57
9/20/2006	826,030	484	151.51	11/14/2006	836,361	287	115.58
9/22/2006	826,572	542	182.52	11/16/2006	836,727	366	130.00
9/23/2006	826,768	196	58.29	11/18/2006	837,156	429	170.12
9/24/2006	827,035	267	86.00	11/19/2006	837,324	168	45.00
9/26/2006	827,320	285	100.00	11/21/2006	837,684	360	117.46
9/27/2006	827,635	315	102.44	11/23/2006	838,068	384	135.01
10/1/2006	827,770	135	57.33	11/24/2006	838,297	229	76.00
10/3/2006	828,147	377	130.39	11/26/2006	838,720	423	138.13
10/5/2006	828,467	320	106.41	11/28/2006	839,125	405	145.00
10/7/2006	828,908	441	134.01	11/30/2006	839,442	317	129.36
10/8/2006	829,238	330	108.05				
10/9/2006	829,379	141	53.01				
10/11/2006	829,718	339	114.18				
10/13/2006	830,141	423	149.00				
10/14/2006	830,413	272	85.60				
10/15/2006	830,556	143	56.27				
10/17/2006	830,976	420	143.00				
10/18/2006	831,238	262	120.01				
10/21/2006	831,660	422	137.00				
10/22/2006	832,023	363	118.06				
10/24/2006	832,379	356	135.31				
10/25/2006	832,752	373	160.00				
10/27/2006	833,165	413	136.00				
10/28/2006	833,395	230	70.00				
10/29/2006	833,557	162	55.98				
10/31/2006	833,893	336	117.04				

Bus No 470
Km 5,544
Fuel (liters) 1,994.94
Liter/100Km 35.98

Control Group

Date	Odometer (Km)	Daily Km	Refueling (liter)	Date	Odometer (Km)	Daily Km	Refueling (liter)
9/13/2006	523,989			10/30/2006	533,039		
9/14/2006	524,377	388	126.00	11/1/2006	533,390	351	131.00
9/16/2006	525,005	628	213.68	11/3/2006	533,727	337	125.01
9/17/2006	525,171	166	59.97	11/4/2006	534,063	336	104.13
9/19/2006	525,540	369	85.02	11/5/2006	534,209	146	57.01
9/20/2006	525,864	324	100.82	11/8/2006	534,390	181	70.85
9/21/2006	525,996	132	56.53	11/10/2006	534,708	318	115.00
9/22/2006	526,255	259	76.18	11/10/2006	534,781	73	43.37
9/23/2006	526,442	187	54.05	11/11/2006	534,933	152	50.00
9/24/2006	526,655	213	62.16	11/12/2006	535,145	212	75.00
9/25/2006	526,878	223	76.11	11/14/2006	535,589	444	138.91
9/27/2006	527,079	201	66.69	11/15/2006	535,852	263	88.56
9/28/2006	527,194	115	51.58	11/16/2006	536,046	194	87.85
9/30/2006	527,471	277	96.57	11/18/2006	536,448	402	130.00
10/2/2006	528,025	554	159.78	11/19/2006	536,713	265	103.04
10/6/2006	528,472	447	180.87	11/21/2006	537,169	456	168.31
10/6/2006	528,619	147	58.10	11/23/2006	537,522	353	119.00
10/7/2006	528,766	147	46.75	11/24/2006	537,653	131	62.00
10/8/2006	528,909	143	40.00	11/25/2006	537,972	319	100.00
10/10/2006	529,447	538	171.08	11/26/2006	538,136	164	67.42
10/11/2006	529,551	104	46.93	11/28/2006	538,374	238	87.19
10/12/2006	529,649	98	34.86	11/29/2006	538,583	209	71.29
10/13/2006	529,875	226	76.00				
10/13/2006	530,027	152	51.45				
10/15/2006	530,356	329	93.00				
10/18/2006	530,829	473	235.01				
10/19/2006	531,122	293	75.00				
10/20/2006	531,279	157	39.22				
10/23/2006	531,516	237	95.00				
10/24/2006	531,767	251	84.67				
10/25/2006	532,020	253	81.02				
10/26/2006	532,189	169	65.41				
10/27/2006	532,543	354	109.16				
10/28/2006	532,690	147	56.77				
10/29/2006	532,835	145	48.00				
10/30/2006	533,039	204	71.27				

Bus No		474		Control Group			
Km		5,098					
Fuel (liters)		1,977.78					
Liter/100Km		38.80					
Date	Odometer (Km)	Daily Km	Refueling (liter)	Date	Odometer (Km)	Daily Km	Refueling (liter)
9/7/2006	489,120			10/29/2006	499,246		
9/8/2006	489,318	198	70.32	11/3/2006	499,417	171	65.99
9/9/2006	489,491	173	70.90	11/4/2006	499,646	229	77.01
9/11/2006	489,833	342	109.16	11/6/2006	499,959	313	97.00
9/12/2006	489,987	154	57.01	11/8/2006	500,296	337	148.11
9/13/2006	490,213	226	65.79	11/9/2006	500,458	162	72.00
9/14/2006	490,344	131	57.30	11/10/2006	500,617	159	67.00
9/15/2006	490,486	142	80.86	11/11/2006	500,840	223	75.66
9/16/2006	490,779	293	63.70	11/13/2006	501,175	335	125.00
9/17/2006	491,167	388	131.96	11/14/2006	501,345	170	69.57
9/18/2006	491,342	175	55.33	11/15/2006	501,639	294	91.14
9/19/2006	491,624	282	59.26	11/16/2006	501,769	130	64.34
9/20/2006	491,754	130	76.92	11/18/2006	502,160	391	127.52
9/23/2006	491,995	241	87.08	11/19/2006	502,371	211	80.54
9/25/2006	492,355	360	113.25	11/20/2006	502,506	135	65.00
9/27/2006	492,610	255	97.50	11/22/2006	502,859	353	123.20
9/28/2006	492,830	220	82.53	11/23/2006	503,000	141	56.98
9/29/2006	493,122	292	130.17	11/24/2006	503,196	196	70.00
9/30/2006	493,292	170	62.65	11/25/2006	503,381	185	103.01
10/2/2006	493,723	431	140.63	11/26/2006	503,598	217	70.21
10/3/2006	493,908	185	70.00	11/27/2006	503,716	118	60.00
10/4/2006	494,167	259	94.84	11/28/2006	503,981	265	98.50
10/5/2006	494,322	155	50.00	11/30/2006	504,344	363	170.00
10/7/2006	494,714	392	125.16				
10/9/2006	495,093	379	134.94				
10/10/2006	495,218	125	44.64				
10/11/2006	495,537	319	123.72				
10/13/2006	495,963	426	170.04				
10/14/2006	496,221	258	81.02				
10/16/2006	496,519	298	105.52				
10/18/2006	496,945	426	182.00				
10/20/2006	497,282	337	110.57				
10/21/2006	497,593	311	93.02				
10/23/2006	497,973	380	130.00				
10/25/2006	498,358	385	135.48				
10/27/2006	498,675	317	112.01				
10/28/2006	499,099	424	150.01				
10/29/2006	499,246	147	50.00				

Bus No 480
Km 5,358
Fuel (liters) 1,893.38
Liter/100Km 35.34

Control Group

Date	Odometer (Km)	Daily Km	Refueling (liter)	Date	Odometer (Km)	Daily Km	Refueling (liter)
9/6/2006	783,026			10/31/2006	793,974		
9/8/2006	783,303	277	80.00	11/4/2006	794,200	226	86.01
9/9/2006	783,524	221	72.05	11/5/2006	794,444	244	63.63
9/10/2006	783,727	203	56.04	11/6/2006	794,658	214	65.65
9/11/2006	783,861	134	56.83	11/9/2006	794,963	305	130.00
9/11/2006	784,020	159	44.37	11/10/2006	795,193	230	79.00
9/12/2006	784,282	262	71.94	11/12/2006	795,622	429	170.00
9/14/2006	784,591	309	94.06	11/13/2006	796,012	390	120.00
9/17/2006	785,043	452	150.00	11/14/2006	796,235	223	85.78
9/18/2006	785,450	407	90.97	11/15/2006	796,339	104	54.52
9/21/2006	785,895	445	159.18	11/15/2006	796,458	119	47.00
9/22/2006	786,121	226	63.02	11/16/2006	796,532	74	41.25
9/23/2006	786,383	262	76.29	11/17/2006	796,797	265	52.35
9/25/2006	786,513	130	46.08	11/18/2006	796,954	157	68.38
9/26/2006	786,705	192	49.05	11/19/2006	797,164	210	67.01
9/27/2006	786,892	187	66.31	11/21/2006	797,441	277	109.32
9/29/2006	787,215	323	112.96	11/22/2006	797,690	249	92.48
9/30/2006	787,450	235	58.02	11/23/2006	797,838	148	100.00
10/1/2006	787,643	193	61.00	11/25/2006	798,510	672	197.00
10/2/2006	787,910	267	85.37	11/27/2006	798,694	184	56.92
10/3/2006	788,057	147	58.58	11/28/2006	798,907	213	67.08
10/4/2006	788,254	197	83.70	11/30/2006	799,332	425	140.00
10/5/2006	788,536	282	90.00				
10/6/2006	788,687	151	65.00				
10/8/2006	789,054	367	105.01				
10/9/2006	789,342	288	77.21				
10/10/2006	789,469	127	56.62				
10/11/2006	789,743	274	90.77				
10/13/2006	790,203	460	137.42				
10/14/2006	790,500	297	96.54				
10/15/2006	790,712	212	71.55				
10/17/2006	791,154	442	140.33				
10/19/2006	791,511	357	121.48				
10/21/2006	791,814	303	116.02				
10/22/2006	792,015	201	65.69				
10/24/2006	792,275	260	92.47				
10/26/2006	792,688	413	152.00				
10/27/2006	792,903	215	85.00				
10/27/2006	793,023	120	36.32				
10/28/2006	793,290	267	91.03				
10/29/2006	793,477	187	57.14				
10/30/2006	793,691	214	62.49				
10/31/2006	793,974	283	90.11				

Bus No		481		Control Group			
Km	5,122						
Fuel (liters)	1,898.08						
Liter/100Km	37.06						
Date	Odometer (Km)	Daily Km	Refueling (liter)	Date	Odometer (Km)	Daily Km	Refueling (liter)
9/7/2006	665,897			10/30/2006	675,206		
9/8/2006	666,080	183	76.88	11/2/2006	675,613	407	145.00
9/9/2006	666,479	399	93.00	11/3/2006	675,962	349	115.00
9/11/2006	666,891	412	143.34	11/4/2006	676,166	204	85.77
9/12/2006	667,037	146	53.12	11/6/2006	676,327	161	65.00
9/13/2006	667,183	146	52.92	11/7/2006	676,565	238	79.17
9/14/2006	667,327	144	49.57	11/8/2006	676,803	238	84.41
9/18/2006	667,799	472	147.00	11/9/2006	677,042	239	80.00
9/19/2006	668,024	225	79.35	11/10/2006	677,280	238	88.00
9/21/2006	668,514	490	161.86	11/12/2006	677,683	403	140.00
9/22/2006	668,730	216	79.81	11/13/2006	677,879	196	77.79
9/23/2006	669,072	342	98.01	11/14/2006	678,117	238	74.82
9/24/2006	669,160	88	44.00	11/15/2006	678,356	239	81.24
9/25/2006	669,470	310	83.26	11/16/2006	678,596	240	85.00
9/26/2006	669,664	194	62.08	11/17/2006	678,835	239	85.00
9/27/2006	669,816	152	72.44	11/20/2006	679,223	388	150.00
9/29/2006	670,149	333	113.51	11/21/2006	679,415	192	85.82
9/30/2006	670,339	190	67.70	11/27/2006	679,795	380	160.00
10/2/2006	670,584	245	75.38	11/28/2006	679,972	177	73.06
10/3/2006	670,776	192	79.68	11/30/2006	680,328	356	143.00
10/4/2006	670,981	205	68.34				
10/5/2006	671,120	139	56.41				
10/6/2006	671,478	358	90.00				
10/9/2006	671,990	512	194.01				
10/11/2006	672,390	400	155.19				
10/13/2006	672,811	421	148.48				
10/15/2006	672,945	134	55.00				
10/16/2006	673,143	198	63.38				
10/18/2006	673,629	486	188.04				
10/19/2006	673,871	242	60.00				
10/20/2006	674,109	238	104.00				
10/21/2006	674,340	231	74.00				
10/22/2006	674,526	186	57.84				
10/27/2006	674,990	464	190.01				
10/30/2006	675,206	216	84.80				

Bus No 482
Km 4,891
Fuel (liters) 1,977.77
Liter/100Km 40.44

Control Group

Date	Odometer (Km)	Daily Km	Refueling (liter)	Date	Odometer (Km)	Daily Km	Refueling (liter)
9/7/2006	598,933			10/31/2006	607,685		
9/8/2006	599,225	292	115.35	11/2/2006	607,922	237	97.73
9/10/2006	599,347	122	65.00	11/6/2006	608,248	326	133.51
9/12/2006	599,714	367	103.00	11/7/2006	608,464	216	84.79
9/13/2006	599,951	237	112.48	11/9/2006	608,792	328	120.00
9/14/2006	600,139	188	78.35	11/11/2006	609,682	890	207.24
9/15/2006	600,215	76	43.67	11/12/2006	609,701	19	44.49
9/18/2006	600,408	193	62.98	11/13/2006	609,826	125	61.62
9/19/2006	600,629	221	75.09	11/15/2006	610,006	180	172.72
9/20/2006	600,851	222	82.81	11/17/2006	610,356	350	135.00
9/21/2006	601,046	195	81.70	11/20/2006	610,862	506	170.00
9/22/2006	601,307	261	94.35	11/22/2006	611,179	317	181.04
9/23/2006	601,650	343	122.92	11/24/2006	611,664	485	195.59
9/25/2006	601,748	98	43.78	11/27/2006	611,996	332	116.03
9/28/2006	602,148	400	186.65	11/29/2006	612,246	250	120.00
9/29/2006	602,482	334	114.10	11/30/2006	612,576	330	138.01
10/2/2006	602,821	339	122.15				
10/4/2006	603,134	313	129.14				
10/6/2006	603,475	341	152.34				
10/9/2006	604,065	590	164.00				
10/10/2006	604,383	318	129.13				
10/12/2006	604,872	489	170.00				
10/16/2006	605,280	408	170.01				
10/18/2006	605,686	406	168.04				
10/19/2006	605,785	99	45.00				
10/20/2006	606,023	238	90.00				
10/21/2006	606,363	340	125.19				
10/23/2006	606,522	159	77.98				
10/25/2006	606,791	269	120.71				
10/28/2006	607,212	421	192.08				
10/31/2006	607,685	473	155.62				

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