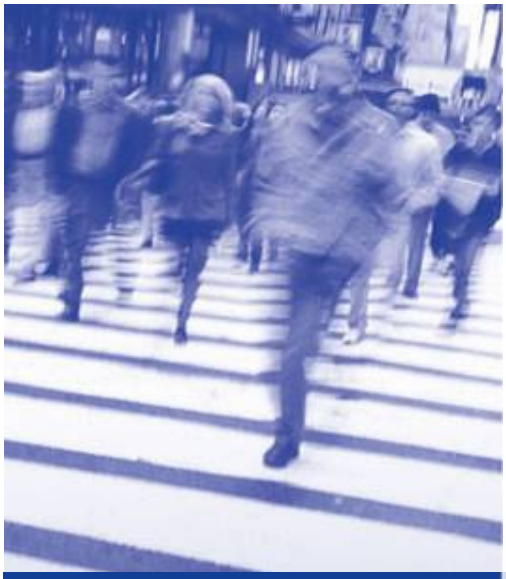

CiViTAS
Cleaner and better transport in cities

ARCHIMEDES
AALBORG • BRIGHTON & HOVE • DONOSTIA - SAN SEBASTIÁN • IAŞI • MONZA • ÚSTÍ NAD LABEM

Donostia – San Sebastian

T4.1 – 50 public buses using 20% blend of biodiesel in Donostia – San Sebastian

Donostia – San Sebastian

July 2009

THE CIVITAS INITIATIVE
IS CO-FINANCED BY THE
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Start date of the Project	15/09/2008
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Measure:	No. 4: Biofuels and Clean Vehicles in Donostia – San Sebastian
Task:	1.5: Public Transport Biofuels and Clean Vehicles
Deliverable:	T4.1: 50 Public Buses Using 20% Blend of Biodiesel in Donostia – San Sebastian
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Contents

1. Introduction

1.1 Background CIVITAS

CIVITAS - cleaner and better transport in cities - stands for CIty-VITAlity-Sustainability. With the CIVITAS Initiative, the EC aims to generate a decisive breakthrough by supporting and evaluating the implementation of ambitious integrated sustainable urban transport strategies that should make a real difference for the welfare of the European citizen.

CIVITAS I started in early 2002 (within the 5th Framework Research Programme);
CIVITAS II started in early 2005 (within the 6th Framework Research Programme) and
CIVITAS PLUS started in late 2008 (within the 7th Framework Research Programme).

The objective of CIVITAS-Plus is to test and increase the understanding of the frameworks, processes and packaging required to successfully introduce bold, integrated and innovative strategies for clean and sustainable urban transport that address concerns related to energy-efficiency, transport policy and road safety, alternative fuels and the environment.

Within CIVITAS I (2002-2006) there were 19 cities clustered in 4 demonstration projects, within CIVITAS II (2005-2009) 17 cities in 4 demonstration projects, whilst within CIVITAS PLUS (2008-2012) 25 cities in 5 demonstration projects are taking part. These demonstration cities all over Europe are funded by the European Commission.

Objectives:

- to promote and implement sustainable, clean and (energy) efficient urban transport measures
- to implement integrated packages of technology and policy measures in the field of energy and transport in 8 categories of measures
- to build up critical mass and markets for innovation

Horizontal projects support the CIVITAS demonstration projects & cities by :

- Cross-site evaluation and Europe wide dissemination in co-operation with the demonstration projects
- The organisation of the annual meeting of CIVITAS Forum members
- Providing the Secretariat for the Political Advisory Committee (PAC)
- Development of policy recommendations for a long-term multiplier effect of CIVITAS

Key elements of CIVITAS

- CIVITAS is co-ordinated by cities: it is a programme “of cities for cities”
- Cities are in the heart of local public private partnerships
- Political commitment is a basic requirement
- Cities are living ‘Laboratories' for learning and evaluating

1.2 Background ARCHIMEDES

ARCHIMEDES is an integrating project, bringing together 6 European cities to address problems and opportunities for creating environmentally sustainable, safe and energy efficient transport systems in medium sized urban areas.

The objective of ARCHIMEDES is to introduce innovative, integrated and ambitious strategies for clean, energy-efficient, sustainable urban transport to achieve significant impacts in the policy fields of energy, transport, and environmental sustainability. An ambitious blend of policy tools and measures will increase energy-efficiency in transport, provide safer and more convenient travel for all, using a higher share of clean engine technology and fuels, resulting in an enhanced urban environment (including reduced noise and air pollution). Visible and measurable impacts will result from significantly sized measures in specific innovation areas. Demonstrations of innovative transport technologies, policy measures and partnership working, combined with targeted research, will verify the best frameworks, processes and packaging required to successfully transfer the strategies to other cities.

1.3 Participant Cities

The ARCHIMEDES project focuses on activities in specific innovation areas of each city, known as the ARCHIMEDES corridor or zone (depending on shape and geography). These innovation areas extend to the peri-urban fringe and the administrative boundaries of regional authorities and neighbouring administrations.

The two Learning cities, to which experience and best-practice will be transferred, are Monza (Italy) and Ústí nad Labem (Czech Republic). The strategy for the project is to ensure that the tools and measures developed have the widest application throughout Europe, tested via the Learning Cities' activities and interaction with the Lead City partners.

1.3.1 Leading City Innovation Areas

The four Leading cities in the ARCHIMEDES project are:

- Aalborg (Denmark);
- Brighton & Hove (UK);
- Donostia-San Sebastián (Spain); and
- Iasi (Romania).

Together the Lead Cities in ARCHIMEDES cover different geographic parts of Europe. They have the full support of the relevant political representatives for the project, and are well able to implement the innovative range of demonstration activities.

The Lead Cities are joined in their local projects by a small number of key partners that show a high level of commitment to the project objectives of energy-efficient urban transportation. In all cases the public transport company features as a partner in the proposed project.

2. Donostia – San Sebastian

The city of Donostia -San Sebastián overlooks the sea and, with a bit more than 180,000 inhabitants, keeps a human scale. Some people consider the balanced combination of small mountains, manor buildings, and sea as the setting for one of the most beautiful cities in the world. We have a tradition in favouring pedestrians, cyclists and public transport.

For about twenty years, the city has been enforcing a strong integrated policy in favour of pedestrians, bicycles and public transport. Considering walking and cycling as modes of transport has led to the building of a non-motorised transport network for promoting this type of mobility around the city.

Likewise, the city has extended its network of bus lanes. The city holds one of the higher bus -riding rates, with around 150 trips per person per year.

2.1 Objectives in CIVITAS

The CIVITAS project is a perfect opportunity to expand our Sustainabile Urban Transport Strategy. With the package of CIVITAS measures Donostia-San Sebstián wants to:

- Increase the number of public transport users
- Decrease the number of cars entering in the city centre
- Increase the use of the bicycle as a normal mode of transport
- Maintain the high modal share of walking
- Reduce the number of fatal accidents and accidents with heavy injuries
- Reduce the use of fossil fuels in public transport.

3. Background to the Deliverable

The present deliverable refers to Measure number 4, Biofuels and Clean Vehicles in Donostia – San Sebastian.

As part of this measure CTSS has been working on the Task 1.5: Public transport bio-fuels and clean vehicles.

Within this task biodiesel at high blends has been tested by the urban public transport company CTSS of Donostia – San Sebastian. At the same time, part of the bus fleet will be replaced by new EEV standard vehicles, lowering emission levels further. The use of biodiesel in the local buses has served as a local showcase backed up by promotional actions to convince other fleet operators and individual car users to switch fuels. Further future innovations in clean vehicles, like second generation bio-diesel, hydrogen and hybrid vehicles are being evaluated in a parallel, comparative study.

3.1 Summary Description of the Task

During the Archimedes project the San Sebastian public transport company (CTSS) will gradually introduce biodiesel in its fleet. Over time both the number of vehicles using

biodiesel and the blend levels will increase. This deliverable reports on the initial steps in this programme.

4. 50 Public buses using 20% blend of biodiesel in Donostia – San Sebastian

4.1 Description of the Work Done

The main project aim of this measure is to go well beyond the EU RTFO requirements using first generation bio-fuels in medium sized cities in an innovative manner, and lay the foundations for maximising the opportunities for the take-up of second generation bio-fuels and EEV vehicles.

The aim of this demonstration task in Donostia - San Sebastián is to reduce the emissions of air pollutants and greenhouse gases by operating bio-diesel buses at high blends at a significant scale in the CIVITAS corridor. The demonstration of the bus fleet and the additional promotional actions and incentives are expected to have an awareness raising effect on other local fleet operators and individual citizens.

Due to an initiation delay, some initial technical reasons and caution die to lack of experience with the combination of biodiesel and EEV engines, this deliverable has been delayed slightly.

The main outcomes of this deliverable have been:

- The biofuel filling-mixing station is operational since month 3
- 50 buses running on 20% biodiesel since month 3
- 15 new EEV buses introduced by month 6.

4.3 Summary of Activities Undertaken

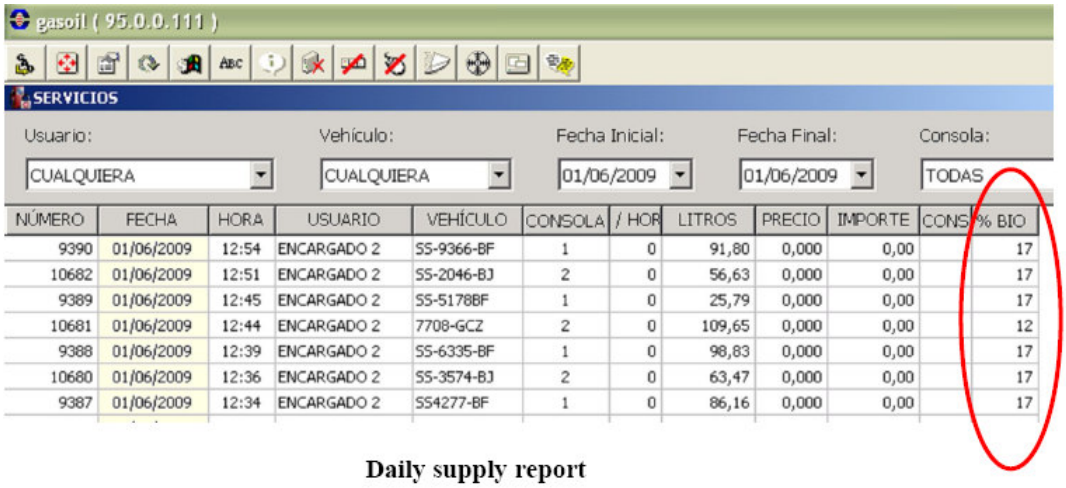
The biofuel filling-mixing station has been operational since month 3 (December 2008) with excellent results. Biodiesel blends have been introduced into the bus fleet according to the task time schedule (50 buses running on 20% biodiesel since month 3).

Samples of blends are tested periodically to control the accuracy.

The new, fuel mixing pumping station controls the blend supplied. The station is programmed with the blend needed for each individual bus within the fleet to allow for their different capabilities in terms of operating on biodiesel.

Control display

The system can provide reports with the information of the quantity of diesel - biodiesel in the daily fuel supply.



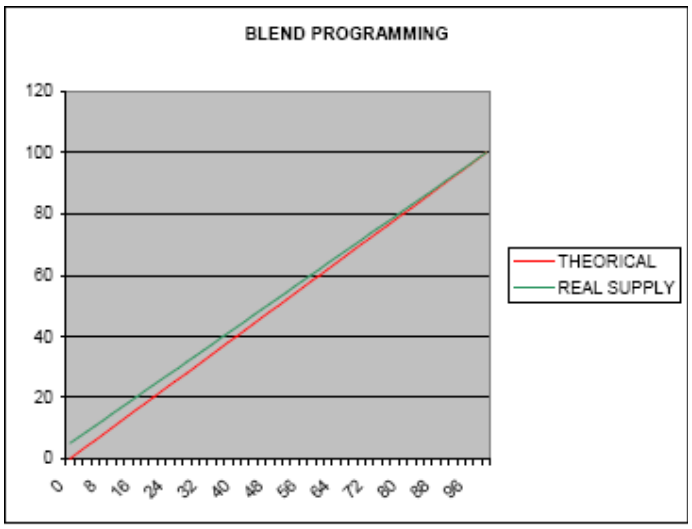
NÚMERO	FECHA	HORA	USUARIO	VEHÍCULO	CONSOLA	/ HOR	LITROS	PRECIO	IMPORTE	CONS	% BIO
9390	01/06/2009	12:54	ENCARGADO 2	SS-9366-BF	1	0	91,80	0,000	0,00		17
10682	01/06/2009	12:51	ENCARGADO 2	SS-2046-BJ	2	0	56,63	0,000	0,00		17
9389	01/06/2009	12:45	ENCARGADO 2	SS-5178BF	1	0	25,79	0,000	0,00		17
10681	01/06/2009	12:44	ENCARGADO 2	7708-GCZ	2	0	109,65	0,000	0,00		12
9388	01/06/2009	12:39	ENCARGADO 2	SS-6335-BF	1	0	98,83	0,000	0,00		17
10680	01/06/2009	12:36	ENCARGADO 2	SS-3574-BJ	2	0	63,47	0,000	0,00		17
9387	01/06/2009	12:34	ENCARGADO 2	SS4277-BF	1	0	86,16	0,000	0,00		17

Daily supply report

The picture is a sample of the daily report. Note that the percentage shown in this case is 17%. This means that the pumping machine mixes a 83% of DIESEL EN 590 with a 17% of B100. (EN14214).

In the first 3 months of operation CTSS has had to adjust the system to ensure it produces the exact blend of biodiesel required. CTSS has made several analyses of the output from the bio-fuel mixing station and has noticed that for low blends, the influence of the biodiesel contained in the base diesel is high (because up to 5% biodiesel can be present in DIESEL EN590 meeting EN14214). For example, analysis shows that programming a 16% blend in the software of the filling station results in about a 20% blend overall.

The graphic relation between the theoretical and real blend is shown in the next graph.



Theorical vs real supply

Several analyses made by an independent laboratory for B20, B50 and B100 blends confirmed the theoretical conclusions and showed the high accuracy of the fuel mixing pumping station.

Though the planning asked for 10 EEV buses introduced in month 6, CTSS has accelerated the measure implementation and 15 new EEV buses have been introduced since the beginning of the project.

4.4 Problems Identified

There has been some delay in milestone 1.5 (50 buses at B20) because of luck of experience with the combination of biodiesel and EEV engines.

As mentioned previously, due to the presence of up to 5% biodiesel in the composition of DIESEL EN590, the resulting blend delivered by the biodiesel filling mixing station was actually greater than planned. Hence, the programmed percentage had to be adjusted to provide the actual blend needed (B20).

4.5 Risks and Mitigating Activities

Because of the recent negative press on biodiesel there could be a risk of low user acceptance (both among PT users and among private fleet owners). In this respect the planned study on second-generation biodiesel is of importance. The monitoring and evaluation and dissemination of this measure need to take the overall impact into account.

In the case of the Biodiesel supplied to CTSS; the raw material used for the manufacturing process is Vegetable Used Fried Oil. This way CTSS removes itself from the “food vs. fuel” controversy. This information will be reinforced by the dissemination activities that will be carried out during the project; leaflets, promotion campaign, etc…

Although other bus companies in Europe already have experience with using Bio-diesel, there are still some technical risks because of the specific character of the demonstration in San Sebastián. These are:

- Little existing experience with testing bio-diesel in cities with many hilly areas
- Lack of technical information of using high blends of bio-diesel during a longer time period

Those risks are indeed the State of Art, the starting point where CTSS has begun working. During the project, the results of the implementation of higher blends of biodiesel on the bus fleet, will serve as a model and a reference on transportation. Also prior to Task 4.1 a lot of research has been carried out into the appliance of biodiesel on buses, working closely with Biodiesel Suppliers, Bus Manufacturers and other Bus Companies.

4.6 Dissemination Activities

Various press releases have been issued with information about the project and an information dossier has been placed on the CTSS website (www.dbus.es), which is contained in Annex A to this deliverable.

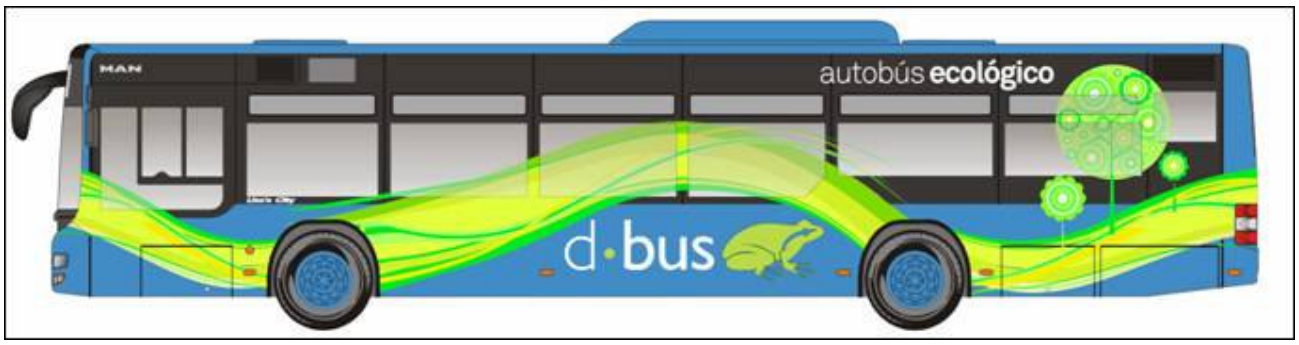
4.7 Future Plans

EEV buses will be tested with increasing blends of biodiesel according to the time schedule of Task 1.5:

- 50 buses running on a minimum blend of 20% biodiesel from month 5
- Additional 20 buses will run on 100% biodiesel from month 36 onwards
- During ARCHIMEDES in Donostia-San Sebastián more than 6,640,000 litres of fossil fuels will be substituted by biodiesel
- 10 EEV buses introduced in month 6
- 11 EEV buses introduced in month 18
- 7 EEV buses introduced in month 30
- 2 EEV buses introduced in month 40
- CTSS will test one hybrid bus in normal operation on the High Quality Public Transport Corridors. The bus will be purchased in month 24
- A promotion campaign to stimulate take-up of biodiesel will be organised. A promotion leaflet on clean buses will be prepared and printed to raise the awareness among PT passengers. The Promotion Campaign will be aimed towards the general public. The detail is still to be designed, but it's planned to promote the recycling of used oil and the use of biodiesel, exchanging a quantity of Used Fried Oil for a Free Discount Ticket in a local filling station (that supplies a biodiesel blend)

Annex A: DBUS INTRODUCES THE MOST ECOLOGICAL BUSES OF THE MARKET IN ITS FLEET

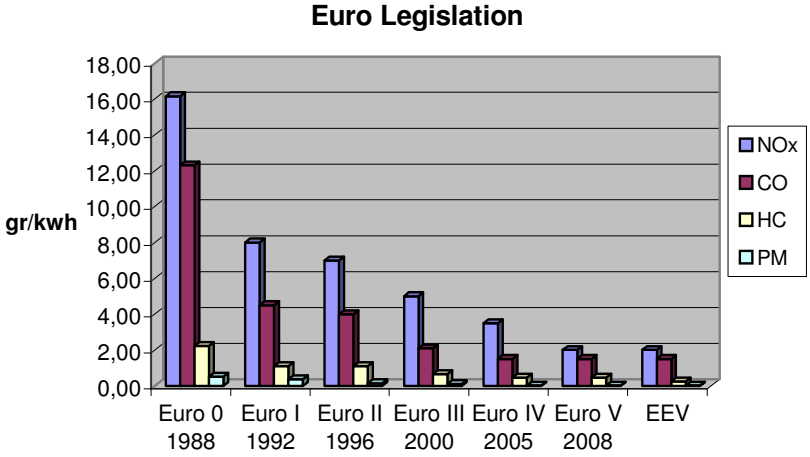
The new three green buses with the MAN brand EEV technology will begin to move through the streets of San Sebastian today.



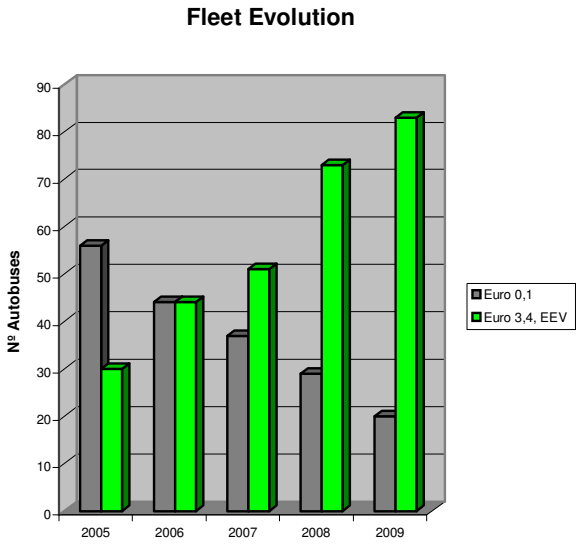
Another 20 buses like these will be introduced in the next months. They will replace the oldest and more contaminant EURO 1 models.

The EU is funding part of this investment totalling 4,600,000 €. These acquisitions are part of the European CIVITAS Archimedes project. Donostia-San Sebastian is participating in this project along with five other European cities over four years to develop measures aimed at sustainable mobility.

EEV technology (Enhanced Environmentally friendly Vehicles) is the stricter standard for exhaust emissions in internal combustion engines released to date. It's even stricter than next EuroV legislation and so far only achievable with CNG vehicles.



DBUS FLEET EVOLUTION:
The development of the fleet to less polluting buses has been steady in recent years

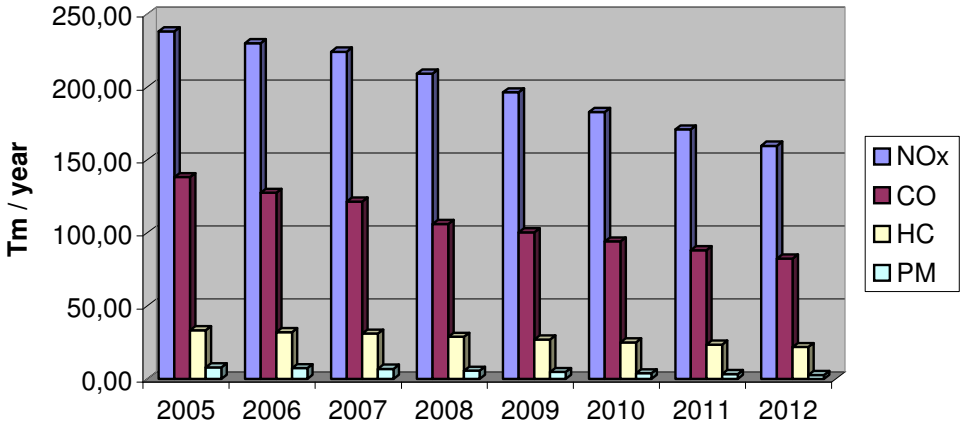


ECOLOGICAL BUSES TO IMPROVE THE ENVIRONMENT:
The Compañía del Tranvía de San Sebastián, committed to the environment, fulfils and anticipates to the European regulations on emissions

With the acquisition of new buses reductions in pollutant emissions of 66.7% CO, 77.27% of HC, NOx and 75% from 94.5% in PM are achieved.

DBUS is running a project to implement biodiesel from recycled vegetable oil in the fleet, which will avoid the emission of more than 920 million tonnes of CO_2 into the atmosphere during the period 2008-2012. This reduction will improve air quality, health of the inhabitants, the city's architecture and the environment.

CTSS annual local emissions



DATASHEET: MAN LION'S CITY EEV

Length	11.980 mm.
Width	2.500 mm.
Height	2.880 mm.
Interior height	2.318 mm.
Floor height	370 mm.
Access height	320 mm / 340 mm.
Permissible gross weight	18.000 Kg.
Engine	Diesel with turbocharger MAN D20LUH22 EEV 270 CV, 10518 cc, common rail injection system.
Gearbox	Automatic gearbox with integrated retarder ZF 6HP554, de 6 forward gear and 1 back year.
Doors	Double Ventura rear and central doors, sliding outwards with self-closing function to overcome the 3km / h.
Ramp	Automatic Massats SAM1001 with lock up and lock door (open) with ramp deployed.
Break system	Pneumatic brake system with electronic EBS regulation, which integrates the ABS anti-lock systems and ASR traction control.
Air conditioning	Athenian Thermking brand and climatization of the driver's seat.
External signage	Aesys brand with Led ultraluminous technology and wide horizontal viewing angle (120 degrees).