LIFE III

Environment




Best LIFE Environment Projects 2007-2008

EUROPEAN COMMISSION

environment

European Commission
Environment Directorate-General

LIFE ("The Financial Instrument for the Environment") is a programme launched by the European Commission and coordinated by the Environment Directorate-General (LIFE Unit - E.4).

The content of the publication "Best LIFE Environment projects 2007-2008" does not necessarily reflect the opinions of the institutions of the European Union.

Authors: Nora Schiessler (Technical expert), Tim Hudson, Ed Thorpe, Jon Eldridge, Justin Toland. Editorial department: Eamon O'Hara (Astrale GEIE-AEIDL). **Managing editor**: Philip Owen (European Commission, DG Environment, LIFE Unit). **LIFE Focus series coordination:** Simon Goss (DG Environment, LIFE Communications Coordinator), Evelyne Jussiant (DG Environment, Communications Coordinator). **Graphic design**: Daniel Renders, Anita Cortés. **Production**: Monique Braem. **The following people also worked on this issue:** Robbie Craig. **Acknowledgements**: Thanks to all LIFE project beneficiaries who contributed comments, photos and other useful material for this report. **Photos**: Cover: LIFE03 ENV/E/000501, LIFE03 ENV/E/000106, LIFE03 ENV/D/000043, LIFE04 ENV/IT/000583. Inside: From the respective LIFE projects unless otherwise specified - This publication is published in English and is only available online.

Europe Direct is a service to help you find answers to your questions about the European Union.
New freephone number: **00 800 6 7 8 9 10 11**

A great deal of additional information on the European Union is available on the internet.
It can be accessed through the Europa server *(http://europa.eu)*.

Luxembourg: Office for Official Publications of the European Communities, 2008

ISBN 978-92-79-09325-8
ISSN 1725-5619
DOI 10.2779/13906

Ecolabel Flower
Printed on recycled paper that has been awarded
the EU Ecolabel for graphic paper *(http://ec.europa.eu/ecolabel/)*

Foreword

Robbie Craig

This is the fourth year that we have selected a collection of good practice LIFE Environment 'Best of the Best' projects that are just that little bit better than the rest.

A group of 21 of the most outstanding LIFE Environment projects, completed in 2007, were reviewed by Member States to select the five that represented the very best practice – the Best of the Best.

This year, I had the honour of being joint coordinator for the selection process, sharing the task with Nicole Kerhof, who organised last year's awards. I coordinated the gathering of information on successful LIFE projects from National Authorities in the Member States.

A big thank you to my colleagues from the Member States who made evaluations for the selection. This year we used the same criteria as in previous years, identifying the best projects from an initial list prepared by the LIFE programme's external monitors. This list was prepared following technical evaluations by the monitoring team of all the projects that finished within the reference period. The top 21 projects were then distributed among Member States on a random basis and in a workable language for the national authority.

The results are very encouraging: it is interesting to see how the projects and their countries' of origin vary from year to year – an indication of the rigour of the selection process. Although only five projects could be included in the final Best of the Best selection, the margin between the top five and the rest was very close.

To announce the top five, Nicole Kerkhof from Senter Novem and the European Commission's LIFE Unit organised a very well attended award presentation on 4 June 2008 in Brussels, during Green Week. In fact, so many people wanted to attend this event that the Commission had to get a bigger room!

I would like to thank all of my fellow National Authorities and the LIFE team, for their valuable contributions to this year's event. Special thanks should go to Nicole, for organising the presentations and to Isabel Lico, for evaluating more projects than anyone else. My thanks also to Marta Alvarez Marquina as well as to Isabelle Michiels and Pamela Weir for their help in organising the award ceremony.

Having moved to a new job within DEFRA (the Department for Environment, Food and Rural Affairs), this year's event marked the end of my involvement with the LIFE programme. Each year I have been amazed by and grateful for the input of busy officials in the Member States for taking the time to read and review the projects I send them. Their contribution is invaluable and a testimony to the importance and value of this exercise. The higher profile that the best projects receive through these awards ensures that more people know about the LIFE programme and the projects it sponsors. I hope that these awards continue into the future and continue to grow in stature and range in the coming years.

Next year's organiser will be Herlinde Vanhoutte from Belgium, I wish her well.

Robbie Craig
LIFE Best of the Best coordinator
The United Kingdom

** Note: As of summer 2008, Robbie Craig is no longer the representative of the LIFE national authority for the UK.*

Contents

Introduction 3

Land-use development and planning.....4

✪ **ENVIFACILITATE:**
Environmental data sharing in Finland and the Baltic States 5

URBANBAT:
Managing waste from public transport.....7

EMAS@SCHOOL:
Environmental management at a Portuguese institute 9

EMAS LAB:
Supporting the first EMAS registration in a Portuguese municipality 10

LINFA: Preventative approach to combating pollution in Piedmont 11

Water management.....12

✪ **PROWATER:**
Waste water recycling in the textile wet industry 13

Optimizagua:
Saving water through more efficient irrigation.....16

CLONIC:
Innovative leachate treatment in Spain 18

Minimising the impact of economic activities 19

✪ **ART:**
Introducing ART into the chemical industry 20

RECARC:
Turning steel slag into high-value industrial material 23

JELLY:
Changing the wasteful ways of an old industry 24

INOCAST:
Greening the engine-block... 25

Waste management 26

✪ **DIONYSOS:**
New uses for wine wastes... 27

ELVES:
Pure metal from end-of-life vehicles 30

Reciplas:
Plastic waste saved from the rubbish dump.....31

Integrated Product Policy 32

✪ **RETOXMET:**
Integrated pollution control in Hungary.....33

PROCOOL:
An eco-friendly future for commercial fridges and freezers 36

SuperC:
Deep heat from renewable energy 37

BASTA:
Promoting healthier buildings 38

GAP:
Improving the environmental footprint of aircraft panel production 39

Greendrachma II:
Higher environmental standards in Halkidiki.....40

Selected LIFE publications 41

✪ "Best of the Best" projects

Introduction

EU Member States represented on the LIFE Committee and the European Commission's LIFE Unit have announced the Best LIFE Environment Projects 2007-2008. The results of the selection, as approved by the LIFE Committee members in the spring of 2008, are the 21 projects featured in this publication. These projects represent the most recent successful LIFE Environment projects terms of their contribution to immediate and long-term environmental, economic and social improvements; their degree of innovation and transferability; their relevance to policy; and their cost-effectiveness.

This, the fourth Best LIFE Environment Projects' exercise, is the product of an established identification and evaluation process based on a set of best practice criteria, developed by EU Member States in collaboration with the European Commission. The projects with 'beneficiaries', or project holders, from across the EU, cover all of LIFE Environment's main themes: land-use development and planning; water management; minimising the impact of economic activities; waste management, and Integrated Product Policy.

The objective of the exercise is to help improve the transmission of LIFE Environment project results by using a set of criteria to identify those projects with the highest potential for long-term environment improvement. From the 21 projects that concluded in 2007 and that have been selected as 'best' projects, five have been awarded the title, 'Best of the Best'.

How were the best projects selected?

Scoring of completed LIFE Environment projects was launched in the summer of 2004. The system was introduced by the Commission, following an initiative taken by Sweden and the Netherlands. After a meeting at The Hague in May 2004, a set of 'best practice' criteria was developed in collaboration with the Member States. These criteria included: projects' contribution to immediate and long-term environmental, economic and social improvements; their degree of innovation and transferability; their relevance to policy; and their cost-effectiveness. In view of the importance of these aspects to project success, project beneficiaries are also required to provide an After-LIFE Communication Plan and an Analysis of the long-term benefits of the project with their final report. This information forms an integral part of the evaluation process.

Projects were initially technically assessed by the LIFE Unit's external monitoring team, provided by the Astrale consortium. The monitors ranked all the projects that ended in December 2007, to produce a first list. The final selection was undertaken by the Member States under the coordination of Robbie Craig (from the UK Ministry DEFRA) and Nicole Kerkhof (from Senter Novem, the agency assisting the Dutch Ministry of Economics Affairs) using the agreed set of criteria to identify the awarded projects.

Some of the happy LIFE Environment Best Project award winners : Pekka Harju-Autti for ENVIFACILITATE, Cesar Romero for OPTIMIZAGUA, Gergely Czirbesz for RETOXMET, Ingrid Ciabatti for PROWATER, Tommy Norén for ART and Dimitris Papageorgiou for Greendrachma II (from left to right).

The 21 best LIFE Environment projects 2007-2008

Land-use development and planning	
✪ ENVIFACILITATE	Finland
URBANBAT	Spain
EMAS @ SCHOOL	Portugal
EMAS LAB	Portugal
L.IN.F.A	Italy
Water management	
✪ PROWATER	Italy
OPTIMIZAGUA	Spain
CLONIC	Spain
Minimising the impact of economic activities	
✪ ART	Sweden
Recarc	Germany
JELLY	Spain
INOCAST	Germany
Waste management	
✪ DIONYSOS	Greece
ELVES	Spain
RECIPLAS	Spain
Integrated Product Policy	
✪ RETOXMET	Hungary
PROCOOL	Austria
SuperC	Germany
Basta	Sweden
GAP	France
Green Drachma II	Greece

✪ "Best of the Best" projects

Land-use development and planning

The concept of sustainable, land-use planning and development is emphasised within the European Commission's Thematic Strategy on the Urban Environment, the Directive on Environment Impact Assessment (EIA) for projects and the Directive on Strategic Environmental Assessement (SEA), in addition to initiatives such as INSPIRE (Infrastructure for Spatial InfoRmation in Europe) and GMES (Global Monitoring for Environment and Security). All of these highlight the importance of an integrated approach to environmental management, land-use and transport planning at the local and regional level. Harmonisation is stressed as a cross-cutting theme in the EU measures, particularly achieving an acceptable balance between development and planning considerations such as water, air and soil quality, as well natural habitats, climate change and socio-economic factors, which require holistic approaches by all stakeholders in order to optimise benefits for future generations.

ENVIFACILITATE: Environmental data sharing in Finland and the Baltic States

The ENVIFACILITATE project developed tools for sharing environmental spatial information vital for environmental management. These interactive mapping tools provide users with access to the most recent data contents over the Internet and allow spatial and other data to be overlaid to give a comprehensive representation of a region.

Bad environmental management is often the result of insufficient information. While there are many producers of spatial data, access to this information is often restricted due to high price and poor accessibility. The LIFE Environment project tackled this common problem in Europe by creating mechanisms to facilitate the availability of such data and by promoting inter-institutional networking.

The beneficiary, the geography department of the University of Turku, developed tools for information exchange between organisations – it worked closely with the project's partners in Estonia (Estonian Environment Information Centre) and Latvia (University of Latvia) as well as the Regional Council of Southwest Finland, the Finnish Environment Institute and the Finnish Meteorological Institute. "The international context really benefitted this project," says Risto Kalliola, head of department and project leader. "We could share experiences with these countries."

The three-year project, which began in 2004, helped implement the EU's INSPIRE Directive that obliges Member States to develop mechanisms for the management of environmental information and data sets. Its collaborative approach demonstrated how environmental information can be shared and distributed using web-based services and Geographical Information Systems. "Our goal was not just to demonstrate a set of services, but to show a model of how information services can be used," Kalliola says.

The project created a Spatial Data Lending Facility that delivers spatial data sets to interested users from 20 different sources. In Finland, more than 1 000 users have already registered, allowing them to download data free of charge for testing and research purposes. The University is also archiving this data (in its UTU Spatial Data Archive). Though this process is automatic, "a national institute might be the best place to maintain the service," says Tuuli Toivonen, project manager.

The system also allows the IP addresses of users to be recorded. Having control over the operation was "necessary to gain the confidence of the data producers", explains Toivonen. Intellectual property issues have been relevant in this area in the past, but the project leaders found that there was a "willingness" among providers to collaborate. It enabled them to "market" their data free of charge with a view to reaching a wider group of users in the long term.

Regional services

At a regional level in Finland, the project supported the networking of spatial information actors creating an Internet site *Lounaispaikka*, managed by the GI centre of Southwest Finland. One of the chief advantages of the system is that it is interactive,

BEST OF THE BEST 2007-2008

The University of Turku's LIFE project was an important step towards achieiving accessible and harmonised spatial data in Finland.

Jon Eldridge

Risto Kalliola and Tuuli Toivonen from the University of Turku.

thus allowing the general public to engage in regional planning. The Lounaispaikka Map Service includes general maps, thematic maps, topical maps, environmental research results, community planning and other map services, and it is free of charge to the user. "Because of this project, the services are easier to find, because they are all in one place," says Sanna Mujunen, coordinator for GI cooperation. For example, a direct link to the databases of Bird Life Finland enables any user to see the actual bird observations in the area.

While the service has proved to be very successful – the site attracts around 500 users per month – Lasse Nurmi, planner at the regional council, says that "technological advances are rapid in this area and the system already needs updating". The team is considering employing an open-source solution, but no decision has been made yet. Says Mujunen: "Everyone wants to take part in making of the maps, and the system isn't that flexible."

The Southwest region is one of 19 regions in Finland. Though the project has generated a lot of interest among the other regions – delegates have come to visit and discuss ways in which similar solutions can be employed in other parts of the country – they don't benefit from access to as many potential data sources. However, the Southwest region is cooperating with neighbouring Satakunta region, which is likely to join the network.

The regional council says that the LIFE funding enabled it to employ a computer programmer full-time for a year. As well as the map service, a Metadata Index was also created and has been developed further after the project's end. This service helps the user to find and facilitate GI data from various sources. "The project has been very valuable. We know what works and what we can do better," says Mujunen. "At the moment we have the best services in Finland."

National and international initiatives

ENVIFACILITATE has contributed to the development of several national and international environmental information systems, including: a Finnish marine and coastal map and database query service (Meriluonto); Estonian environmental information facilities on protected areas, registered species and habitats (EELIS), legislation and water bodies, and a viewer presenting coastal data from three countries. The ICZM viewer presents coastal data from the coastal areas of three countries, and it aims to support an international orientation for Integrated Coastal Zone Management in the Baltic Sea area.

At a national level, the project directly contributed to the Finnish National Strategy of Spatial Information and was an active player in the implementation of the National Spatial Data Infrastructure. It also supported the general organisation of specialists in Estonia and Latvia with the aim of establishing national spatial data strategies and infrastructures in these countries.

The project engaged internationally through participation in specialist organisations such as GBIF, GMES and GEOSS. It is very likely that the project will influence the spatial data infrastructure in other European countries, says Risto Kalliola of the University of Turku.

The tools for information sharing and delivery are being transferred between the three participating countries and the project team has already secured funding for their future use. To increase the transferability of the results, the practical solutions and lessons learned in spatial environmental data collecting, archiving and use were carefully documented and an in-depth analysis of the project experiences was conducted. A comprehensive document, *Requirements and Guidelines for Compatible Environmental Information Facilities*, was drawn up and presented at several seminars. The project leaders also contributed articles to specialist journals.

The ENVIFACILITATE project was a significant step on the path towards harmonised and accessible spatial data in Finland. Kalliola says that the LIFE Environment funding was "timely" and "convenient" for employing extra staff – around 30 people were employed in the three countries on short-term contracts – needed to fulfil the aims of the project. "National funds could be used to a certain degree, but with the EU funds we could take it further," he says.

Project Number:
LIFE04 ENV/FI/000304

Title: Integration of spatial environmental information across different themes, scales, resolutions and uses: added value of facilitating mechanisms

Beneficiary:
Laboratory of Computer Cartography, University of Turku

Total Budget: €1 118 000

LIFE Contribution: €550 000

Period: Jan-2004 to Dec-2006

Website: http://envifacilitate.utu.fi

Contact: Risto Kalliola

Email: risto.kalliola@utu.fi

URBANBAT: Managing waste from public transport

Despite its obvious environmental benefits, public transport is not without its environmental impacts. Specifically, cleaning and maintaining an urban transport fleet generates liquid wastes with a high chemical oxygen demand (COD) and other environmental hazards. The LIFE Environment URBANBAT project defined a waste management model for the majority of the liquid wastes generated in the maintenance and operation of Valencia's public transport fleet, leading to a reduction in water consumption and pollution levels.

Empresa Municipal Transportes de Valencia (EMT) - Valencia's public transit body - operates an extensive fleet of buses (480 vehicles which cover 22 million kilometers annually) that it also maintains at its garages in the city of Valencia. The daily washing and other maintenance activities generate a large amount of effluent that can be environmentally damaging – for instance, flat-battery acids contain 15-20% sulphuric acid and dissolved lead in a colloidal state, which is accumulated during the running down process.

The LIFE Environment URBANBAT project set out to define an integrated management model for six categories of liquid waste produced by EMT's buses: water from washing bodywork; water from washing engines and motors; used battery acid and water from washing batteries and undercarriages; used antifreeze fluids; water from cleaning the cooling circuit and radiators; and used brake fluid.

Technical facilities at the city of Valencia's Municipal Transport Company are used for repair, maintenance and cleaning of the city's extensive bus fleet

Putting the BAT into URBANBAT

The management strategy for these wastes was to: reduce environmental hazards; increase the useful life of the products; and recycle the water used in cleaning and maintaining the bus fleet at the point of generation (i.e. in the EMT garages).

The integrated management model was based on best available technologies (BATs) such as ultrafiltration, microfiltration, vacuum evaporation and electrolysis, that, while well-known and frequently applied in other areas, were unfamiliar in the transport sector.

Managing waste water from cooling circuit cleaning and bodywork washing

Results mostly positive

URBANBAT succeeded in defining a waste management model for the majority of liquid wastes generated by EMT's operations. The implementation of air flotation and tangential ultrafiltration has enabled the reuse of 98% of the water used for washing bodywork (some 13 000 m^3/yr). The same technologies (together with vacuum evaporation for the treatment of residues from microfiltration) have also enabled a reuse rate of 96% (or 221 m^3/yr) of the waters used for washing batteries and underbodies. A recycling rate of 96% (220 m^3/yr) was achieved for the water used for washing motors and components of the cooling circuit. Furthermore, the introduction of decantation and belt filtration technology enabled EMT to recover 100% of its used cooling fluids at the end of their five-year service lifetime.

The treatment of acid from exhausted batteries allowed 50% of residual lead to be removed, while the catalytic anodisation of radiator rinse waters enabled a 96% reduction in COD. However, these waters were found to be non-recyclable. The reuse of brake fluids was also found to be impractical because of the formation of azeotropes (glycol ether and water).

Transportable techniques

Most of the methods used by the LIFE URBANBAT project can be extended to other public transit systems in major European cities. However, this will only be possible where public administrations co-finance the investment to introduce such techniques.

Project Number:
LIFE03 ENV/E/000160

Title: Integral waste management model for urban transport infrastructure

Beneficiary: Empresa Municipal Transportes de Valencia

Total Budget: €1 721 000

LIFE Contribution:
€833 000 (maximum)

Period: Dec-2003 to Nov-2006

Website: www.urbanbat.com

Contact: Jesús Herrero Gamón

Email: emt@emtvalencia.es

EMAS@SCHOOL: Environmental management at a Portuguese institute

The EMAS@SCHOOL project implemented EMAS II approaches at Escola Superior Agrária de Coimbra (ESAC) in Portugal. Successful outputs from the LIFE project included improvements in positive environmental contributions and new integrated procedures to sustain resource efficiency gains.

The EMAS II (the revised Eco-Management and Audit Scheme) is a management tool that allows companies and other organisations to evaluate, report and improve their environmental performance. It is a cost-effective tool that has been shown to be very successful in reducing environmental impacts.

ESAC is a multi-faceted Portuguese higher education establishment located within Coimbra's urban area in central Portugal. The university site covers 140ha and includes animal breeding facilities, food industries, farming land, forest area and school complexes hosting research and teaching laboratories.

Implementation of EMAS II at the university began with a comprehensive consultation of different stakeholders (workers, students and citizens) in order to raise awareness about the LIFE project and build support for the environmental improvements. Lessons learnt during the stakeholder involvement went on to inform the development of an EMAS registration toolkit. The toolkit targeted SMEs and was based on other experiences gained during the LIFE project. Valuable practical knowledge was obtained regarding the introduction of environmental management systems in institutions with more than one productive activity and the project processes became demonstration devices for the implementation of EMAS II in non-industrial SMEs.

Through the scheme, the project achieved a significant reduction in the use of raw materials and energy consumption by the different departments, together with a better performance in waste management and treatment. The project developed an innovative treatment using macrophytes and a system for composting manure as well as introducing the re-use of waste material.

EMAS registration is under way and it is expected that its implementation will continue in the future with the appointment of a dedicated environmental manager. Two of the project's partners are taking the first steps to register themselves under EMAS. Dissemination of results and deliverables is ongoing. The project produced two manuals: One, on the implementation of Environmental Management Systems in farms, was published by the Portuguese Society for Innovation and provided examples about the procedures for EMAS II implementation in the Practical Manual of Environmental Management. The After LIFE communication plan includes a commitment among academics and professionals to submit papers to international scientific and technical journals for peer review. The school will also offer degree and master courses on environmental engineering.

Results

Additional environmental benefits include the following:

- Reduction of energy consumption (11% less in 2005 than in 2004);
- Reduction of water costs (50% reduction for 2005 compared with 2004);
- Rational use of irrigation water (a reduction of 4000 m^3/ha/yr needed to maintain the pastures), reducing also the energy needed to make the pumps work;
- Replacement of inorganic fertilisers by composting;
- Use of pest control methodologies reducing the application of pesticides, which improve the quality of surface and groundwater; and
- Use of ultra, nanofiltration and reverse osmosis technology reducing the concentration of protein in the wastewater.

More than 100 trees planted by the project to improve water quality were "godfathered" by nearby primary school classes.

The project's contribution to sustainable development was recognised with the granting of a National Energy Global Award in 2006.

Project Number:
LIFE03 ENV/P/000501

Title: Environmental Management and Audit Scheme implementation at a complex school

Beneficiary: Escola Superior Agrária de Coimbra

Total Budget: €1 462 000

LIFE Contribution:
€692 000 (maximum)

Period: Oct-2003 to Sep-2006

Website:
www.esac.pt/emas%40school/

Contact: António Dinis Ferreira

Email: aferreira@esac.pt

EMAS LAB: Supporting the first EMAS registration in a Portuguese municipality

The EMAS LAB LIFE project selected EMAS indicators and developed corresponding benchmarks, tools and methodologies for the implementation of EMAS in Almada, Portugal and for use in local authorities throughout the country.

While EU-funded projects have introduced EMAS (Eco-Management and Audit Scheme) to several towns, the widespread implementation of EMAS in Portugal has been relatively limited in both the private and public sectors. At the time of project's start, only four private sector bodies had been registered, and none of the 308 local governments in Portugal had implemented EMAS.

Moreover, the incentives and support necessary for EMAS implementation in Portugal has also been very limited, with instruments that facilitate the process being virtually absent.

The LIFE co-funded EMAS LAB project devised environmental benchmarks that are realistic and appropriate for local authorities for each of the 27 EMAS indicators selected. These indicators were grouped into seven different environmental areas: water use, energy use and greenhouse gas emissions, waste management, procurement of goods and services, pollution prevention and control, mobility and transport, and quality of the natural and developed environment.

Demonstrating environmental benefits

The project focused on the procurement and installation of goods and equipment for resource-savings and waste reduction, aiming to reduce costs together with better environmental performance. The introduction of LED technology in traffic lights offered a tenfold reduction in energy consumption and a life expectancy of an additional 10 years in comparison with traditional traffic lights. Conventional light bulbs were replaced with energy-saving ones at different Almada City Council sites; Flux systems were tested, as well as photovoltaic systems. This proved possible a 25% reduction in energy consumption and maintenance savings of up to 50%.

Another key aspect of the project was the conversion of propane gas to natural gas at the municipal sports facility, a switch that represents a 15% reduction in CO_2 emissions. A condenser battery was installed at the municipal sports facility. Condenser batteries are a more attractive replacement for conventional lead-acid batteries since in Almada they deliver an average saving of around €6 500 a year.

Finally, the project developed and distributed the "Paper Eater", a humorously designed paper recycling bin that encouraged the recycling of 36 tonnes of used paper and cardboard in the 2005-2006 period, some 12 tonnes more than in 2004. The municipality also pushed for the procurement of goods and services from environmentally accredited suppliers (ISO 14001 or EMAS-registered). Six low emission hybrid vehicles were procured, representing a reduction of 8.6 tonnes of CO_2 a year (60%) on that produced by the fleet that they replaced.

Throughout the project, municipal employees received training on the stages and requirements of the EMAS system. EMAS registration remains ongoing and progress to date in Almada has led to significant improvements in performance, particularly via savings in areas such as recycling, solid-waste production, water and energy consumption, green purchasing, greenhouse gas emissions and use of environmentally friendly transport, all the while providing greater value for money.

EMAS at the Almada City Council.

Project Number:
LIFE03 ENV/P/000504

Title: Eco-Management Audit Scheme for Local Authorities Environmental Benchmarking

Beneficiary: Câmara Municipal de Almada

Total Budget: €958 000

LIFE Contribution:
€450 000 (maximum)

Period: Nov-2003 to Oct-2006

Website:
www.m-almada.pt/emas-lab

Contact: Catarina Freitas

Email: cfreitas@cma.m-almada.pt

LINFA: Preventative approach to combating pollution in Piedmont

This innovative LIFE project introduced a new preventative approach to environmental problems related to industrial activities in the Fraschetta area of the Alessandria Municipality, Piedmont, Italy.

Since the beginning of the last century, complex and diversified industrial activities have been located in Fraschetta, using the area for waste landfill. As a consequence, Fraschetta, which has a population of around 15 000, suffers from polluting emissions, water pollution, noise and heavy transport use. Prior to the LIFE project, steps to limit pollution were taken only when regulatory limits had been exceeded – thus the approach to environmental management was one of damage limitation rather than prevention.

The LIFE Interventions for Fraschetta Area (L.IN.FA) project focussed on air quality, noise reduction, an innovative air and noise monitoring system, and the development of an up-to-date real-time database. This tool simulates pollution situations and the potential effects of planning decisions and territorial management choices. It enables the municipal and provincial administrations to take informed decisions and plan future actions in the field of environment and health. Its development involved all the stakeholders in environmental pollution prevention and correction (region, province, municipality, health organisations, university, etc.).

Modelling environmental scenarios

In order to develop the monitoring tool, data was collected using techniques such as biomonitoring, remote sensing systems, and satellite photographs. Modelling (e.g. three dimensional models to study the dispersing of air pollution) enabled a simulation of the potential effects of planning decisions and territorial management choices. On this basis, systems to support decisions for the most effective environmental scenario were defined. These included, for example, the creation of strategic acoustic maps and zoning as well as recovery plans, and the definition of criteria and areas to locate local territorial boards. These actions were carried out using advanced scientific technologies and are highly transferable to similar towns in the EU.

By preventing air and noise pollution, environmental costs can be reduced or avoided. The positive socioeconomic effects of improved air quality and noise reduction include:

- Prevention of environmental and health problems among the local population;
- Possibility of implementing environmental policies with a highly scientific tool;
- General improvement in the quality of life;
- Reduction of absence from work due to illness;
- Reduction of law suits linked to environmental problems in the Fraschetta area; and
- Greater awareness among social actors of environmental problems.

The beneficiary, the Comune di Alessandria in Piedmont Region, and its partners established an institutional body to draw up strategies and carry out actions with regard to environmental improvements and human health in the Fraschetta area. A partnership cooperation agreement has since been signed to continue and expand upon the project's activities in the future. Furthermore, the Municipality of Alessandria and the Province of Alessandria have formally adopted (in council resolutions) the inclusion of decisional criteria in local planning tools and the continuation of the project's activities.

LINFA tackled air and noise pollution.

Dissemination activities, including the opening of the L.IN.F.A. Environmental Desk, were very effective. The desk provides year-round environmental documentation and information on projects in the local area (including L.IN.F.A.) as well as being a meeting place for environmental associations. The production of brochures, posters, and conferences also helped to raise awareness of the project.

Project Number:
LIFE04 ENV/IT/000442

Title: LIFE-Environment Interventions for Fraschetta Area: innovative measures for the improvement of air quality and the reduction of noise in Fraschetta area

Beneficiary: Comune di Alessandria

Total Budget: €1 041 000

LIFE Contribution:
€484 000

Period: Dec-2003 to May-2006

Website: www.progettolinfa.com

Contact: Gianni Mogni

Email:
ecologia@comune.alessandria.it

Water management

Europe's citizens rank the availability of water as a key quality of life indicator and this is one of the reasons why the Commission has prioritised water protection through its work with the Water Framework Directive (WFD) 2000, which provides a range of targets for Member States to achieve by 2015. Huge levels of pubic investment have been allocated across the EU 27 to address WFD objectives regarding clean and safe water supplies. These include innovative measures to ensure efficient, sustainable approaches to the use of European water sources.

PROWATER: Waste water recycling in the textile wet industry

This Italian LIFE project demonstrated at pre-industrial scale the technical and economic viability of an innovative recycling system for textile effluents that combines chemical pre-treatment, cross-flow ultrafiltration and ozonation processes to successfully clean waste water.

Working at the Prato-based MA-VI dyeing mill.

Since the 13th Century Prato has been well known for its textile industry. The Tuscan city is not only home to 180 000 inhabitants but also to several thousand companies dealing with textiles. However, while in 2000 there were still about 8 000 textile companies, in 2008 only around 3 800 are left: International low-wage competition and increasing energy costs are creating high pressures and local textile businesses are keen to identify possibilities to enhance cost effectiveness and thereby their competiveness on the European and international market.

A key "textile" issue is the huge amount of water used, particularly by the textile wet processing industry, which represents the majority of the sector located in Prato. "Wet treatment" processes use large volumes of water which are normally discharged as polluted waste water. To produce 1 kg of finished product, the textile wet industry needs 200-500 litres of fresh water. With treatment systems that allow partial or total reuse of their own effluents, textile industries could do much to ease the demands on water supplies, for their own and the environment's benefit.

"The textile industry in Prato is very sensitive to the water issue" stresses Ivo Vignali, who has managed his family's dyeing mill MA-VI for more than 40 years, and which supports 140 employees. "It was therefore the right moment for us to participate in the LIFE project of Tecnotessile and test new recycling approaches."

'Next Technology Tecnotessile', a Prato-based research centre and consultancy jointly founded in 1972 by the Ministry of University and Research and industries working in the textile and textile machineries sector, had always prioritised water quality issues. Following an extensive period of studies, the Tecnotessile team applied in 2003 for LIFE funding to demonstrate a new technology that would improve water reuse systems in the wet textile processing sector, thereby reducing fresh water consumption and pollutant discharge. Before the project's start, wastewater reuse systems had not been widely implemented on a large scale by individual local textile companies since no efficient, reliable, cost-effective nor "easy to operate" individual treatment system was readily accessible.

"LIFE has been a very good instrument to enable demonstrating our research results," states Federico Tognotti, the technical project manager from Tecnotessile. "Big projects such as PROWATER are difficult to put in place without such support. Without the EC co-funding the implementation of the pilot plants would not have been possible."

BEST OF THE BEST 2007-2008

The process

The PROWATER concept is based on an effluent recycling system composed of a sequence of treatments that are particularly suitable for removing certain pollutants or classes of

MA-Vi happily hosted one of the large-scale PROWATER prototypes.

undesirable compounds. The treatment processes involved are:

- **Homogenisation of the wastewaters** to be treated with the help of a balance tank;
- **Clarification (coagulation + lamellar** sedimentation or coagulation + flotation) and filtration with sand allowing a solid-liquid separation to reduce the organic pollution load;
- **Cross-flow filtration with flat membranes** for the removal of suspended solids and turbidity; and
- **Advanced chemical oxidation with** ozone, allowing the oxidation of the residual dyestuffs and a disinfection of the water.

"The main innovative part of our project was the combination of cross-flow and ozonation. The tangential membrane filtration reduces fouling phenomena and is able to remove oil emulsions, colloidal silica, proteins, bacterial and viral hazards, while ozonation completes the removal of the coloured substances and surfactants" explains Ingrid Ciabatti, member of the core LIFE team at Tecnotessile. "On this basis, and following case-by-case studies, we were able to show that the PROWATER concept can be effectively adapted to different textile wet industries."

The proposed purification systems were tested with large-scale prototypes - having a high automation degree and in-let flow rates ranging from 5 to 10m³/h – installed in-situ by four end-users with different types of textile wet processes: MA-VI (dyeing mill), LIT (washing mill), Vignalli (finishing mill) and Fin-Mode (dyeing and finishing mill).

In strong collaboration with plant suppliers and technology providers, the PROWATER process parameters were optimised for each section of the prototypes. This was important to meet the requirements of the processes but also for the companies' textile technicians, who require high standards in terms of water quality.

Clarification, ultrafiltration and ozonation were used in series for three of the companies (FIN, MA-VI, VIG), and clarification, ozonation and ultrafiltration for the fourth one (LIT). Further variations included: the use of an ultrafiltration membrane working under pressure instead of under vacuum at the FIN site; and the use of an electronic control system by MA-VI, assessing the quality of wastewater and enabling the optimisation of the treatment process by selecting effluents with low pollution load.

The project team encountered and overcame a number of problems during the experimental research studies. These included: the adaptation of coagulant agent doses (that were slightly higher than on lab-scale to guarantee high product quality), the need to limit fouling of the ultra-filtration membranes by ensuring their regeneration by the use of washing solutions and the installation of a large equalisation tank to reduce the flotation of flocks in the lamellar settler used at the VIG project site.

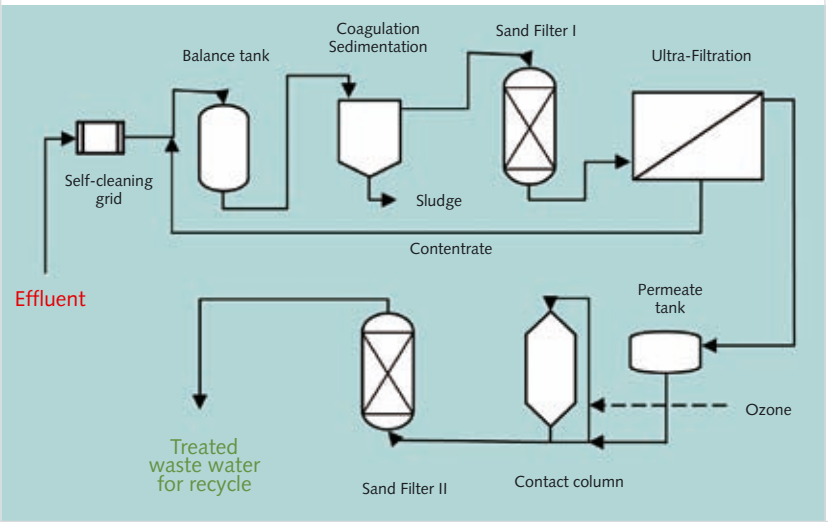
Black and white

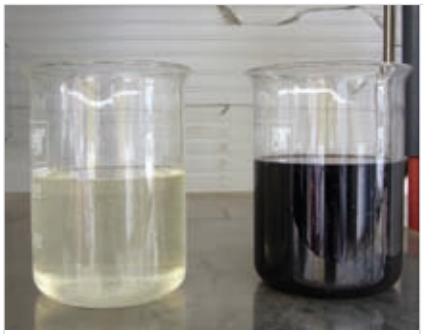
A large number of repeat tests were carried out at each of the four prototypes. These demonstrated that the PROWATER technology consistently achieved highly satisfactory results,

The project used a large balance tank.

particularly for high pollution removal efficiencies: Sixty-two percent of total surfactants were removed by the treatment process against a target of 50%. Ninety-eight percent of colour was removed which was significantly higher than the 85% target, and this "even impressed the textile workers" according to Federico Tognotti. All the other results were perfectly in line with the original targets: 60% removal of chemical oxygen demand (COD); 92% turbidity removal; and 95% removal of total suspended solids (TSS). These are important achievements, since these pollutants seriously compromise water reuse.

The PROWATER treatment process.





White and black: Treated and untreated effluents.

Other tests to assess the suitability of waste water recycling demonstrated effectively that the quality of the purified wastewater allows for partial reuse within different textile wet processes, including fabrics' softening and some washing processes. The LIFE project showed that by mixing this recycled liquid with purified effluents, fresh water consumption could be reduced by 40% on an industrial scale. In some finishing and washing processes this increased to 100%. Assuming a partial reuse of 40% by 500 textile industries with a total effluent production of 1 000 m^3/day, the PROWATER experts estimate that their innovative treatment system could result in a saving of 44 million/m^3 of fresh water a year.

Economic feasibility

The project team further demonstrated that the new purification and reuse system is cost-effective and competitive with commercial purification processes and possible alternative solutions. Operating costs of the system for each end-user at the four project prototypes are judged to range between 0.78 and 2.37€/m^3, depending on the different optimisations needed at each site (thanks to the electronic effluent control, MA-VI could reduce its costs to 0.78 €/m^3). While the operating costs of a system using a chemical-physical treatment and a biological process for purification of textile effluents are about 2 €/m^3, that system allows only limited wastewater reuse.

A plant implementing the PROWATER technologies can recover the investment costs after roughly five years. This compares well to nine years for a plant working on an aerobic biological process followed by filtration on traditional membranes.

Despite these findings, and although 78 Italian firms as well as several companies from Spain, France and Turkey have shown clear interest in the project, the LIFE team had hoped for a much stronger, concrete interest from textile or other companies in the implementation of their approach on industrial scale.

As pointed out by Alessio Bitozzi from the LIFE partner Unione Industriale Pratese, possible reasons for this reluctance to invest might include the general uncertainty that the textile industries suffer since 2001 due to the situation of the global economy." The sticking point for the textile companies is to consider wastewater treatment as part of the production unit that needs to be perfectly integrated within the process. Then, they will see that they can profit from the considerable cost savings of the PROWATER approach," stresses Tognotti.

Life after LIFE

"The PROWATER concept proved to be technically successful" concludes Ingrid Ciabatti, "but it is important to verify and optimise the approach on pilot-scale since there is no unique solution."

"The quantifiable project results are really impressive. Although difficult, it was thanks to the great technical experience of the whole project team that the implementation of four different prototypes in four different industrial cycles could be brought to a successful conclusion," adds Maria Paola Breghi, from ENEA[1] – responsible for the project's dissemination activities.

On-going efforts continue with LIT, the industrial laundry company, currently considering building a PROWATER plant on industrial scale. Partial reuse of cleaned wastewater and the resultant independence from fresh and waste water prices fluctuations is a real option for LIT, which is located in a relatively isolated area.

MA-VI aims to continue working with the pilot-plant for another year, in order to carry out further tests with the electronic system for effluent selection and to make the PROWATER approach even more cost effective. After that test-run, Mr Vignali is considering moving to the industrial-scale phase. A handbook produced by the project team will further help to guide industries interested in implementing the developed technology at full industrial scale.

Project Number:
LIFE04 ENV/IT/000583

Title: Sustainable water management in the textile wet industry through an innovative treatment process for wastewater re-use

Beneficiary: Tecnotessile – Società Nazionale di Ricerca Tecnologica r.l.

Total Budget: €2 195 000

LIFE Contribution: €1 059 000

Period: Oct-2004 to Feb-2007

Website: www.tecnotex.it/prowater

Contact: Solitario Nesti

Email: watertech@tecnotex.it

1 Italian National Agency for Energy, Environment and new Technologies

Optimizagua: Saving water through more efficient irrigation

Water is an increasingly precious natural resource. Yet all too often land is irrigated on guesswork or routine, resulting in unnecessary wastage. This Spanish LIFE project used latest technologies to develop an automated system capable of controlling exactly how much and when to water land to ensure maximum benefit to plants and crops and minimum water consumption.

Water scarcity is an increasingly urgent issue across the world and the EU is no exception. Water stressed countries in the South are particularly affected.

Watering agricultural, leisure and residential land is the biggest cause of water consumption in Europe. Agriculture is a particularly water-intensive sector, using around 70% of all European water supplies. Watering therefore represents a key target for efforts to reduce water usage.

Cutting-edge technologies were combined to develop a simple and cost-effective method for minimising water use.

Improving the efficiency of Irrigation

The project beneficiary, the San Valero Foundation in Zaragoza realised that the problem was not just that crops, grass and other land uses require lots of water. A major issue was that those in charge of watering did not have accurate and reliable information on how much water their land needed or how to ensure that optimum amount was achieved.

This meant that watering was taking place in wasteful and inefficient ways - for example, when there was already sufficient water in the ground, during rainfall or when sun or wind conditions meant that the water would not reach its intended destination.

Emerging knowledge of plant physiology was also providing more accurate information than ever on the true water needs of different plants. This science even highlighted that underwatering plants can sometimes be beneficial to the final cultivated product.

The Foundation was therefore convinced that by establishing a detailed system to tell users when and how much to water their land, significant water savings could be achieved with no adverse effects on the plants or crops being grown.

An integrated, automated system

The Spanish project combined several leading-edge technologies to create the prototype Optimizagua system. This was tested in a variety of situations, including corn and wheat fields in Soria, cornfields in Monte Julia, two public parks in Zaragoza and the private gardens of a residential estate in Logroño.

Impressive water savings were achieved in different climate conditions.

Humidity sensors were placed at different depths in the soil on the demonstration sites. Readings from these gave, often for the first time, extremely accurate information on the water contained within the soil. This was used to determine whether watering was needed or not and could even identify invisible underground leaks.

Climatic sensors were installed on each site to provide information on when the watering should take place. It prevented watering during windy, rainy or very hot conditions when much water would fail to penetrate the soil of the target area. Watering at the most effective times of day ensured that a little water had maximum impact on the moisture of the soil.

The automated system works by transmitting the readings provided by the various sensors to a central ‘concentrator station’ on each site. This

Tests were also preformed at public parks and private gardens.

collects the data and sends it to a 'management and control station' via GPRS. Once collated on a server, the data is then used to trigger automatic watering at the appropriate time and in the appropriate quantity. The system is controlled by software that is programmed by the client so that watering takes place within set parameters according to the land use.

The system can also be programmed to trigger a variety of alarms requiring action by the user, sent either via the Internet or mobile phone. Whilst the system is highly automated, it does not replace the need for an overseeing role. In this sense, it does not constitute a threat to jobs, but allows workers to get the optimum benefit from their watering and dedicate more time to other associated activities.

Impressive water saving

The project demonstrated water savings of over 60% in public parks, over 50% for private lawns and around 40% for wheat and corn fields. Combining all the demonstration sites, the Optimizagua system used 54% less water than the control zones. During the project, a total saving of over 22 000m^2 of water was achieved on a total area of only 4 ha.

The water savings are even more impressive when the use of rainwater is taken into account. The project developed a complementary system to ensure that rainwater was used wherever possible. At an agricultural site in Monte Julia, rainwater was collected from the roofs of nearby buildings and from the run-off from nearby slopes into a 10 000 litre underground water storage tank specifically installed by the project. An automated watering control system was installed to ensure that water was sourced from these underground stores before making use of the mains water supply.

Despite the exceptionally dry conditions experienced during the project implementation, the use of mains supply water was reduced by nearly 50% on both the cornfields of Monte Julia and the wheat fields of Soria. The importance of rainwater to reducing demand on the mains water supply is likely to be even greater during years - or in areas - with more rain.

Life beyond LIFE

The success of this demonstration project has already led to its extended implementation on new sites. Lola Campos, Zaragoza's City Councillor for the environment, recently confirmed that "Zaragoza has already started to introduce the Optimizagua methodology into local parks, a new eco-area in the city, two natural peri-urban zones and green areas alongside the river."

A public organisation providing watering services to farmers in Spain (the Montes Negros Comunidad de Regantes) have also committed to making the initial investment to install the system on areas they water. The beneficiary has been able to reassure them that this investment will be offset within two years, from the water savings alone.

The project's transferability is exceptionally strong because the technology can be so easily applied to other land uses and other locations, with the expectation of water savings in all cases. The project also offers the potential for reducing energy consumption through the use of renewable sources - such as on-site solar panels - and reduced pumping of water.

This impressive LIFE project has demonstrated the potential economic, agricultural and environmental benefits of optimised watering. It has already been used as the evidence base to strengthen local and regional legislation on water efficiency around Zaragoza and it provides convincing evidence that stricter laws on water consumption in watering are possible without affecting output. It is a project that could have tremendous impact on water consumption across Europe and beyond.

Project Number:
LIFE03 ENV/E/000164

Title: Demonstration of water saving for watering uses through the experimentation of artificial intelligence integrated in traditional systems of water control

Beneficiary: Fundacion San Valero

Total Budget: €1 452 000

LIFE Contribution: €692 000

Period: Oct-03 to Sep-06

Website: www.life-optimizagua.org

Contact: Nieves Zubalez Marco

Email: nzubalez@svalero.org

CLONIC: Innovative leachate treatment in Spain

The CLONIC LIFE project demonstrated the effectiveness and environmental benefits of an innovative process (PANI-SBR/ANAMMOX and thermal dry) for the treatment of wastewater generated in an urban landfill.

Wastewater from landfills, known as leachate, can be highly contaminated due to the presence of organic matter (with a very low biodegradable fraction), nitrogen and salt. The removal of nitrogen represents a complex treatment problem since the nitrogen concentration of landfill lechate increases over time while its content of biodegradable organic matter decreases. As such, traditional denitrification treatments, using activated sludge, are not efficient for such effluents. In addition, the use of physical-chemical treatments (for example, ammonia stripping plus ammonium sulphate recovery) presents technical and manipulation complications in terms of control, stability and other hazards. The removal of the high salt content is mainly performed by filtration processes, and as a result, the management and treatment of leachate is a costly procedure.

Combining technologies

The CLONIC project aimed to find a new process for reducing the economic and environmental impacts of treating landfill leachate by combining a specific biological treatment with a thermal drying technology. The biological treatment is based on a partial biological autotrophic oxidation of ammonium to nitrite (PANI-SBR process), followed by an autotrophic anaerobic ammonium oxidation via nitrite (Anammox process), achieving a nitrogen removal rate of 98%. After the nitrogen removal, the leachate treatment process was completed by a thermal drying process in order to retain the salt in the dry powder produced. The drying process used biogas as an energy source and the resultant technology was shown to be highly effective for fixing salts in the solid phase. Furthermore, the gaseous emissions had a pollutant concentration much lower than the legal limits.

CLONIC's thermal dry pilot plant.

Compared with current leachate treatments, the new combination of these two technologies present numerous advantages:

- In comparison with physico-chemical treatments, the overall operation is reduced due to the fact that reagents are not used and products of difficult elimination/treatment, such as ammonia sulphate, are not produced;
- In comparison with biological treatments, the new process needs 35% less aeration than a conventional biological nitrification;
- The production of biomass is lower than with conventional biological treatments; and
- The combination of the technologies, PANI-SBR-ANAMMOX and thermal drying, allows for the closing of the nitrogen cycle, releasing nitrogen into the atmosphere.

An analysis using FLEXRIS methodology was carried out to evaluate and compare the environmental and economical costs of a conventional leachate treatment, consisting of wet oxidation with peroxide followed by an ammonia stripping and the CLONIC treatment. The results showed an environmental cost of 0.026 €/L for the conventional treatment and 0.013 €/L for the CLONIC treatment – thus the CLONIC process achieves an improvement of 48%.

Anammox biomass.

Although the project focused on leachate treatment, the biological process developed has a wide range of applications. It can be adjusted to any effluent with a high content of ammonia and salts, such as anaerobic digestion effluent, pig slurry and industrial processes.

Project Number:
LIFE03 ENV/E/000140

Title: Closing The Nitrogen Cycle From Urban Landfill Leachate By Biological Nitrogen Removal Over Nitrite And Thermal Treatment

Beneficiary: Cespa Group

Total Budget: €1 311 000

LIFE Contribution: €545 000

Period: Aug-2003 to May-2007

Website: www.lifeleachate.com

Contact: Elena Jiménez Coloma

Email: e.jimenez@cespa.es

Minimising the impact of economic activities

A variety of different EU policy initiatives exist to manage the environmental impact of economic activities. One piece of legislation that features strongly in this field is the 1996 Directive on Integrated Pollution Prevention and Control (IPPC), which aims at minimising emissions to soil, water and air from large, medium and small scale industrial plants throughout the EU27. Reduction of negative environmental impacts and sustainable management of toxic substances are all heavily promoted by the IPPC Directive which also defines common rules on the authorisation of permits for industrial installations, which have to be based on Best Available Techniques (BAT). BAT refers to the most advanced techniques that can be used to achieve a high level of environmental protection for the industrial sector in question.

ART: Introducing ART into the chemical industry

The fine chemicals and pharmaceuticals sectors are important creators of wealth and jobs in Europe. However, these industries also produce high levels of waste – up to 70% in some cases to get the required end product. With the assistance of LIFE, Sweden's Alfa Laval, in partnership with the French chemicals company, Arkema, has developed Alfa Laval Plate Reactor Technology (ART) to enable more efficient raw material use, lower energy consumption, and safer and more environmentally friendly production.

The chemical industry represents Europe's third largest manufacturing sector and so significant benefits can be gained from finding safer, cleaner and more energy-efficient manufacturing processes for this high impact industry.

BEST OF THE BEST 2007-2008

Some of the key concerns facing the industry include inefficient energy use, poor product quality and costly management of toxic by-products. These issues are often caused when standard production equipment is not well suited to the chemical transformation processes. Demand is therefore strong within the industry to identify improved technologies that are capable of overcoming such obstacles and generating cost-effective, environmentally appropriate solutions for commercial chemical production.

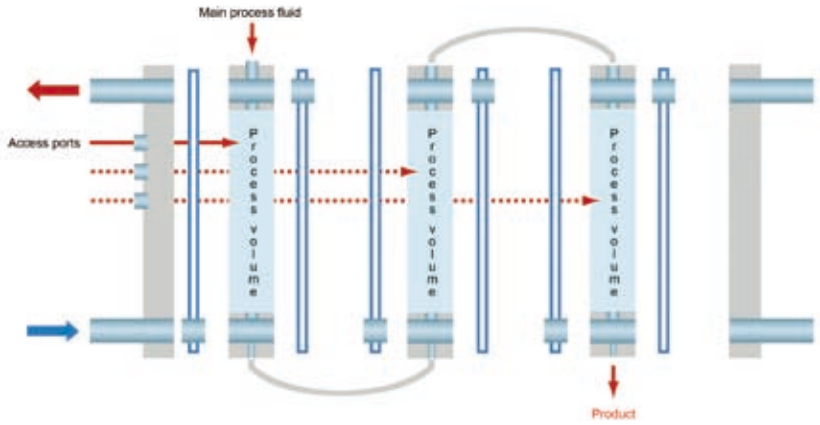
Global demands are growing for cleaner synthesis, improved safety, higher reliability, improved energy efficiency, reduced environmental impact and shorter-time-to market. "Process intensification" is the buzz term in the industry for this drive to make processes continuous (rather than batch), smaller, more efficient and less energy intensive.

Perstorp chemical plant.

Upscaling the micro-reactor

The aim of the LIFE ART project was to demonstrate and evaluate a new, highly innovative continuous reactor technology to be used for synthesis and other chemical reactions in the fine chemicals and pharmaceuticals industries. The Alfa Laval ART® Plate Reactor was to combine many of the best attributes of micro-reactors, plate heat exchangers, and tube (and static mixer) reactors.

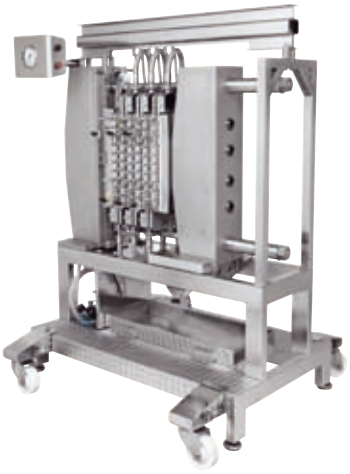
The reactor is based on a modular design to make it full flexible and reconfigurable from lab- to produc-



The working principle of the Alfa Laval ART® Plate Reactor.

tion-scale. It consists of reactor chambers, adjustable to each process need. The reactor is built up by sets of plates. Each chamber is equipped with flow directing inserts arranged in such a way that the reaction fluid is mixed in a controlled way during the reaction. Two walls, one on each side of the reactor channel, are used to control the process. At the same time as the heat from the process increases, the cooling channel takes care of the heat load and the reaction is efficiently controlled. The mixing and temperature control acting along the process channel are designed to give a better control of the reaction, leading to a higher yield due to the possibility to run the processes at higher concentrations and at optimal conditions.

Compared to classic stirred-tank reactors, ART process allows faster scale-up, improved yield and provides better control of the reaction.



Alfa Laval first began work on the technology in 2000. Seven Universities (in Sweden, France and UK) were involved in the pre-testing and research phase. The LIFE ART project was the first-time the company had trialled the technology full-size, with the right material, tested with the customer.

The decision to apply for LIFE funding was "serendipity" says head of Corporate Development, Technologies, Alfa Laval, and project manager for the LIFE ART project, Tommy Norén. "I got a phone call from Alfa Laval's head of finance saying that this type of project was eligible for LIFE funding and at the same time I was talking to a consultant who suggested we apply for funding."

"We sent an A4 sheet of paper with an outline of the project to the Swedish environment agency and they said they would support the application – we had three weeks to put the application together, rather than the normal three months, but we were successful, one of 30 out of about 200 applicants," recalls the project manager.

LIFE funding was important to the project, but it covered only 25% of the total cost: "We had to build a case not just on the LIFE project," says Mr Norén. This case was successfully made and the project received the full support of Alfa Laval and Arkema: "It was a very high level project within the companies. I was very pleased because it got special attention," he enthuses.

The Plate Reactor was demonstrated and evaluated through tests using two different types of reactor. Initial tests were carried out on a small scale plate reactor (PR-Lab) and these results were then used to inform further work on a pilot scale plate reactor (PR-Pilot). "A two-step approach was necessary since many fundamental answers to different parameters could only be given by testing at lab-scale and pilot-scale in this project," explains Mr Norén.

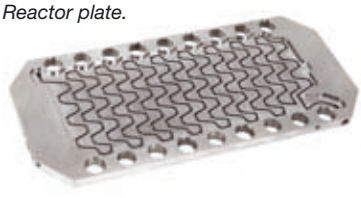
The French chemical company Arkema carried out tests of the equipment on seven defined reactions (X1-X7). The PR-Lab and PR-Pilot Reactors were evaluated throughout the project duration against a set of pre-established parameters assessing:

- Reactor performance;
- Control and operating system requirements (including personnel); and
- Integration needs within industrial-scale process lines or plant production systems.

A 'piano' for the industry

Results of the trials were very positive. The volume of waste generated by reaction X3 was reduced by 50%, with even better results possible, says

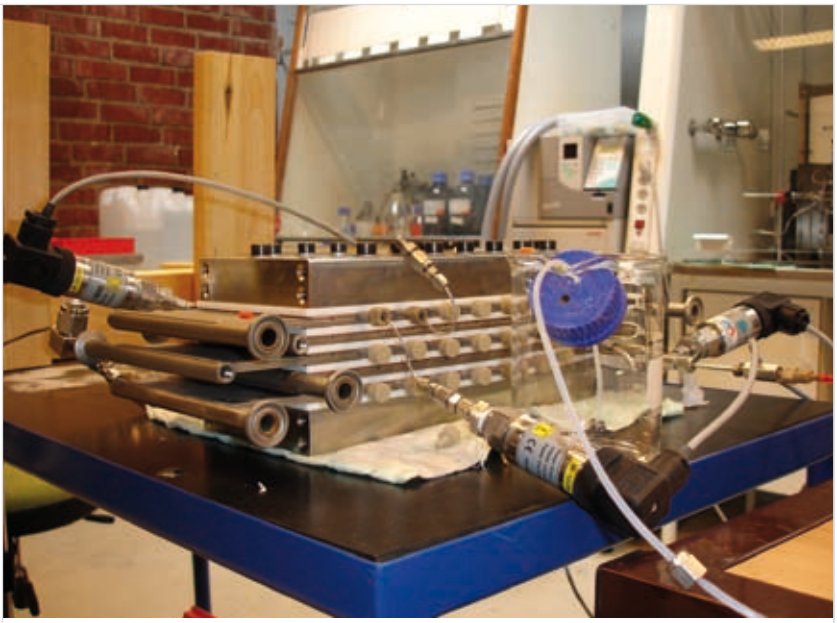
Reactor plate.



the beneficiary. The yield for this same reaction was up by 6 to 8%. Other reactions achieved an improvement in yield of 50% or more. Productivity per unit volume was 30 times higher for the reactions X2, X3 and X5. Another benefit of the new technology was improved safety, since the volume of chemicals in operation was much less than with standard batch processing methods (just 0.005 times the volume of batch). Specific results also indicate that toxic by-products can be reduced by up to 95% and energy consumption by up to 70% using ART.

Technical operational factors were assessed and found to be effective in terms of heat exchange, mixing, improvement of productivity and selectivity for the family of chemicals tested.

"Since LIFE we have gone into a commercial phase," explains Alfa Laval's sales and marketing manager, Martin Jonsson. Two products went to market in November 2007 – ART PR 37 and ART PR 49. 'The interest from the market is very high," says Mr Jonsson. One reason for this is that less rework will be required as reactions are scaled up from the lab. "Time to market is very important in pharmaceuticals and fine chemicals industry," notes the sales and marketing manager.

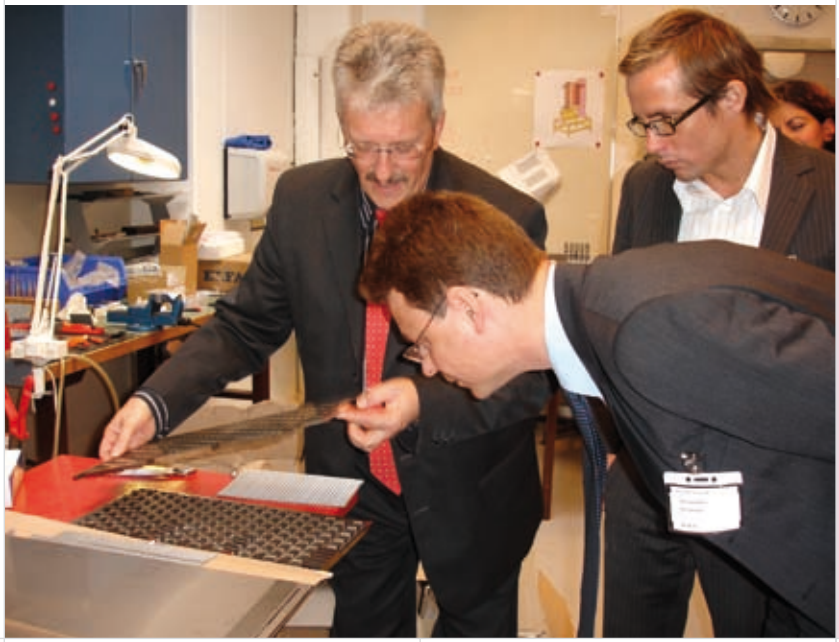


Lab Scale Plate Reactor under development.

Commercialisation of the technology is expected to reinforce the long-term practical legacy from this successful LIFE Environment project, which has already been acknowledged as good practice and received the Frost & Sullivan Award 2006 for Product Innovation in the field of chemical reactors for pharmaceuticals.

"The main market focus today is Western Europe, but we will launch in other places: the market will grow with us," believes Mr Jonsson. Tommy Norén concurs: "We have given the industry a piano, but no-one can play it yet. The industry will have to learn to play it and results will improve. This paradigm shift will not happen in a year, it will happen with the transformation of the chemical industry."

Project manager Tommy Noren demonstrates the Lab Scale Plate Reactor.



Project Number:
LIFE05 ENV/S/000401

Title: Advanced Reactor Technology for Sustainable Production in the Chemical Industry

Beneficiary: Alfa Laval

Total Budget: €3 978 000

LIFE Contribution:
€1 017 000 (maximum)

Period: Jan-2005 to Oct-2007

Website: www.stepintoart.com

Contact: Tommy Norén

Email: tommy.noren@alfalaval.com

RECARC: Turning steel slag into high-value industrial material

This German LIFE project has shown that thermo-chemical treatment of stainless steel slag can be used on an industrial scale to recover valuable metal for recycling and produce minerals for the construction industry, offering huge environmental and economic benefits.

Europe alone produces seven million tonnes of high-grade steel each year requiring increasing amounts of raw materials. During stainless steel manufacture, slag amounting to 15-20% of the input is produced. At present this is unsuitable for most further uses, mainly because of the health risks from the level of chromium it contains. Much of the slag therefore simply goes to landfill.

This innovative project set out to split the slag into a chromium-rich metal part and a mineral part through thermo-chemical treatment in an arc furnace. Using this process, chromium fractions bound in a mineral form converts into the metallic form of chromium. The resulting heavier metal part sinks to the bottom of the furnace while the mineral part can be decanted.

Various melting conditions were investigated by the beneficiary who found that more than 97% of the chromium could be recovered by melting in resistance. This recovered chromium - along with other metals in the alloy such as iron, manganese and nickel - was then recycled back into the steel-making process in place of new raw material. The quantities recovered for recycling were significant. Using this process, approximately 40kg of chromium can be produced from 1 tonne of slag.

The mineral part – which makes up 90% of the slag – was rendered suitable for use in its simple form as a raw material in road or railway construction or it can be upgraded with additives to become a granulated material for the cement industry.

Potential benefits to the environment are significant, particularly since the project demonstrated a technology capable of being applied on an industrial scale. “Ores are limited natural resources and become more and more expensive. For this reason, the recovery of valuable materials from so called anthropogenic resources is a sustainable way for handling resources in the 21st century”, stated Dr. Burkart Adamczyk, the project leader of RECARC. The beneficiary believes that throughout Europe, enough chromium could be recovered from slag to make 600 000 to 800 000 tonnes of high-grade steel that would otherwise have required the extraction of 80 000 tonnes of chromium metal from natural ore.

Using treated mineral slag in the cement industry has a similar benefit, replacing raw materials such as lime and clay which would otherwise have to be extracted from large open-pit mines. In addition, cement production from natural raw materials produces large quantities of the greenhouse gas CO_2 which the recycling and recovery process avoids.

The relatively high power consumption needed to convert chromium compounds to chromium metal and to separate the metal from the mineral fractions could be seen as a possible disadvantage of the method. But the beneficiary asserts that the consumption is equivalent to that required in extracting and treating the alternative raw materials. The system also avoids the high economic and environmental costs now associated with the current need for disposal of steel slag.

Testing melting conditions.

Transferability is further encouraged because the infrastructure needed for widespread application of the RECARC methods is already in place - arc-furnace technology has been used by the metallurgy industry for decades. The demonstrated benefits are therefore readily available and comparatively simple to reproduce.

Project Number:
LIFE03 ENV/D/000043

Title: Recycling of residues from metallurgical industry with the arc furnace technology

Beneficiary: Bundesanstalt fuer Materialforschung und-pruefung

Total Budget: €703 000

LIFE Contribution:
€350 000

Period: Oct-2003 to Sep-2006

Website: www.recarc.bam.de

Contact: Burkart Adamczyk

Email: burkart.adamczyk@bam.de

JELLY: Changing the wasteful ways of an old industry

The traditional industry of producing gelatine from animal fats grew up in an era where its need to consume huge quantities of natural resources, particularly water, was not an issue. Today that situation cannot be sustained. This Spanish LIFE project succeeded in finding innovative solutions to the problem.

Gelatine is an important food ingredient as well as being used in adhesives and photographic materials. But our liking for cakes and sweets has been met at an environmental cost in terms of the gelatine's production process.

A principal method has been to produce it from pig skins through a long, costly and wasteful process involving mincing, washing, acid treatment, thermal extraction, clarification and filtration, ion exchange, evaporation, sterilisation and drying. This process requires very large amounts of water and energy.

Rising awareness of the environmental impact and increased costs have threatened this traditional industry and challenged it to find novel solutions. The beneficiary in this project, a leading Spanish gelatine manufacturing company, believed that by re-thinking the whole process and using modern technology they could dramatically reduce water consumption and produce a higher-quality end product.

Faster, easier and ecological release of gelatine

Their solution involved reducing the size of pig rind pieces being processed. They found this resulted in better contact between the water and rinds and required significantly less water to be used at this stage. Combining this process with innovative membrane technology meant the water was made suitable for recycling.

The first result was a reduction of about 70% in both water use and the volume going through the waste water treatment plant. When applied to all production at the beneficiary's factory, this is a saving equivalent to the water consumption of a town with 6 000 inhabitants.

Demonstrating a new gelatine production process.

The project also showed that other components – blood, proteins and fat - could be recovered from the wash waters and converted into valuable products. In this project they were exploited by a Danish animal by-products company which joined the beneficiary in creating a new company to capitalise on the possibilities.

Other benefits from the innovation were numerous. The time needed for the whole production process fell from 60 hours to 10 hours. The increased efficiency meant fewer extraction cycles were needed and at lower temperatures. This in turn led to significant reductions in energy consumption, solid-waste by-products and odour emissions. In addition, the process produced a higher-quality final product since the gelatine was less exposed to high temperatures.

The new process requires machinery of much smaller size than the old methods and the space required, particularly in the initial steps of cutting, washing, acid treatment and acid washing, is less than 25% of that needed previously.

Provisional data suggests that the company will save €845 000 a year in environmental costs - water and wastewater treatment. This gives a pay-back time on the required investment of 5 years from the environmental benefits alone.

This LIFE project was a practical demonstration of the environmental benefits of investing in innovation to find sustainable new procedures. Its findings suggest the benefits shown can be easily replicated in other forms of gelatine production, and the results have already been presented at industry fairs and conferences around Europe.

Project Number:
LIFE04 ENV/ES/000224

Title: Demonstration project for gelatine production with use of innovative technology achieving an important washing wastewater reduction

Beneficiary: Miquel Junca S.A.

Total Budget: €5 005 000

LIFE Contribution: €807 000

Period: Dec-2003 to Jun-2006

Website: www.miqueljunca.com/gb/life.html

Contact: Salvador Junca I Piera

Email: junta@miqueljuncasa.es

INOCAST: Greening the engine-block

With the support of LIFE, Nemak Dillingen GmbH in Germany has demonstrated the effectiveness of a less polluting alternative to the cold-box technique for casting aluminium for engine blocks. For the LIFE Environment "INOCAST" project, Nemak Dillingen established and optimised a pilot core production and casting unit using the 'inorganic warm box' (AWB) method.

At the heart of every motor vehicle is an engine block. usually made from cast iron or aluminium. Some 98% of all cylinder heads and 50% of engine blocks in Europe are currently made of aluminium, which is used because it reduces engine weight and improves efficiency.

However, the standard Core Package Casting (CPS) process for aluminium engine blocks, referred to as the cold-box technique, releases substantial quantities of toxic fumes into the air, including aromatic amines, furan, benzopyrene and other organic materials. The binder used to create the sand mould for the casting also releases organic compounds, such as phenol resins and amines, into the atmosphere when it is burned off the cast at the end. What's more, the cold box process uses significant energy resources and generates substantial quantities of waste, including water, filters, sand and sulphuric acid. The alternative process, AWB, uses a new, inorganic binder together with Quarzsand to build core moulds for the production of the engine blocks. These moulds can be mechanically de-cored, which does not release toxic fumes into the air.

However, because of a lack of prototypes for quality testing, automobile manufacturers had refused to use blocks cast using AWB. The LIFE supported INOCAST project, which ran from January 2005 to July 2007, therefore sought to demonstrate both the technical effectiveness of the new process and the environmental advantages it offered in terms of reduced energy consumption, emissions, deposits and waste water.

INOCAST's alternative process offers many opportunities for the automotive industry.

An effective demonstration

The beneficiary set up a full-scale pilot core production and casting unit to test and develop the warm-box technology free of organic binders. More than 300 engine blocks were produced using the new technique.

"Due to the elimination of combustion of the organic binder, a substantial reduction of emissions during the casting and decoring process is achieved," explains process engineer, Dr. Ingo Prass. If the new technology would be used for the complete production, Nemak Dillingen would be able to reduce inorganic components by 93-99% and the typical foundry emissions of phenols, formaldehyde, naphtha, methanol and amines to below measurable concentrations. The firm proved that pollution can be avoided by removing the need to use isocyanide-mixture containing diphenylmethane and aromatic hydrocarbon and a catalytic converter made up mainly of ethyldimethylamine.

The technology also promises significant cuts in energy consumption (down 37% overall) and dust pollution (down 80%) compared with the traditional casting technique. Levels of waste materials, such as burned sand, organic filters, phenol resin solution, sodium hydroxide and sulphuric acid can be reduced to nil.

Technical results of the cast products were also excellent. Laboratory analysis showed no deficiencies of the castings produced using AWB when compared with those produced using the traditional method. A curing time of 70 seconds was achieved, important for integration of the process into automated assembly lines.

From pilot plant to mass market

The LIFE INOCAST project proved that the AWB technology is reliable and ready for market, a crucial step in winning acceptance from the automotive industry and promoting private investment in the development of the process.

Project Number:
LIFE05 ENV/D/000185

Title: Demonstration of environmentally friendly aluminium engine Core Package Casting (CPS) using an inorganic binder

Beneficiary:
Nemak Dillingen GmbH

Total Budget: €4 762 000

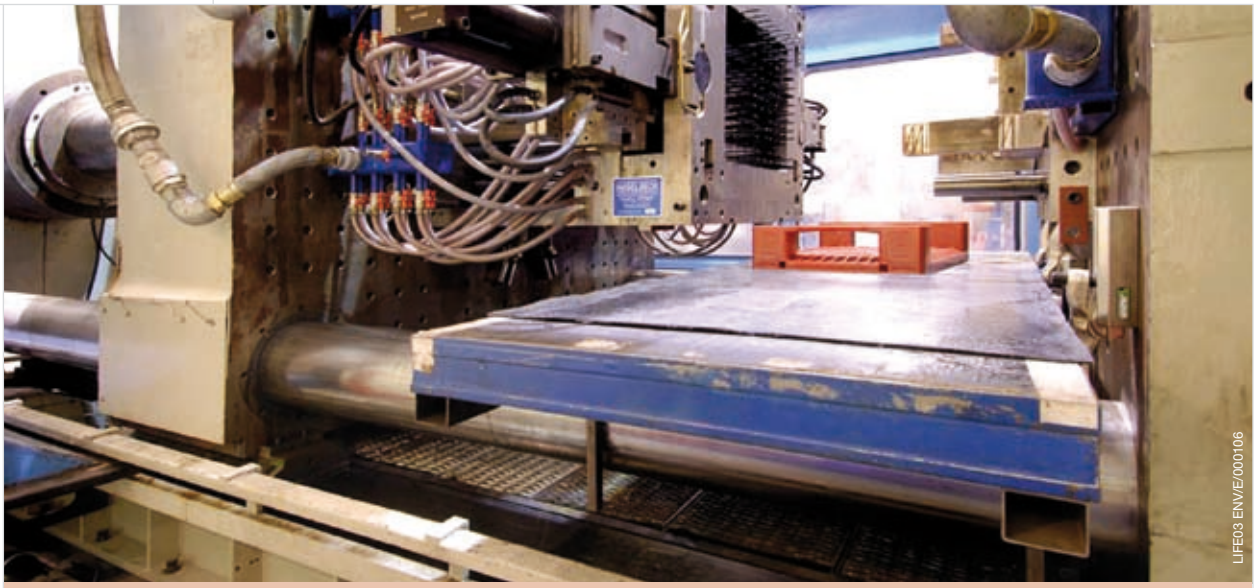
LIFE Contribution:
€1 405 000 (maximum)

Period: Jan-2005 to Jul-2007

Website: www.nemak.com/socialresponsibility/inocast

Contact: Joachim Kahn

Email: joachim.kahn@nemak.com



Waste management

The EU's Sixth Environment Action Programme identifies waste prevention and management as one of four top priorities. Its primary objective is to decouple waste generation from economic activity, so that EU growth will no longer lead to the production of more and more waste, and there are signs that this is beginning to happen. The EU is aiming for a significant cut in the amount of waste generated, through new waste prevention initiatives, better use of resources, and encouraging a shift to more sustainable consumption patterns. The European Union's approach to waste management is based on three principles: Waste prevention; Recycling and reuse; and Improving final disposal and monitoring.

DIONYSOS: New uses for wine wastes

Scientists from Athens have identified a range of alternative uses for waste material from wine making processes. Large volumes of grape pomace are regularly discarded after fermentation and innovative LIFE funded research in Greece has confirmed new commercial opportunities to gain added-value extracts from grape waste, resulting in win-win benefits for Greece's environment and rural economy.

Greek wineries produce around 400 million litres of wine annually and use approximately 500 000 tonnes of grapes in the process. Most of the country's 400 wineries are small or medium-sized companies that grow the same indigenous grape varieties that have been harvested in Greece for many generations.

Large amounts of solid waste matter are produced by these wineries, since approximately 17% of the total grape weight collects in fermentation tank sediments and strict laws regulate its reuse for alcohol production. Furthermore, the process involved in producing one litre of wine generates two litres of sludgy wastewater. Both solid and sludge wastes contain organic molecules, such as lipids, polyphenols and tannins. These can pose threats to plant life, water quality and aquatic animal species if the wine wastes are discarded untreated onto open land, because the biodegradation processes create antimicrobial and phytotoxic compounds which leach into local soils and water sources.

Scientists from the Agricultural University of Athens (AUA) became aware of the scale of these environmental pollution concerns in Greece during research on national wine production systems. The study by Serkos Haroutounian, professor of chemistry at AUA, inadvertently revealed that much of the 120,000 tonnes of grape pomace waste and 800 million litres of sludgy wastewater produced by Greek wineries each year was dumped, untreated, onto open land.

Professor Haroutounian was surprised by this fact and states "I found it difficult to understand that so much waste was being produced but no real alternative had ever evolved for its reuse." He was conscious of the fact that only a few, larger scale, wineries in Greece would be able to afford expensive waste management systems and so he joined forces with his colleagues from the University of Athens (UOA) to explore cost effective options that were suited to the particular circumstances of the Greek wine industry.

Identifying new opportunities

A partnership was formed between the two Universities and proposals were drawn up for a LIFE project with objectives to develop new economically viable approaches that promoted integrated management of wastes from the wine industry. This DIONYSOS LIFE project was launched in the autumn of 2003 and by the end of its three year term it had successfully demonstrated methods for reusing grape pomace that were both technically and financially feasible, as well as environmentally friendly.

The LIFE project's main aim concentrated on identifying and recovering important biological properties from the grape waste. Prokopios Magiatis, assistant professor at UOA's Pharmacognosy and Natural Products Chemistry Department and member of the DIONYSOS project team, explains "we paid special attention to investigate how we could recover compounds called polyphenols, which have antioxidant properties and so could offer commercial possibilities in products such

BEST OF THE BEST 2007-2008

By products from wine grapes were found to contain useful chemical extracts that could extend the grapes' commerical life cycle.

Large volumes of winery waste are often dumped on open land without any form of environmental treatment. Dionysos could help change this.

as cosmetics, food-stuffs or pharmaceuticals."

Extraction of the polyphenols proved to be a challenging process and involved testing the viability and capacity of various adsorbance resins to recover the polyphenols from grape pomace waste. A successful prototype technology was developed during the LIFE project's second year which was then deployed in two different primary treatment plants.

Extracting commercial compounds

Trials were carried out at a cooperative winery in Tyrnavos, working mainly with white grapes, and the Ktima Kyrianniy winery in Naoussa, which used mostly red grapes. These sites provided the DIONYSOS project with its raw materials and a central polyphenol recovery unit was installed at UOA to extract the antioxidants. An aerobic and anaerobic composting facility was also established at AUA to identify and maximise waste minimisation options for the residual pomace.

Both trial sites succeeded in using the primary treatment plants to process their solid waste and wastewater on site. This involved the collection and air-drying of grape pomace, which was then pulverized and mixed with ethanol before being dissolved in water. The extract produced from this process was then filtered and passed through a series of specialised adsorbent resins suspended in tubular tanks. These captured the antioxidants and stored them for future extraction at UOA's central polyphenol recovery unit.

LIFE project staff were keen to ensure that their DIONYSOS technology was both cost efficient and environmentally benign. This was achieved and none of the valuable target compounds were found in the treatment plants' effluents, that were shown to contain mainly water or non-hazardous compounds such as sugars.

Once full, the adsorbent resin tanks were moved from the primary treatment plants and transported to UOA's central polyphenol recovery unit, where the LIFE scientists were able to evaporate the ethanol and collect the valuable polyphenols. The tanks containing the regenerated adsorbent resins were then returned to the primary treatment plants, along with the evaporated ethanol that was condensed and collected for reuse in the next batch of dried pomace.

Results from this methodology were extremely encouraging indicating that all of the polyphenols contained in grape pomace were recovered by the LIFE funded technology. Quantitative analysis showed that 1,000 kg of grapes produced a 100kg of grape pomace, from which 1kg of polyphenolic enriched extract could be produced using the DIONYSOS approach. Furthermore, the scientists confirmed that different polyphenol compounds could be isolated. These included commercially valuable compounds such as trans-resveratrol, a substance with strong antioxidant and bioactive properties, as well as a high commercial value, estimated by LIFE staff at some €1 100/g. FCPC chromatography was used to produce 1 g of resveratrol from 1 kg of DIONYSOS extract during the project trials.

Applying the results

Having succeeded in extracting the commercial compounds from grape pomace, Professor Haroutounian and his colleagues were aware that this only partly achieved their goals. The critical factor now focused on whether the team was able to apply their findings and demonstrate feasible product markets for the DIONYSOS polyphenols. A number of different applications for the wine waste extracts were tested including cosmetics, food-stuffs, pharmaceuticals and farm products.

Cosmetics

Anti-allergic tests were conducted by laboratories in America on special make-up cream prepared with DIONYSOS polyphenolic extract and these found no evidence of any adverse side effects. Such positive feedback was welcomed by the LIFE team who recognised the premium prices, profits and associated investment potential that could be attracted for a wide range of added-value beauty products, all of which could be branded with green credentials for domestic, international and tourist markets.

Dairy products and other food supplements

DIONYSOS staff teamed up with a large Greek dairy company to investigate the possibility of incorporating polyphenolic extract in yoghurt production processes. The trials proved

Two wineries participated at the research trials.

successful and the product's commercial characteristics, taste and stability tested well. The dairy is currently considering how best to apply the results of the LIFE funded tests on a larger scale production basis and this commercial interest in the polyphenols confirms their future prospects as food supplements, either in the form of an extract-mixture or as an isolated product, such as trans-resveratrol.

Pharmaceuticals

A clinical study conducted during DIONYSOS in UOA's cardiology clinic on 30 male patients with coronary heart disease showed that the extract of polyphenolic compounds from red grapes significantly improved the endothelial function of the patients. One dose of the LIFE project's polyphenol extract corresponded to an equivalent 1kg consumption of grapes. Professor Skaltsounis, co-founder of the DIONYSOS project proposal from UOA, noted, with a smile, that this consumption level of polyphenol exceeds "even an average Mediterranean-type diet". He and his colleagues in the project team believe larger and long-term medical studies should be undertaken to assess whether polyphenols from red grapes could to be used commercially in the production of health supplements.

Farm fodder and fertiliser

Digestion experiments were carried with goats and sheep to explore the nutritional value of waste material from the processed pomace and results identified organic molecules with high nutrient properties. Further analysis suggested that the use of the treated wine waste as livestock fodder can increase concentrations of the most active constituents of milk lipids, Conjugated Linoleic Acid (CLA) and Trans-Vaccenic Acid (TVA), by up to 50%.

Similarly, residual pomace from the DIONYSOS treatment process was found to contain organic molecules with high nutritional value that could

Tests showed benefits from using treated wine waste as livestock fodder.

be further converted into natural, non-polluting, organic fertiliser by using specialised composting techniques. The DIONYSOS composting system involved two open-vessel and two closed-vessel composting units that were equipped with a control system for the waste humidity content. Mature compost was then created via mechanical aeration in open "windrows". Two wineries are now using this process to convert a large portion of their grape pomace into organic fertilizer, which is being recycled in their vineyards.

Future prospects

LIFE's support was instrumental in identifying these new opportunities for wineries across Europe and the DIONYSOS team are confident that their technology will be applicable in a variety of different circumstances. Professor Haroutounian draws attention to the demonstration value and transferability of their methodology quoting the LIFE project's economic modelling exercise "we have established the feasibility for fully operational polyphenol recovery plants, capable of treating 2 000 kg of winery wastes per day. We estimate that turn key costs come in at under €25 000 per plant and we believe this model represents a viable waste management system for cooperatives of small wineries." Moreover, he highlights the fact that "even greater profits could be possible by extending each plant's operational season and extracting other substances of pharmaceutical interest from olives or herbs."

Overall, the future for DIONYSOS looks bright as interest in the LIFE funded technology continues to grow. With it, the risks of environmental pollution from piles of decaying grape pomace reduce and the potential for new jobs in rural areas increases from both antioxidant recovery processes and the manufacturing of local products containing grape waste extracts. Professor Haroutounian is very enthusiastic about the DIONYSOS project's progress to date and he says "our successes have been a team effort and we are very happy with the win-win results that have come from our research. Our energies will now continue to encourage the investments necessary to maximise environmental and economic benefits from reusing the winery waste materials."

Project Number:
LIFE03 ENV/GR/000223

Title: DIONYSOS - Development of an economically viable process for the integrated management via utilization of winemaking industry waste; production of high added value natural products and organic fertilizer

Beneficiary: Agricultural University of Athens

Total Budget: €1 310 000

LIFE Contribution:
€641 000 (maximum)

Period: Oct-2003 to Dec-2006

Website: www.pharm.uoa.gr/dionysos/index.htm

Contact: Serkos Haroutounian

Email: sehar@aua.gr

ELVES: Pure metal from end-of-life vehicles

Many countries have struggled to meet EU standards on recycling metals from used vehicles. This Spanish LIFE project found an innovative way of turning old engines into more than 99% pure aluminium, which could be reused immediately within the manufacturing cycle.

Each year, up to 20 million vehicles in Europe reach the end of their working lives. In the past, too many of these simply ended up in scrap-heap graveyards, rusting away and seeping toxic waste, oil and chemicals into the earth.

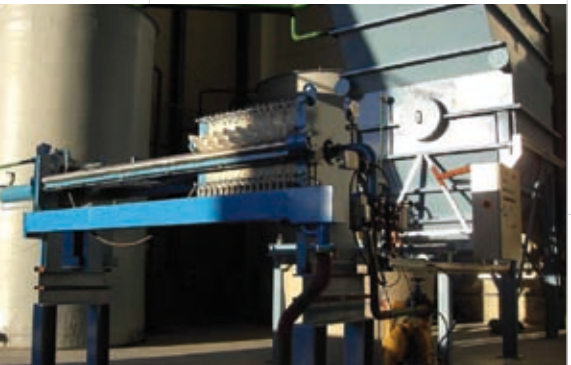
Today, EU directives require strict controls over treatment of these "end-of-life" vehicles (ELVs) and the 17 to 18 million tonnes of waste per year they produce. One requirement is that all the metal components should be separated out and decontaminated for re-introduction into the motor industry.

Unfortunately, a number of countries have difficulty complying due to a lack of facilities. Around 25% of all material from ELVs has been going directly to landfill. In Spain alone, this has meant 155 525 tonnes of waste per year.

Separating metal alloys

The project beneficiary, a private Spanish joint-venture company developed a technically feasible, high-capacity way of separating out the metal from old engines, achieving a purity of more than 99%. Furthermore, it established a supply network to receive the engines and then deliver the recovered metals to manufacturers for re-use in new engines, casings and gear-boxes.

Innovative separation and recuperation of ELVs.



Engines were the focus because they contain about half of all aluminium used in a vehicle and the recovered metal is of very high-value to the automotive industry. Low-weight high-strength aluminium can be used to replace steel and iron components resulting in lighter vehicles, with consequential savings in fuel costs.

The recovery process uses a combination of magnetic-separation and other physical rather than chemical techniques. Previously, such processes had involved distinct stages of fragmentation and separation and had resulted in recovered metals of varying quality. This project developed a ground-breaking, automatic, continuous in-line process to produce metal alloys - mainly iron, aluminium and heavy metals - with less than 1% impurity and which could demonstrate economic viability.

Metal delivered by the new technique requires 95% less energy than is needed for an equivalent amount of raw material. Recovery also avoids significant CO_2 emission by replacing primary production. Reducing the need for importing metal also supports the sustainability of Europe's motor industry.

The beneficiary established a plant able to process 33 000 tonnes of engines each year and recover an estimated 15.6% or 5 148 tonnes of aluminium, re-use of which prevents emission of more than 79 000 tonnes of CO_2 and saves €5 million in the energy cost of prime production.

Negative environmental effects of the project process itself are minimal. The new facility uses acoustic insulation and a water-based dust-removal system that has zero water impact because it has a closed-circuit system with its own water treatment plant.

The techniques developed are expected to be taken up widely because of the demonstrated potential impact on waste levels throughout the industry, providing an economic and practical way for companies to become compliant with environmental law. Crucially, the process is flexible enough to be readily modified to recover different alloys that may be used in future vehicles. It could also be adapted to other sectors, for instance processing domestic electrical appliances such as fridges and freezers.

Project Number:
LIFE05 ENV/E/000317

Title: Development of a system for high-quality separation of metal alloys from end-of-life vehicle engines and its re-use in new engines and components for automotive sector

Beneficiary: Recieder S.L.

Total Budget: €4 941 000

LIFE Contribution: €756 000

Period: Jan-2005 to Apr-2007

Website: www.recieder.com

Contact: Gotzon Armendariz

Email: recieder@telefonica.net

Reciplas: Plastic waste saved from the rubbish dump

The motor industry is a heavy user of plastic for many of its required parts, particularly car interiors. Production of these parts creates large quantities of plastic waste, which mostly ends up in landfill. This Spanish LIFE project what is now a solution to presents a significant environmental problem.

Plastic waste is an environmental nightmare: taking up space in landfill, contaminating land and water, sending harmful emissions into the atmosphere from uncontrolled burning and blighting the landscape. Even transporting it away has a significant environmental cost, being polluting and energy consuming.

Until this LIFE project, the beneficiary – a Spanish manufacturer making linings for car interiors - had found no way to avoid simply dumping most of the waste plastic associated with its production.

With Reciplas, however, they not only developed a transferable process to turn their waste into a 100% recoverable, re-usable and recyclable high-quality plastic, but also developed technology to use the new material themselves to make a new product - plastic pallets – which in turn saved the need to fell thousands of trees.

The project developed a system of mixing and heating the plastic waste in a technique known as “thermal agglomeration.” This generates high-density plastic granules suitable for re-moulding - in this case into pallets and packaging materials.

It is a zero waste system. The process leaves the plastic free from structural damage meaning that later in their life-cycle the pallets and packaging produced by this method can be re-cycled again and again.

The beneficiary processed the company’s own plastic waste as well as more brought in from a maker of car bumpers. In a year, they were able to process 3 200 tonnes of plastic that would otherwise have been dumped, and to produce an equivalent volume of plastic pallets, preventing the felling of 38 000 trees.

Sub-material and final product: Recycling plastic from vehicle factory waste to produce pallets.

Production was based on working three eight-hour shifts Monday to Friday over 220 business days a year. The beneficiary reported that they could increase the amount recycled to 4 480 tonnes a year if working a seven-day week.

The company found ready markets for their new products. Among their contracts was an important early one with Heineken who were keen to replace their wooden pallets with the new plastic ones for security reasons. This contract proved an important economic milestone in the success of the project.

The project has important implications. It offers a solution to an environmental problem common throughout Europe and demonstrates how good environmental management can go hand-in-hand with economic competitive advantage. Such management is key to maintaining a high level of sustainable development.

The success of the scheme has particular relevance in the motor industry, where EU directives concerning end-of-life vehicles require that all vehicles must contain the highest-possible proportion of recyclable materials. Reciplas has proved the technical and financial viability of the process as a starting point for the construction of other plastic recycling plants based on the same technology.

Project Number:
LIFE03 ENV/E/000106

Title: Recycling plastic from vehicle factory waste to produce packaging and pallets

Beneficiary: Ribawood S.A.

Total Budget: €3 046 000

LIFE Contribution: €595 000

Period: Jun-2003 to Aug 2006

Website: www.ribawood.com

Contact: Carlos Rivera Ballarin

Email: roficina@ribawood.com

Integrated Product Policy

The EU's Integrated Product Policy (IPP) strategy seeks to minimise the environmental degradation that is associated with many products' manufacturing, use or disposal. It promotes analysis of all phases of product life-cycles and encourages action to be taken where it is most effective. The life-cycle of a product is often long and complicated. It covers all the areas from the extraction of natural resources, through their design, manufacture, assembly, marketing, distribution, sale and use to their eventual disposal as waste. These phases involve many different stakeholders, such as designers, industry, marketing people, retailers and consumers. IPP attempts to stimulate each part of these individual phases to improve their environmental performance.

RETOXMET: Integrated pollution control in Hungary

Yeast is normally associated with the production of bread, beer or wine and now, thanks to an innovative Hungarian LIFE project, we can also add pollution control to this list. The RETOXMET project successfully demonstrated an integrated approach that reuses highly polluting food industry wastes to produce cost effective yeast-based bioconversion materials capable of cleaning waste water or drinking water by removing dangerous contaminants such as arsenic, boron, lead, cadmium, chrome and copper.

Hungary's environment experiences a wide range of different polluting factors including large volumes of waste water from industrial processes such as metal plating, leather processing and mining. Current technology involved in cleaning these waste waters relies on resource intensive technique such as electrolysis and incineration, or active carbon approaches using reduction, precipitation, separation and ion exchange methods to remove heavy metal pollutants. All these technologies experience disadvantages and problems associated with high energy and chemical demand, incomplete extraction and creation of hazardous wastes.

An alternative solution to Hungary's industrial waste water treatment was needed and a breakthrough came from the food industry with VIRECO a Budapest-based company specialising in manufacturing yeasts for nutritional products VIRECO's Managing Director, Dr György Radnai, explains "we thought that if we can use yeast to bind together nutritional compounds as essential metals, that are good for our health then maybe it could be used to bind pollutants as toxic metals together as well that would be good for our environment". This hypothesis was shared by Dr Radnai's colleagues from a number of other scientific and industrial bodies who joined forces in a partnership that applied for LIFE support to help demonstrate the potential of a new, environmentally friendly and cost efficient integrated pollution control method based on natural yeasts.

Pollution control partners

The LIFE project partnership formed in 2004 and combined a useful collection of synergetic specialisms. Tiara Co. Ltd, a national R&D investment company, took on the role of LIFE beneficiary for the RETOXMET (REmoval of TOXic METals) project and the other RETOXMET partners included: VIRECO's research and innovation personnel; the Hungarian government's Central Food Research Institute's bioengineering department; E+E Ltd, a private sector company active in designing waste water treatment technology; and Biopetrol, an important supplier of equipment and systems used in bioengineering processes.

RETOXMET partners' first job involved identifying a suitable form of yeast material to test during the LIFE demonstration trials. Conventional baking yeast was considered too expensive but a cost effective solution was proposed by the LIFE team that aimed to reuse and convert food industry wastes into a new kind of yeast biomass. This approach was particularly innovative since it provided a pollution control solution that integrated both food and waste water treatments within the same technology.

Dr Gábor Vereczkey, from the government's Central Food Research Institute was very pleased with the RETOXMET proposal and he said, "Wastes from factories making everyday products like potato chips, canned foods, maize and dairy products often contain high levels of lactose or starch which can contaminate water courses and badly affect wildlife. We were looking for ways of reducing the pollution risks from food industry wastes and converting these wastes into a yeast product capable of cleaning waste waters

Removing toxic heavy metals from waste water.

RETOXMET exhibition and information centre.

containing toxic heavy metals was an ideal solution."

LIFE Project Plan

The LIFE partners designed a project plan that involved four main stages – analysis of demand, laboratory scale experiments, planning and production of a demonstration plant, operation and information dissemination. Detailed surveys were initiated early on in the project to identify the scale of the waste water treatment demand and volume of potential food wastes that could be used as raw RETOXMET material. Results from the surveys identified a large number of industrial and public sector stakeholders who were interested in the LIFE project proposals and these potential end-users were kept up to date throughout the project via a dedicated dissemination strategy organised by the beneficiary.

Work on the scientific experiments also started early on during the project lifecycle with much of the analysis being undertaken at Hungary's Central Food Research Institute. A variety of options were explored during the screening and breeding of yeast species on food by-products, which resulted in a total of seven yeast phyla being finally selected. These included three phyla capable of decomposing dairy wastes (*Kluyveromyces lactis*, *Kluyveromyces marxianus* and *Dekkera anomala*) and four phyla working on starchy sediments (Lipomyces kononenkoae, *Saccharomycopsis fibuligera*, *Schwanniomyces castelli* and *Schwanniomyces occidentalis*). Laboratory-based experiments identified optimal conditions for yeast reproduction in these species and all were shown to provide consistently positive results in the fermentation of food byproducts to produce a biomaterial that absorbed heavy metal pollutants from waste water samples.

RETOXMET's third phase involved developing a demonstration plant that was able to replicate the laboratory experiments in semi-industrial scale conditions. This aspect of the project proved to be the most difficult but the LIFE partners' combined skills and specialisms overcame the various engineering and scientific challenges involved and a functioning demonstration plant was operational by March 2007. The project team decided to locate the food waste fermentor and waste water treatment plant together within the same building, and a suitable site was selected at Tatabánya, about 60 km from Budapest, where local food and metal plating companies agreed to participate in the LIFE demonstration trials.

The decision to base both RETOXMET demonstration processes on the same site provided economies of scale and meant that the team were able to install fewer but larger tanks, since a number of tanks could be shared between the two different plant components. Similarly savings were made by mutual heating, cooling, electrical and control systems. Other beneficial innovations designed by the LIFE team included the use of fixed centrifuge equipment, rather than mobile flotation separation systems used in standard fermentation processes. This reduced compressed air requirements during ventilation and avoided the need for drying equipment since the yeast milk produced by the fermentor was transferred immediately to the waste water treatment tanks.

RETOXMET results

Results from the new integrated waste management process were exceptional and all of the yeast species used in the demonstration plant were shown to produce biomaterial that succeeded in accumulating heavy metals. The biosorbent produced with the help of the yeast proved to be particularly productive at concentrating the pollutants and this made them easier to extract from the treated water.

Four different demonstration runs were carried out using the RETOXMET technology on various effluents included waste water from a metal galvanising factory and contaminated groundwater. Analysis of the results showed that the new LIFE funded biosorbent material was able to extract heavy metals including zinc, nickel, cadmium, lead, chrome, manganese, iron and copper. Purification tests on drinking water also succeeded in removing arsenic and boron pollutants. This unexpected benefit was highlighted by the RETOXMET team

Using yeast-based bioconversion materials.

Table: **Levels of purification achieved by the LIFE RETOXMET demonstration plant**

Significant parameter	Galvanic waste-water		Groundwater		Drinking water	
	Original	Purified	Original	Purified	Original	Purified
Floating material g/l	3		0		0	
pH	6,8	7,3	7,9	7,7	8,2	8,0
Cadmium mg/l	2,4	<0,01				
Chrome mg/l	9,5	1,0				
Copper mg/l	24,2	1,1	8,8	1,2		
Iron mg/l			9,2	1,6	5,2	1,0
Manganese mg/l			9,4	2,4	3,4	0,4
Lead mg/l			10,4	3,1		
Zinc mg/l	21,5	1,9	8,6	1,6		
Arsenic mg/l					2,4	<0,01

as being especially relevant for Hungary's rural communities where polluted drinking water continues to represent a very real health hazard.

Promoting RETOXMET's potential

Outcomes from the demonstration plant operations were conclusive and showed that the RETOXMET technology was highly effective at purifying polluted water sources. Evaluation of the cost factors involved indicated that the technology's optimum economic potential could be achieved in a purpose built operational plant with a fermentation capacity of 160 cubic meters. Further efficiencies were shown to be possible if existing fermentation facilities were converted and in such cases the economic viability was shown to be possible in an operational plant with a processing capacity of around 65 cubic meters.

The RETOXMET team is confident that these figures provide a realistic cost alternative to conventional treatment options and team members have been actively promoting their new technology's potential to a wide range of possible users. Demonstration days were organised as part of the LIFE project's dissemination strategy and these attracted nearly 100 different visitors, including representatives from public sector environmental protection bodies and inspectorates, national industrial federations, individual companies, the state railway company and the media. Written declarations of intent have been received from 19 different organisations and interest continues to grow in the new environmentally friendly technology with public awareness being raised by the project being featured on national television.

Sustainability of the LIFE project outcomes is being guaranteed by the RETOXMET partners' commitment to their technology's uptake on a commercial scale, and proposals are being developed for further collaboration with the galvanising factory that provided waste water material for the RETOXMET demonstration runs. Dissemination activities are also continuing and have now extended beyond Europe's borders with the integrated pollution methodology being promoted by the Asian-Hungarian Economic Association for Development.

Overall the project has been deemed a significant success by all its stakeholders and this fact is underlined by its founder Dr Radnai who states "the key to our important achievements has been the added value that all our partners have brought to this project and we are confident that the technology will soon be adopted on an industrial scale. Our project would not have happened without LIFE support and we now want to continue our collaborative work on new LIFE projects in the future that help develop other solutions to environmental problems that can be as simply and cost effective as RETOXMET".

Project Number:
LIFE04 ENV/HU/000374

Title: Removal of toxic heavy metals from waste water by special yeast produced by bioconversion on food byproducts - an integrated solution for wastewater treatment

Beneficiary: TIARA Co. Ltd.

Total Budget: €1 144 000

LIFE Contribution:
€565 000 (maximum)

Period: Oct-2004 to June-2007

Website: www.retoxmet.hu

Contact: Dr György Radnai

Email: radnaigy@vireco.hu

PROCOOL: An eco-friendly future for commercial fridges and freezers

Continuing use of hydro fluorocarbons (HFCs) as refrigerants in fridges and freezers in the food trade is a significant contributor to global warming. These appliances also consume large amounts of energy. This Austrian LIFE project found a novel way to encourage both design and use of eco-friendly alternatives – by holding a competition.

Domestic fridges and freezers have increased in energy efficiency by more than 40% in the past decade thanks in part to the introduction of the EU Energy Label. In this market, refrigerants free of HFCs are extensively used. However, the commercial world has been slow to make the same advances.

Commercial plug-in cooling appliances used by the food trade around Europe consume more than 2.5% of the EU's total electricity output and generate more than 50 million tonnes of CO_2. emissions. HFCs, still routinely used in the industry when this LIFE project started, are up to 3 800 times more damaging to the environment than CO_2.

A cool idea

In this project, the Austrian Energy Agency, together with its German partners, successfully organised a Europe-wide competition among manufacturers to promote innovation and prove that HFC-free, energy-efficient and cost-effective commercial appliances could be successfully produced. Entrants were set strict criteria on energy-consumption, use of HFC-free refrigerants, superior functionality and product appearance as well as the need to build-in recycling potential and repair-orientated design.

Given this stimulus, eight leading manufacturers, representing 30% of the European market, entered the competition. Although 20 different products, none of which had been on sale before, were registered, only seven products finally met the competition's tough stipulations. The winning entries incorporated enterprising solutions and have found immediate markets for their new designs.

The most popular choices of refrigerant in the new products were isobutane and propane, which were already used in domestic appliances but previously considered difficult to use commercially. One special prize was awarded to an entry that used CO_2 as its refrigerant - an entirely unexpected result because technical implementation of its use in refrigeration is still at an early stage.

All the designs entered showed energy saving of up to 50% compared to standard products. They also completely avoided harmful refrigerants and insulation materials and comfortably met standards on noise levels.

One company undershot some of the mandatory criteria by 40% and won three awards. The three appliances – two chest freezers for supermarkets or petrol stations and a multi-purpose fridge – use isobutane, while the innovative CO_2 -based display-cabinet design achieved a near-20% reduction in energy-use compared to conventional products currently on the market.

The beneficiary estimates from these results that 400GWh of electricity and 9.5million tonnes of CO_2 emissions can be saved annually in the Austrian market alone. Around Europe the saving could be up to 19 000 GWh.

Demonstration of economic benefit was an important element to encourage widespread use of the new technology. One of the winning participants estimated that a store using 20 PRO-

PROCOOL award winners from Frigoglass, Greece.

COOL freezers will be able to save €3 000 a year. Large chains could save as much as €30 million. "No company can ignore these savings much longer", emphasises Bernd Schäppi, LIFE project co-ordinator.

Signs of take-up among big commercial users are encouraging. German supermarket chain Aldi immediately ordered 20 000 of the new eco-freezers and a number of companies including Coca-Cola (Germany) signed statements of intent as soon as the products were unveiled.

Project Number:
LIFE03 ENV/A/000002

Title: Development and successful market penetration of HFC-free and eco-efficient cold appliances for the commercial use

Beneficiary: Österreichische Energieagentur - Austrian Energy Agency (E.V.A.)

Total Budget: €767 000

LIFE Contribution: €371 000

Period: Oct-03 to Sep-06

Website: www.procool.info

Contact: Bernd Schaeppi

Email: schaeppi@eva.ac.at

SuperC: Deep heat from renewable energy

One of the mains forms of renewable energy that can be used all year round in Europe as an alternative to fossil fuels is geothermal energy. This ambitious German LIFE project demonstrated how its use could be successfully incorporated in the design of a large-scale landmark building, with a potential 95% reduction in greenhouse gas emissions.

Heating of buildings causes around 60% of the world's CO_2 emissions and reducing this source is a top priority of EU environment policy. Geothermal heat is one of the few year-round renewable energy source available in Europe. However, tapping into this natural underground energy supply has been seen as technically challenging and expensive, with question marks over its economic viability.

The SuperC LIFE project met the challenges head on by incorporating a geothermal energy supply into the design of an iconic new building at the RWTH Institute of Technology, University of Aachen, Germany.

The building, with 4 600m^2 of floor space, is large enough to house all student services and provide a lively hub for meetings and exhibitions, drawing in people from the city and business world as well as from the university. It incorporates conference rooms under a roof which spans the forecourt, so providing an outside area large enough for events to be held under its canopy in front of an impressive glass façade. The building resembles a giant letter "C" and is known as the SuperC.

An inner city deep drilling project

The bold design for the building's energy system involved drilling a well of 22cm diameter for geothermal heat supply 2 000m deep, directly on the inner-city site. A deep heat exchanger uses the surrounding high-temperature rock to heat the water which is then brought to the surface to both heat the building and cool it when required using an absorption refrigeration system. No heat pump is required and the water system is self-contained, free of corrosion and easily-maintained.

This system can provide 620MWh of renewable energy per year, which is enough to provide 80% of the building's consumption. The exchanger has a peak capacity of 450kw and well temperature of about 81°C. Saving in CO_2 emission is put at 340 tonnes a year.

Additionally, the project tested drilling with an innovative in-hole hammer, which gave promising initial results and technical solutions developed with the University's own Institute for acoustics were used to reduce noise pollution. This was particularly important given the German project's sensitive location in the middle of a city and the need to comply with strict environmental laws.

An important element of the project was to stimulate public debate on the issue of CO_2-free heat supply. Apart from wide dissemination of news, the SuperC building itself will be host to a permanent exhibition about the project. The public will be invited to see for themselves at its opening in 2008.

Geothermal energy is available everywhere so the project has high transferability. The major limitation is the high start-up cost, with the beneficiary estimating it will take 16 to 20 years to break even against traditional energy supply after the initial investment. With an expected life-span of 40 years, this would still represent a good long-term investment and since oil price rises have accelerated, the initial costs could be offset much quicker than initially anticipated.

Fritzer + Pape

The SuperC building in Aachen.

Project Number:
LIFE02 ENV/D/000408

Title: Geothermal energy supply for heating and cooling of the Students' Service Center of RWTH Institute of Technology University of Aachen

Beneficiary: Rheinisch-Westfälische Technische Hochschule Aachen

Total Budget: €5 141 000

LIFE Contribution:
€1 973 000 (maximum)

Period: Apr-02 to Mar-06

Website:
www.superc.rwth-aachen.de

Contact: Axel Preusse

Email:
Geothermie@IFM.RWTH-Aachen.de

BASTA: Promoting healthier buildings

The construction industry has been using thousands of products containing substances which can be a direct danger to the environment or cause illness to those who come into contact with them. Finding an effective way to avert these dangers was the focus of this Swedish LIFE project.

No builder wants to construct buildings containing materials that will cause illness or environmental damage. But too often these effects have emerged later, and then it can be up to the eventual user of the building to show the true origin of the problems and to deal with them.

Of the 45 000-plus substances used in the European construction sector, about 35% contain components that can be classified dangerous at some level - for instance, carcinogenic, mutagenic, allergenic, bio-accumulative, toxic or harmful to ozone. The 11 million people who work in the industry face such hazards daily, and these substances can have a long lifespan creating long-term impact.

New EU laws on chemicals - the REACH regulations - came into force last year and address some of the problems, but how can the aims of the regulations be achieved in practice in the building industry? And what about dangerous materials that are not chemicals?

A re-thinking system

The BASTA LIFE project, which involved four of Sweden's largest construction companies and a national federation, showed how it can be done - with a system that re-thinks the way that controls have traditionally been initiated and applied.

First, the project got the whole national sector – suppliers, manufacturers, builders, developers and property-owners – to agree criteria that all products used in the industry must meet. They set levels in use of dangerous substances in these materials that cannot be exceeded.

The beneficiary then established a central database with a constantly updated register of products that meet the criteria and are therefore safe to use. This database is made freely available on the BASTA website for reference and use by the whole industry.

This system changes the philosophy of the previous listing systems, which have all attempted to list dangerous materials and stop their use. A major problem with such phasing-out lists is that they come with a tacit implication that if a product is not on the list it is safe to use.

Another novel element of the system is that to be registered in the database, a product is self-certified by the manufacturers or suppliers as meeting the criteria. Integrity of the self-certification process is ensured by concentrating strict controls on suppliers before they are allowed to take part and therefore register products. This whole process is then subject to an audit system, again on the supplier.

By the end of the project, 49 manufacturers and suppliers had recognised the commercial advantages of the system and signed agreements allowing them to register products. At the same stage there were 1 100 certified-safe products on the BASTA database.

BASTA

The plan to ensure the long-term future of the scheme is to charge suppliers an annual fee of €1 000 to join. Although the early take-up was relatively small, industry organisations have taken over running the scheme and the hope is that its geographical coverage will spread, as well as provide a model for other European industries.

Project Number:
LIFE03 ENV/S/000594

Title: Phasing Out Very Dangerous Substances from the Construction Industry

Beneficiary: NCC Construction Sverige AB

Total Budget: €1 488 000

LIFE Contribution:
€741 000 (maximum)

Period: Sep-2003 to Aug-2006

Website: www.bastaonline.se

Contact: Lars Jarnhammar

Email: lars.jarnhammar@ivl.se

GAP: Improving the environmental footprint of aircraft panel production

LIFE funds have been applied effectively in France during the demonstration of new environmentally-friendly technology for Europe's aeronautical industry, succeeding in eliminating pollution risks from aircraft panel manufacturing.

High tech 'double curvature panels' are a core component in the aircraft manufacturing industry. These fuselage skin panels strengthen aeroplane structures and their lightweight composition allows reduced oil consumption without impairing the aircraft's overall rigidity. Such crucial plane parts have in the past been produced by a chemical milling process, since no other technology was available.

Chemical milling is largely unique to the aeronautical and aerospace industries and involves soaking aluminium panels in sodium hydroxide baths while the plates are etched to their required specifications. Plates are then washed by four separate rinsing cycles and the overall process creates large volumes of toxic sludge formed from waste water and sodium hydroxide. Sludge is normally eliminated during burning in cement kilns and this increases the overall environmental footprint associated with conventional panel construction techniques. Engineers from Dufieux Industries, a machinery tool company in Grenoble, France, had been exploring options to identify cleaner and more cost efficient plate production technologies. Low impact approaches were favoured by the company and an application for LIFE funds was submitted to pilot an innovative Green Advanced Panels (GAP) mechanical milling process, which produced no toxic sludge and could recycle aluminium wastes for reuse in other products.

Environmental savings

Dufieux Industries' new LIFE funded technology proved itself to be both effective and cost efficient. Their first machine, "The Demonstrator F5X1" was launched in October 2005 and began producing eco-friendly Airbus panels, 6.5 meters long and 2.5 meters wide, after only a few months of rigorous testing. The company expects this production capacity to increase and panel sizes of up 40 m^2 are ultimately expected to be produced by the new machinery.

Airbus was highly satisfied with the resulting technology and prepared plans to replace their previous chemical milling processes with the new GAP mechanical milling machinery. Independent analysis showed that such a switch could make important contributions to implementing the IPPC Directive 96/6 and generate significant environmental savings on an annual basis including:

- A reduction in greenhouse gas emissions equivalent to 6 200 tonnes of CO_2;
- Water savings of up 225 000 cubic meters;
- Reduction in Volatile Organic Compounds of 850 tonnes;
- Savings in chemical use of 6 200 tonnes;
- A reduction in the quantity of waste produced by more than 16 000 tonnes; and
- Reduced electricity consumption of 57 % (4 GWh per year).

Furthermore, the new LIFE funded mechanical milling processes avoids any need for dangerous materials, such as flammable hydrogen used during chemical milling, and so improves health and safety conditions for employees at the plate manufacturing sites. These environmental benefits are augmented by positive economic indicators, with evaluation confirming a 50 % reduction in operating costs, as well as a 20 % reduction in the cost per machined part. Overall forecasts suggest an annual profit of €5 million for the beneficiary from a production run of 7 000 panels.

LIFE is acknowledged as playing a key role in facilitating this cost effective technological leap in green engineering, which is now attracting interest from new aeronautical and space industry clients. The IPPC bureau in Spain has been contacted to discuss the GAP technology becoming a Best Available Technology and Dufieux Industries are anticipating a substantial long term legacy from their LIFE support, both in terms of new, high quality and stable jobs, and also environmental benefits associated with the complete elimination of pollution risks from chemically milled plane panels by aircraft manufacturers across the world.

Project Number:
LIFE05 ENV/F/000062

Title: Clean alternative technology to chemical milling: demonstration of technical, environmental and economic performance of mechanical milling for the machining of complex shaped panels used in the aeronautical and space industries - GAP (Green Advanced Panels) project

Beneficiary: Dufieux Industrie

Total Budget: €8 150 000

LIFE Contribution: €1 900 000

Period: Jan-2005 to Jun-2007

Website: www.dufieux-industrie.com

Contact: René Panczuk

Email: info@dufieux-industrie.com

Greendrachma II: Higher environmental standards in Halkidiki

Sustainable tourism methods were successfully implemented in this Greek LIFE project which adopted an innovative, inclusive and integrated approach linking improved environmental standards with long-term socio-economic benefits for farmers, tourism operators and rural communities.

Halkidiki in northern Greece boasts some of the country's finest coastal landscapes and as such has experienced a significant boom in tourism development over the last two decades. Much of this new economic activity has been concentrated in local 'honey pots'. Here, environmental issues often remain a low priority and socio-economic benefits rarely extend into the rural hinterland. These characteristics are a common feature of mass tourism and represent extremely unsustainable patterns of development.

The regional Development Association of Halkidiki recognised these problems and applied for LIFE Environment support to help the area move away from intensive tourism methods towards more sustainable tourism models. An inclusive, bottom-up based project proposal was designed which concentrated on improving local products and services via a harmonised approach to implementing Integrated Product Policy (IPP) tools.

Collaboration was considered essential to the LIFE project's overall success and initial efforts focused on building support between key public, private and community sector stakeholders. This integrated approach was highly innovative for the area and succeeded in bringing together environmental bodies, hoteliers, farmers and business associations within a sustainable development framework for Halkidiki.

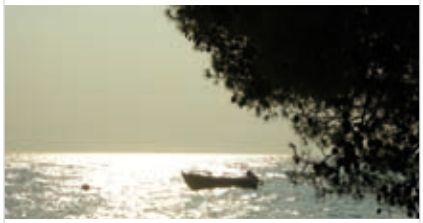
Synergetic links between tourism, food products and agriculture featured prominently in the LIFE project objectives, which also emphasised the benefits from improving environmental standards via IPP tools. The European eco-label was promoted to tourism businesses, food processing companies were encouraged to begin working towards EMAS / ISO 14001 qualifications and sustainable management techniques, under EurepGap standards, were advocated in the agricultural sector.

Early outputs included preparation of an IPP benchmarking initiative and this was welcomed as a valuable, cost-effective tool that helped all local stakeholders identify their own particular contributions to the area's sustainable development objectives. Other on-going LIFE project actions were financed under the title "Green Alliances". These included a green procurement programme, municipal action plans to reuse organic waste and a scheme to market local farm products in conjunction with agro-tourism initiatives. LIFE project staff also organised a 'Green Contest' to award businesses with exceptional environmental performance.

Sustainable benefits

Results from this LIFE project were both productive and popular. Over 35 businesses committed to new IPP environmental standards in farming, food production and tourism. The green procurement programme attracted 31 participants and 14 local authorities received waste management action plans covering energy production from olive waste, industrial composting, on-site composting and production of biodiesel from cooking oil or animal fats. Olives, feta, timber and other local products were profiled at six events for local tourism businesses and visitors. Good practice guidance on sustainable tourism techniques was widely disseminated and several dedicated websites were produced.

All of these outcomes demonstrate the success of the project's sustainable tourism policies, which is reinforced by LIFE project manager, Theodore Syrganides, who says, "We have learned many useful lessons during the project and thanks to LIFE we are now well placed to develop our area in a more harmonised and environmentally sensitive manner", adding "We are confident that our efforts have made a long-term difference and we look forward to continuing our integrated approach to supporting our communities and protecting the natural beauty of Halkidiki."



Project Number:
LIFE04 ENV/GR/000145

Title: Promoting sustainable Development in the Region of Halkidiki through Concerted Pilot Actions on Integrated Product Policy Tools

Beneficiary: Development Association of Halkidiki

Total Budget: €1 324 500

LIFE Contribution:
€662 000 (maximum)

Period: Oct-2004 to Dec-2006

Website: www.greendrachma.gr

Contact: Theodore Syrganides

Email: info@anetxa.gr

Selected LIFE publications

LIFE-Focus brochures

A number of LIFE publications are available on the LIFE website:

LIFE on the farm: Supporting environmentally sustainable agriculture in Europe (2008 - 60 pp. - 978-92-79-08976-3)
http://ec.europa.eu/environment/life/publications/lifepublications/lifefocus/documents/agriculture.pdf

LIFE and endangered plants: Conserving Europe's threatened flora (2007 - 52 pp. - ISBN 978-92-79-08815-5)
http://ec.europa.eu/environment/life/publications/lifepublications/lifefocus/documents/plants.pdf

LIFE and Europe's wetlands: Restoring a vital ecosystem (2007 - 68 pp. - ISBN 978-92-79-07617-6)
http://ec.europa.eu/environment/life/publications/lifepublications/lifefocus/documents/wetlands.pdf

LIFE and waste recycling: Innovative waste management options in Europe (2007 - 60 pp. - ISBN 978-92-79-07397-7)
http://ec.europa.eu/environment/life/publications/lifepublications/lifefocus/documents/recycling.pdf

LIFE and Europe's rivers: Protecting and improving our water resources (2007 – 52pp. ISBN 978-92-79-05543-0 - ISSN 1725-5619)
http://ec.europa.eu/environment/life/publications/lifepublications/lifefocus/documents/rivers.pdf

LIFE and Energy: Innovative solutions for sustainable and efficient energy in Europe (2007 – 64pp. ISBN 978 92-79-04969-9 - ISSN 1725-5619)
http://ec.europa.eu/environment/life/publications/lifepublications/lifefocus/documents/energy_lr.pdf

LIFE-Third Countries 1992-2006 (2007, 64 pp. – ISBN 978-92-79-05694-9 – ISSN 1725-5619)
http://ec.europa.eu/environment/life/publications/lifepublications/lifefocus/documents/TCY_lr.pdf

LIFE and the marine environment (2006 – 54pp. ISBN 92-79-03447-2- ISSN 1725-5619)
http://ec.europa.eu/environment/life/publications/lifepublications/lifefocus/documents/marine_lr.pdf

LIFE and European forests (2006 - 68pp. ISBN 92-79-02255-5 - ISSN 1725-5619)
http://ec.europa.eu/environment/life/publications/lifepublications/lifefocus/documents/forest_lr.pdf

LIFE in the City: Innovative solutions for Europe's urban environment (2006, 64pp. - ISBN 92-79-02254-7 – ISSN 1725-5619) *http://ec.europa.eu/environment/life/publications/lifepublications/lifefocus/documents/urban_lr.pdf*

Integrated management of Natura 2000 sites (2005 - 48 pp. – ISBN 92-79-00388-7) *http://ec.europa.eu/environment/life/publications/lifepublications/lifefocus/documents/managingnatura_lr.pdf*

LIFE, Natura 2000 and the military (2005 - 86 pp. – ISBN 92-894-9213-9 – ISSN 1725-5619) *http://ec.europa.eu/environment/life/publications/lifepublications/lifefocus/documents/military_en.pdf*

LIFE for birds: 25 years of the Birds Directive: the contribution of LIFE-Nature projects (2004 - 48 pp. – ISBN 92-894-7452-1 – ISSN 1725-5619)
http://ec.europa.eu/environment/life/publications/lifepublications/lifefocus/documents/birds_en.pdf

The air we breathe: LIFE and the European Union clean air policy (2004 - 32 pp. – ISBN 92-894-7899-3 – ISSN 1725-5619)
http://ec.europa.eu/environment/life/publications/lifepublications/lifefocus/documents/lifeair_hr.pdf

LIFE-Nature: communicating with stakeholders and the general public – Best practice examples for Natura 2000 (2004 - 72 pp. – ISBN 92-894-7898-5 – ISSN 1725-5619)
http://ec.europa.eu/environment/life/publications/lifepublications/lifefocus/documents/natcommunicat_lr.pdf

A cleaner, greener Europe: LIFE and the European Union waste policy (2004 - 28 pp. – ISBN 92-894-6018-0 – ISSN 1725-5619) *http://ec.europa.eu/environment/life/publications/lifepublications/lifefocus/documents/waste_en.pdf*

Other publications

Best LIFE-Environment Projects 2006-2007 (2007, 44 pp.-ISBN 978-92-79-06699-3 ISSN 1725-5619)
http://ec.europa.eu/environment/life/publications/lifepublications/bestprojects/documents/bestenv07.pdf

Best LIFE-Environment Projects 2005-2006 (2006, 40 pp.-ISBN 92-79-02123-0) *http://ec.europa.eu/environment/life/publications/lifepublications/bestprojects/documents/bestenv06_lr.pdf*

Best LIFE-Environment Projects 2004-2005 (2005, 44 pp. – ISBN 92-79-00889-7) *http://ec.europa.eu/environment/life/publications/lifepublications/bestprojects/documents/bestenv05_lr.pdf*

LIFE-Environment 1992 – 2004 "Demonstrating excellence in environmental innovation" (2005, 124 pp. – ISBN 92-894-7699-3 – ISSN 1725-5619)
http://ec.europa.eu/environment/life/publications/lifepublications/lifefocus/documents/lifeenv92_04.pdf

LIFE-Environment Projects 2006 compilation (2006, 56 pp.-ISBN 92-79-02786-7)
http://ec.europa.eu/environment/life/publications/lifepublications/compilations/documents/envcompilation06.pdf

LIFE-Nature Projects 2006 compilation (2006, 67 pp. – ISBN 92-79-02788-3)
http://ec.europa.eu/environment/life/publications/lifepublications/compilations/documents/natcompilation06.pdf

LIFE-Third Countries Projects 2006 compilation (2006, 20 pp. – ISBN 92-79-02787-5) *http://ec.europa.eu/environment/life/infoproducts/lifetcycompilation_06.pdf*

A number of printed copies of certain LIFE publications are available and can be ordered free-of-charge at: *http://ec.europa.eu/environment/env-informa/*

The programme

LIFE "**L**'**I**nstrument **F**inancier pour l'**E**nvironnement" / The financial instrument for the environment

Period covered (LIFE III) 2000-2006.

EU funding available approximately EUR 945 million.

Type of intervention co-financing actions in favour of the environment (LIFE projects) in the Member States of the European Union, in associated candidate countries and in certain third countries bordering the Mediterranean and the Baltic Sea.

LIFE projects

> **LIFE Nature projects** improve the conservation status of endangered species and natural habitats. They support the implementation of the Birds and Habitats Directives and the Natura 2000 network.
> **LIFE Environment projects** contribute to the development of innovative and integrated techniques or methods to support environmental progress.
> **LIFE Third Countries projects** support environmental capacity building and initiatives in non-EU countries bordering the Mediterranean and the Baltic Sea.

LIFE+ "**L**'**I**nstrument **F**inancier pour l'**E**nvironnement" / The financial instrument for the environment

Period covered (LIFE+) 2007-2013.

EU funding available approximately EUR 2,143 million

Type of intervention at least 78% of the budget is for co-financing actions in favour of the environment (LIFE+ projects) in the Member States of the European Union and in certain non-EU countries.

LIFE+ projects

> **LIFE+ Nature projects** improve the conservation status of endangered species and natural habitats. They support the implementation of the Birds and Habitats Directives and the Natura 2000 network.
> **LIFE+ Biodiversity projects** improve biodiversity in the EU. They contribute to the implementation of the objectives of the Commission Communication, "*Halting the loss of Biodiversity by 2010 – and beyond*" (COM (2006) 216 final).
> **LIFE+ Environment Policy and Governance projects** contribute to the development and demonstration of innovative policy approaches, technologies, methods and instruments in support of European environmental policy and legislation.
> **LIFE+ Information and Communication projects** are communication and awareness raising campaigns related to the implementation, updating and development of European environmental policy and legislation, including the prevention of forest fires and training for forest fire agents.

Further information further information on LIFE and LIFE+ is available at http://ec.europa.eu/life.

How to apply for LIFE+ funding The European Commission organises annual calls for proposals. Full details are available at http://ec.europa.eu/life/funding/lifeplus.htm

Contact

European Commission – Directorate-General for the Environment
LIFE Unit – BU-9 02/1 – B-1049 Brussels – Internet: http://ec.europa.eu/life

LIFE Focus / Best Life Environment projects 2007-2008

Luxembourg: Office for Official Publications of the European Communities

ISBN 978-92-79-09325-8
ISSN 1725-5619
DOI 10.2779/13906

KH-AJ-08-002-EN-N

Publications Office
Publications.europa.eu

ISSN 1725-5619

ISBN 978-92-79-09325-8