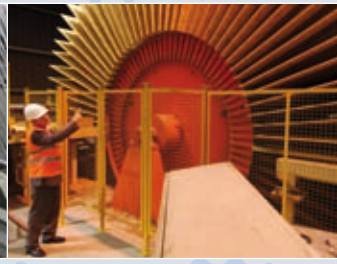
LIFE III

focus



Breathing LIFE into greener businesses

Demonstrating innovative approaches to improving the environmental performance of European businesses

EUROPEAN COMMISSION

environment

European Commission
Environment Directorate-General

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Authors: Nora Schiessler, Tim Hudson, Ed Thorpe. **Editorial department:** Eamon O'Hara (Astrale GEIE-AEIDL). **Managing editor:** Philip Owen, European Commission, Environment DG, LIFE Unit – BU-9, 02/1, 200 rue de la Loi, B-1049 Brussels. **LIFE Focus series coordination:** Simon Goss (LIFE Communications Coordinator), Evelyne Jussiant (DG Environment Communications Coordinator). **Graphic design:** Daniel Renders, Anita Cortés. **The following people also worked on this issue:** Remo Savoia, Igor Jelinski, Pekka Hänninen, Marion Pinatel, Agnese Roccato, Mariona Salvatella, Mathilde Snel, Audrey Thenard. **Acknowledgements:** Thanks to all LIFE project beneficiaries who contributed comments, photos and other useful material for this report. **Photos:** Cover: LIFE02 ENV/NL/000114, European Commission, LIFE06 ENV/D/000471-Thomas Mayer, Tim Hudson, Inside: From the respective projects unless otherwise specified – This issue of LIFE Focus is published in English with a print-run of 5,000 copies and is also available online.

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Foreword

Philip Owen

Europe's businesses have a primary role to play in ensuring a sustainable future for the environment and the economy. This is not only because many business activities depend on the earth's natural resources, but also because some of these activities can have serious negative impacts on both the long-term availability and future quality of global environmental resources.

The European Union has adopted the concept of sustainable development to address the challenge of balancing economic growth with a high level of environmental protection. Sustainable development involves finding ways to limit pressures on the environment, while also allowing businesses to compete and prosper in the global market place and create new and better jobs. The idea was enshrined as one of the objectives of the Union in the Amsterdam Treaty, and has since been complemented by numerous pieces of environmental legislation on specific issues, as well as by the mainstreaming of environmental protection in other Community policies.

There are clear signals that many industrial sectors are moving towards cleaner and more sustainable production processes to meet high European environmental requirements. For example, about half of the pollutants monitored by the European Pollutant Emission Register decreased by 10% from 2001 to 2004 and only one sixth of the pollutant emissions increased by 10%.

Nor do environmental policies have to have a negative impact on business performance. They can actually play a guiding, and sometimes even a driving role in reducing costs and improving efficiency and performance. Environmental sustainability is increasingly recognised as a competitive advantage among European businesses. The eco-industry itself has become one of Europe's strongest industrial sectors, enjoying a 5% annual growth rate, well above that of other economic sectors.

Technology is a double-edged sword. Technological developments are responsible for the environmental challenges we face, but also can offer us the solutions to these problems. At the same time a sustainable and prosperous European economy depends on innovation and technology. Here, the European Commission's LIFE (Financial Instrument for the Environment) programme has played an important role, demonstrating innovative approaches to improving the environmental performance of businesses and industry in Europe. To date, more than 480 projects co-financed by LIFE are business or industry related, addressing a variety of sectors and environmental challenges. Additional financial support for the development of innovative green technologies is now also available from the European Commission's Competitiveness and Innovation Framework Programme (CIP), which channels its assistance towards commercial and private sector businesses.

This LIFE-Focus brochure supports the view of the EU Environment Commissioner, Stavros Dimas, that "going green is a 'win-win' approach for both business and the environment." Nineteen successful LIFE projects from 11 countries are showcased, representing a small but valuable selection of the numerous successful LIFE initiatives supporting companies to strengthen their environmental performance.

Presented in sections that reflect Europe's main industrial sectors, this publication presents good business practice, which can guide and inspire businesses across the EU. I hope that these practical examples will highlight the economic benefits available and motivate even more European companies to take the decision to enhance their green credentials. After all, eco-innovation can be good for business and good for the environment.

Philip Owen
Head of Unit - LIFE
Directorate-General for the Environment
European Commission

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Europe's business "environment"

In 2008, over 19 million enterprises were active within the EU-27 economy. These businesses have the potential to contribute to a prosperous and environmentally sustainable future for Europe. However, business activities and industrial processes can still exert considerable pressure on the environment, thereby also threatening Europe's long-term economic and social welfare.

Europe's economic prosperity and future growth depend to a large extent on natural resources and environment services, including: raw materials, such as minerals, biomass and biological resources; environmental media, such as air, water and soil; flow resources such as wind, geothermal, tidal and solar energy; and landmass, that is used either to produce food, materials and energy, or as sinks that absorb emissions or waste.

These natural resources and services are used by businesses to generate products and wealth. However, business activity can also exert pressures on the environment. The past 50 years have seen a rapid and extensive alteration of ecosystems by humans, largely driven by the need to meet growing demands for food, fresh water, timber, fibre and fuel. Well-known environmental problems associated with this growth, such as deforestation, loss of biodiversity and soil degradation are now being joined by new problems linked to industrialisation, such as rising greenhouse gas emissions, air and water pollution, expanding waste volumes, desertification and chemical pollution. Environmental degradation and depletion of natural resources will continue until practical solutions to these problems are developed. Current patterns of resource use are clearly not sustainable, in Europe or globally.

Challenges

The great challenge for policymakers is to facilitate and stimulate growth without damaging the environment. Sustainable patterns of economic and industrial development are needed, based on new innovations that benefits both businesses and the environment.

Photo: Tim Hudson

Making business greener creates challenges and offers opportunities for all EU industries.

High levels of environmental protection, sustainable resource use, economic growth and social cohesion are considered mutually reinforcing policy goals by the EU. These aims are reflected in numerous pieces of environmental legislation and policies, as well as in environmental considerations integrated into all policy sectors. Other policy instruments promote the development of environmentally friendly industrial activities.

… and opportunities

Achieving these goals will require efforts from business, but greening the economy can also present companies with opportunities to cut costs, exploit new markets or to achieve competitive advantage in existing markets. Not only is it usually more cost effective to avoid environmental problems at source rather than try to remedy them later, but companies that take care of the environment often quickly recoup their initial investments; gains in energy efficiency and waste reduction, for example, often translate into tangible operational savings. Additionally, companies that innovate to maximise the efficiency of their resource consumption can also enhance their brand image in the marketplace.

Recognising that good environmental performance can be good for economic competitiveness and profitability, European businesses have already made considerable progress in reducing their environmental impact. This has been strongly supported by the fact that businesses were the first target of EU environmental regulation.

Furthermore, those businesses that market environmental technologies operate in an increasingly dynamic sector. EU eco-industries have enjoyed a healthy annual growth rate of around five percent since the mid-1990s and are now one of Europe's biggest industrial players. It is also important to remember that green industries have the potential to create new and better jobs that will offset job losses in more traditional industries.

The EU will continue its efforts to drive progress towards more sustainable industrial practices. Key aspects will include:

- practical and viable ways to make new and better use of industrial waste streams;
- improving resource productivity, efficiency and cost effectiveness;
- improving consumption patterns
- enhancing the overall environmental performance of products throughout their life cycle;
- increasing demand for environmentally sustainable products and production technologies;
- promotion of eco-innovation and eco-technologies;
- accelerating the time taken to convert green technology research ideas into commercial business products; and
- making environmental concerns an integral part of the production processes for all products.

Greening EU businesses: Policy and legislation

The European Union is aware that some business activities can create considerable pressures on the environment. Since 2001 the EU has prioritised strategic approaches that integrate environmental objectives into economic and social policies and programmes.

Photo: European Commission

Integrating environmental considerations into other Community policies is key for the European Union

European legislation lays down rules aimed at preventing pollution and repairing any damage that companies can cause to the environment. It also contains measures aimed at promoting the development of environmentally friendly business activities. The EU's objective is to limit the risk of possible negative impacts that businesses might have on the environment, while at the same time not hampering their development. This includes numerous corrective measures relating to specific environmental problems.

However, sufficient levels of environmental protection and the promotion of sustainable development cannot be achieved through environmental regulations and policies alone. In Article 6 of the **treaty** establishing the European Community, the EU recognises the need to find solutions for integrating environmental concerns and sustainable development into all policy sectors. This also includes basic principles of Community action on the environment, in particular the precautionary principle and the polluter pays principle, which are set out in Article 174 of the EC Treaty.

Specific environmental legislation

Several individual pieces of legislation cover business discharges into **soil**, including rules on the biodegradability of detergents, persistent organic pollutants, nitrates and mercury. Specific sectors whose activities impact on soil are also covered by other legislation, such as waste landfill, extractive industries and agriculture. Future action to protect soil is laid out in the Communication 'Towards a thematic strategy for soil protection' adopted by the Commission in 2006, and in the proposal for a soil Framework Directive, currently under discussion by the European Parliament and the European Council.

Effluent emissions from specific industrial and agricultural sectors, urban waste water and dangerous substances are all controlled by EU legislation that aims to minimise pollution and improve the quality of Europe's **drinking water**, **rivers**, **lakes** and **seas**. The overarching EU legislation on water quality standards is the Water Framework Directive, covering both surface waters and groundwater. Discharges into water from a number of business sectors, particularly food production, are also controlled under EU rules on **urban waste water.**

Interim objectives for **air pollution** in the EU, plus appropriate meas-

ures to achieve them, are established by the EU's proposal for a thematic strategy on air pollution. It is closely linked to the Directive on **ambient air quality**, which stresses the importance of combating emissions of pollutants at source and identifying and implementing emission reduction measures at local, national and Community level. To reduce acidification, eutrophication and tropospheric ozone formation, the EU also sets limits on pollutant emissions from large combustion plants and the emissions of specific pollutants, such as: sulphur dioxide; nitrogen oxide; particulate matter and lead; volatile organic compounds; and ammonia.

The reduction of CO_2 emissions is the aim of the EU's **emissions trading scheme** (ETS). This is designed to help the EU Member States meet their commitments under the international agreement on climate change - the Kyoto Protocol - in a cost-effective manner. It covers over 11 500 energy-intensive installations across the EU, including combustion plants, oil refineries, coke ovens, and iron and steel plants. Factories making cement, glass, lime, brick, ceramics, pulp and paper are also included within the ETS. Discussions are ongoing about extending the scope of the ETS to include greenhouse gases (other than CO_2) and all major industrial emitters.

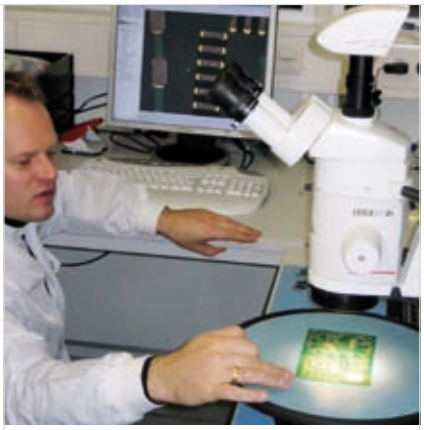


Photo: LIFE05 ENV/D/000197

EU legislation regulates the materials that can be used in electronic equipment

Several pieces of legislation and initiatives at Community level aim to increase **energy efficiency** within the EU. The manufacturing industry, for example, is estimated to be able to reduce its energy use by 25% and uniform standards have been set to improve the efficiency of commercial properties, particularly via their heating and air-conditioning equipment.

A single framework establishes maximum levels of **noise** by equipment used outdoors – such as compressors, excavator-loaders, saws, mixers or lawnmowers – in construction and other industries. Manufacturers have to ensure that the equipment they produce complies with uniform noise standards and label them appropriately. Users must ensure their equipment meets these standards. Under health and safety requirements, employers have the additional responsibility to provide protection to workers when noise is above a certain level in their workplace.

European legislation sets out detailed rules on different aspects of **waste** and its management. Based on the "producer responsibility" principle, businesses must ensure that the waste they produce or handle is treated in an efficient, safe and environmentally friendly way – and pay for the costs of treatment. The waste Framework Directive sets guidelines for waste management in Member States, having a direct or indirect impact on all other EU legislation related to waste. Specific additional legislation covers waste in the form of packaging, vehicles, batteries, oils, electrical and electronic equipment, food, sewage sludge, polychlorinated bi- and terphenyls (PCBs and PCTs), as well as hazardous waste. Legislation also covers recycling, landfill, incineration and shipments of waste.

Thematic strategies to prevent and recycle waste and on the sustainable use of natural resources adopted in 2005 strengthen the life-cycle approach and encourage businesses to adopt more sustainable waste management systems, reducing the amount of waste produced, minimising the environmental impact of waste and reducing the use of resources.

The way that chemicals are controlled in the EU underwent a major change with the passing of the EU's Regulation on the **registration**, **evaluation**, **authorisation** and **restriction of chemicals** (REACH) at the end of 2006. This Regulation puts an obligation on all companies that produce or use chemicals to ensure they are safe. The most dangerous chemicals will be phased out and replaced with safer alternatives. In effect, businesses must prove that substances they produce or use are safe – a change from the previ-

REACH aims to protect human health and the environment as well as enhance innovative capability in the EU chemicals industry

ous way chemicals were regulated, which put the burden of proof on the authorities. Furthermore, the Directive on the control of **major-accident hazards involving dangerous substances** aims at minimising the risk of industrial accidents and their consequences.

Another important directive for Europe's businesses concerns **integrated pollution prevention and control** (IPPC). The IPPC Directive is a cornerstone of EU legislation addressing industrial installations and agricultural activities that are classified as having a high pollution potential. The operators of these businesses are legally obliged to hold a permit containing requirements for the protection of air, water and soil, waste minimisation, accident prevention and, if necessary, site clean-up. These requirements must be based on the principle of best available techniques (BAT) to ensure the businesses operate using the cleanest technology possible.

For electrical and electronic devices, the energy using products Directive sets rules on **eco-design**, while the Directives for waste electrical and electronic equipment and restriction of hazardous substances regulate the materials that can be used in **electrical or electronic equipment** and how they are treated once they become waste. **The End-of-Life Vehicles** Directive does the same for scrap road vehicles.

EU legislation and innovation support improved management of end-of-life vehicles

Photo: LIFE06 ENV/IT/000241

Green policy promotes the replacement of highly polluting and unhealthy production methods with advanced ecologically sustainable technology

Promoting green policy

Encouraging environmentally friendly production, use and disposal of products is a focus of the aforementioned EU policy initiatives. Businesses have to comply with the legal controls, but can also benefit from opportunities present in several pieces of legislation and initiatives to promote green business operations.

Integrated product policy (IPP) is used to promote sustainable production and consumption by looking to anticipate environmental threats as well as responding to their eventual emergence. This requires consideration of immediate and future environmental impact from each of the stages of production, from the extraction of natural resources, through product design, manufacture, assembly, marketing, distribution, sale and use, to the product's eventual disposal as waste.

IPP is therefore based on a **life-cycle approach** to the environmental management of any given product. To minimise the negative environmental impacts of a product, all stages of its life are examined and action taken where it is most effective. Integrating the concept into industrial processes aims to make products more environmentally friendly and less resource hungry. It involves the many different professionals working at each of these stages, as well as consumers.

Part of IPP looks at ways in which the market can promote the adoption of greener products and services. One aspect of this is encouraging **green public procurement**, in which public purchasers set environmental criteria when buying products, services or works. Innovative and eco-efficient companies are increasingly taking advantage of the possibilities offered by green public procurement.

As part of the EU's policy towards encouraging voluntary action for the environment, the Commission set up the **eco-management and audit scheme** (EMAS). EMAS provides a management tool for companies and other organisations to help them evaluate, report and improve their environmental performance. Available for companies in industrial sectors to participate since 1995, it has been open to all economic sectors since 2001. A revision was proposed by the European Commission in July 2008 to increase companies' participation and reduce administrative burdens, particularly for small and medium enterprises (SMEs).

The EU **Eco-label** is a voluntary scheme designed to encourage businesses to market and brand products and services that are more environmentally friendly. Companies are able to apply for the eco-label recognis-

ing the good environmental performance of their product or service. When awarded, consumers are able to easily identify greener products by the universal brand label – a flower. It is foreseen to extend the scheme to cover a wider range of products and services.

To complement these policy instruments and provide measures where gaps exist, the European Commission presented in July 2008 a series of proposals that aim to contribute to improving the environmental performance of products and increase the demand for more sustainable goods and production technologies. An **Action Plan on sustainable production and consumption and sustainable industrial policy** aims to "improve the energy and environmental performance of products and foster their uptake by consumers." A **Communication on public procurement for a better environment** seeks to promote the implementation of green public procurement. There have also been proposals for **revision of the Eco-label and EMAS schemes** and of the **Directive on the eco-design of energy-using products**. These new proposals will be discussed by the European Parliament and the Council of the EU in the next months.

The 2004 Environmental Technologies Action Plan (ETAP) aims to remove financial, economic and institutional obstacles to stimulate the development and use of environmental technologies protecting the environment while contributing to competitiveness and economic growth.

The EU eco-label encourages businesses to improve their environmental performance to boost their image

Integrating the environment

Key developments on the integration of the environment into other Community policies include the **Cardiff Process**, the EU Strategy for Sustainable Development, and the 6th Environmental Action Programme. The Cardiff process, initiated as the result of Article 6 of the EC Treaty, was the outcome of the Cardiff Summit of June 1998, where EU Member States kicked off the development of strategies for industry, energy, economic and financial affairs, as well as six other sectors, that all took specific account of environmental considerations within their activities.

The **strategy for sustainable development**, adopted by the European Council during the Gothenburg Summit in June 2001, prioritises environmental problems, such as climate change, as more prominent responsibilities for Member States. In consequence, an environmental dimension was added to the Lisbon Strategy for economic and social renewal. This aimed to coordinate EU policies addressing the economy, environment and social problems within the context of sustainable development. All EU-adopted sectoral integration polices must now "have sustainable development as their core concern," especially during review procedures.

The **environment action programmes** (EAP) define the priorities and objectives of European environment policy and set out measures to be taken to implement the EU's sustainable development strategy. The 6th EAP, adopted in 2002, reaffirmed the importance of the principle of integration of the environment into other EU polices. It laid the foundations needed to create horizontal thematic strategies to develop positive synergies with the Lisbon Strategy's growth and employment objectives. The 6th EAP also established additional mechanisms to implement the Treaty provisions on integration and to further develop indicators to monitor the integration process.

Without being an exhaustive list, the EU policies and initiatives set out above highlight the range of measures taken at EU level to safeguard the environment and to encourage - and where necessary enforce – the transition to a greener and cleaner business environment. Sustainable economic growth in the EU clearly depends on the capacity of businesses to effectively address environmental concerns and take advantage of environmental opportunities. The LIFE programme and its successor LIFE+ are one tool among others to promote such sustainable business practices.

In 2007 the European Union introduced LIFE+ with a remit that includes providing support for green technologies and increasing the uptake of environmental considerations in business practices. Much of LIFE+ activity focuses on business operations within the EU's public sector. Private sector businesses are now able to receive dedicated support for environmental improvements via an eco-innovation strand of the European Commission's Competitiveness and Innovation Framework Programme (CIP).

LIFE: Supporting innovative green business and industry activities

The effective integration of sustainable development into industrial policy cannot be based on legislative requirements alone. Positive stimuli are also needed to encourage green business activities. The main drivers for a shift in corporate approaches are increasingly market-led or voluntary initiatives, of which many tangible and prudent examples exist.

Integrating environmental concerns into industrial policy is an important aim of the European Union and its Member States. Improved environmental performance evolves, however, not only from enforcement of respective EU or national regulations, but also from political and financial incentives for a behavioural change in the core operations of European companies.

The EU has instruments that foster such mindsets. These are designed to favour the development of environmentally friendly economic activities, support the competitiveness of businesses that meet environmental standards and provide assistance to companies working towards improving the environment. Among these incentives is funding from the European Commission's LIFE programme, the EU's financial instrument for the environment.

LIFE supported the development of green computers

Photo: LIFE00 ENV/IRL/000764

Photo: LIFE05 ENV/L/000047

LIFE has been a popular and beneficial green business instrument for EU manufacturers

LIFE continues to make significant contributions to the development and implementation of different initiatives directed at improving environmental performance in a broad spectrum of business sectors. A specific objective of its LIFE Environment component focuses on co-financing pilot and demonstration projects that help bridge gaps between the results of research and development and their large-scale commercial application. For more details on Community financing for innovative green technologies and business from 2007 please see page 56.

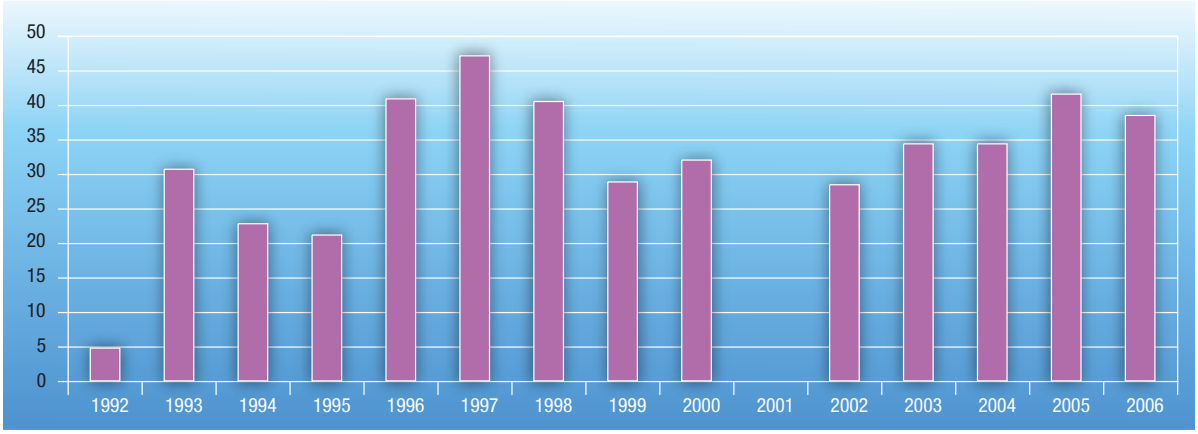
One third of all LIFE Environment projects contribute to greening business

Over the past 17 years, the LIFE programme has demonstrated that compliance with environmental legislation and better management of environmental risks and impacts can go hand in hand with many economic benefits. These include new business opportunities, stimulation of innovative thinking, cost reductions and improved company image.

More than 480 projects related to greening business and industry performance have been co-financed by LIFE since 1992. This means that roughly one third of all LIFE Environment projects have dealt with industrial or economic activities and numerous LIFE Third Country projects have also generated green business results.

Project themes developed by LIFE beneficiaries have covered all of Europe's key environmental challenges. Inter alia, these include: water protection; waste management; reduction of air and noise pollution; clean technologies; soil protection; sustainable use of resources; and reducing product-related environmental impacts through integrated product policies.

Figure 1: **Percentage of LIFE Environment projects dealing with industry & business issues**



Since 1992, more than 480 LIFE Environment projects related to greening industry and business performance have received funding. (Note that a cumulative budget covered 2000 and 2001.)

LIFE has also addressed a broad variety of industrial and business sectors, such as food processing, automobile manufacturing, iron and steel production, wood-based industries, and leather and textile factories, to name the most prominent.

During the different programme periods, LIFE's support for these activities has remained relatively stable with a slight increase over the years. Yet it can be noted that LIFE II (1996-1999) experienced a prominent peak with nearly half of the 1997 LIFE Environment projects dealing with business and industries.

Not surprisingly, private enterprises constitute the biggest portion (63% in total) of the programme's beneficiaries for projects dealing with business and industry issues. A detailed examination of the LIFE project approvals reveals that SMEs are the most active in supporting green business developments (27%), closely followed by international enterprises (26%). Universities and research institutions (15%) have also been active participants in progressing environmentally sound business practices, as have public sector organisations such as local (8%) as well as regional and national authorities (5%). Public enterprises, professional associations and large enterprises are more or less equally represented (with around 4% each).

These figures not only highlight the private sector's growing interest in greening their businesses and in taking the opportunity to stimulate innovation and create new economic prospects, but also mirror a key EU commitment to support small and medium-sized enterprises in fulfilling their environmental obligations. The figures show how LIFE has provided an important Community mechanism for helping SMEs meet many different environmental compliance requirements.

Analysis of country data shows that most green business-related projects were implemented in Member States with large industrial bases. Italy (84) and Spain (73) top the list, followed by Germany (60), the Netherlands (53) and France (45). A balanced picture emerges when we examine the proportion of business-related LIFE Environment projects in Member States. Nineteen countries have received LIFE support for green business activities and in twelve of these countries the proportion ranges between 22% and 37% of project approvals.

Figure 2: **LIFE Environment projects dealing with industry & business issues by approach**

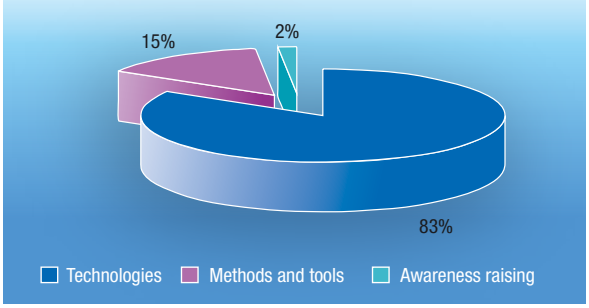


Figure 3: **LIFE Environment projects by approach**

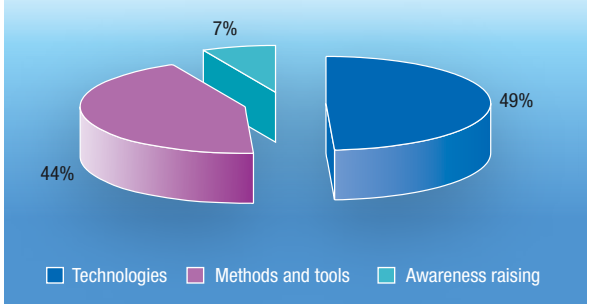
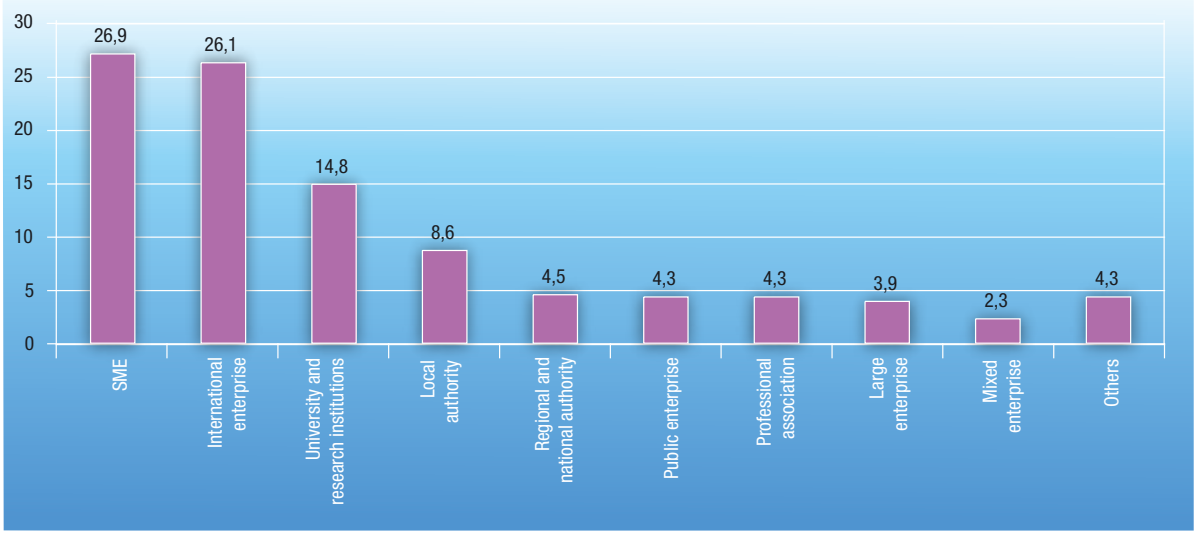


Figure 4: **Percentage of industry & business -related LIFE Environment projects per type of beneficiary**



These figures confirm a Europe-wide appreciation among companies and organisations of the importance of improved environmental performance and the usefulness of LIFE as an instrument to achieve such goals.

Improved performance in green business operations requires a change in behaviour and a commitment to implement practical environmental improvements, such as energy, water and natural resource savings, waste minimisation or reductions in air and noise pollution for example. These can be achieved through improvements in working methods, but above all, through the development of new technologies. Therefore, while generally 'only' half of LIFE Environment projects deal with 'hard' technology, around 80% of all business-related LIFE projects are technology focused.

Spreading good practice

The exchange of information and good practices is vital to improve the environmental performance of businesses and industries. Increasing awareness and understanding, particularly of the economic benefits and cost savings of better eco-efficiency, is therefore also the aim of this LIFE Focus publication. Nineteen projects are being showcased in detail, another ten are mentioned. The featured projects have been implemented in eleven Member States. They are presented in sections that reflect Europe's main industrial sectors which are: basic industries; tourism; food and life science industries; machine and system industries; as well as clothing and design industries*.

Many of the selected projects clearly underline the potential of the LIFE programme to foster 'win-win' results. Additional exciting projects dealing with 'greening business' are also listed in the back of this publication (see page 53), whilst many more can be found on the LIFE website's project database at: http://ec.europa.eu/life.

LIFE projects have successfully demonstrated the cost savings of eco-efficiency – such as by re-integrating waste materials back into the production process

Photo: LIFE00 ENV/E/000452

** This classification bases on common industry challenges and similarities. See: Implementing the Community Lisbon Programme: A policy framework to strengthen EU manufacturing - towards a more integrated approach for industrial policy (COM(2005) 474 final)*

Basic industries

Europe's basic industries (metals, chemicals and timber) provide raw materials for a large proportion of all EU industries and the sector accounts for some 40% of EU manufacturing value added. As suppliers of such important business inputs, the basic industries are also a source of innovation for other sectors.

Some of the main environmental challenges for these largely intensive industries relate to energy use and pollution control. The REACH legislation is particularly relevant for Europe's chemicals industry and other key green regulatory tools include legislation covering air emissions, water quality and waste management.

LIFE support has been used by many different basic industries to help demonstrate successful green business technologies such as measures to minimise pollution from volatile organic compounds (VOCs), new eco-friendly production processes, alternative manufacturing approaches that reduce toxic waste and innovative - often industry-led - self-regulatory procedures.

ECOSB: Reducing emissions from wood-panel processing

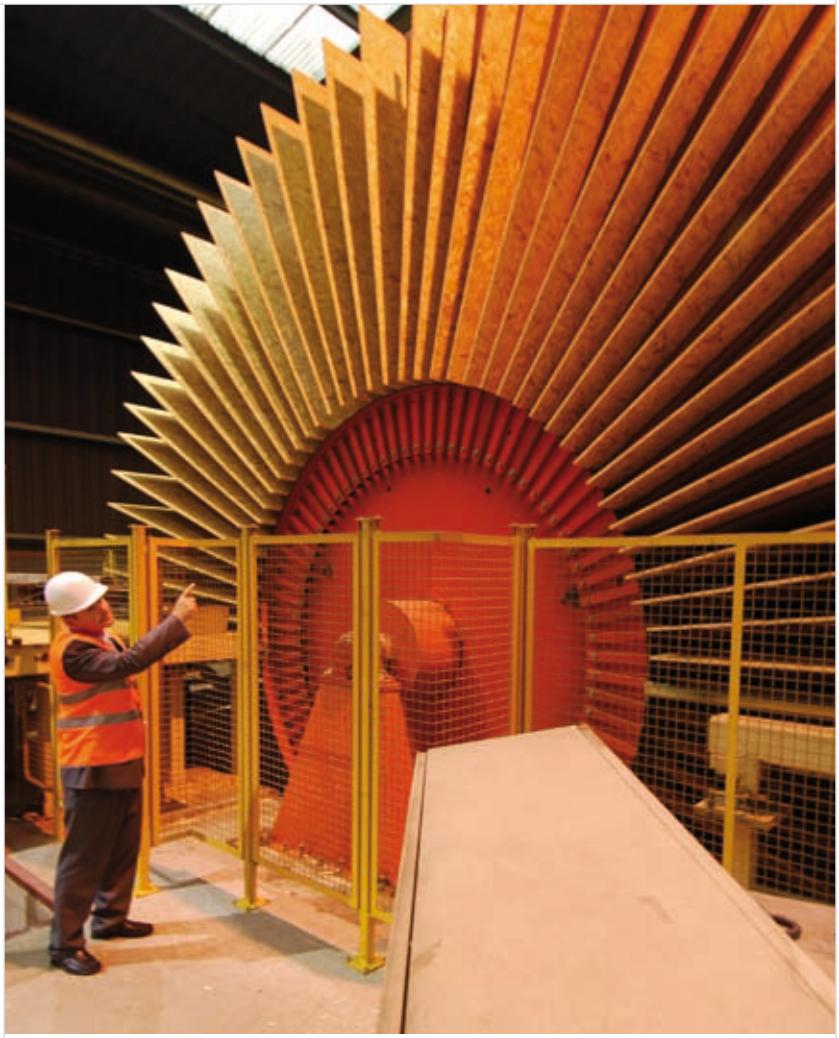
A Luxembourg-based wood-processing company has successfully harnessed LIFE support to introduce new production technology that dramatically reduces emissions of Volatile Organic Compounds in order to improve the environmental efficiency of wood panel boards that are used extensively by Europe's building industry.

Oriented strand boards (OSBs) comprise wood-based panels, made from three layers of dried wood flakes which are glued and pressed together under intense heat. Commonly used by the building trades, OSB panels are lighter and stronger than ordinary wooden planks.

Conventional manufacturing processes for OSB panels create high levels of volatile organic compound (VOC) emissions which are mainly attributed to the natural terpenes and waxes found in the soft wood raw materials. These VOCs pose a strong risk of odour polution, which can cause considerable environmental management challenges for OSB producers. Post-production, VOCs from timber products can also contribute to 'Sick building syndrome' whereby workers are made ill by their working environment, a factor that is thought to have a negative impact on Europe's business operations.

Green business proposals

LIFE funds have been used to great effect by a Luxembourg-based wood processing company, Kronospan, to address this issue of VOC emissions from OSB panels. Kronospan is a family business with operations in Germany, Poland, the Czech Republic and Sanem in southern Luxembourg. The company is over a century old and has built up a solid reputation as a supplier of quality timber products for the construction and furniture industries. Its Sanem site in the Grand Duchy covers 30 hectares and employs a workforce of over 300 from the surrounding rural areas.



Marko Becker from Kronospan points out the ECOSB final drying process

Green business principles feature strongly in the company's operations which are geared towards sustainability and innovation. Kronospan's Energy and Environment Manager at the Luxembourg plant, Marko Becker, underlines these aims by pointing out that "our goal here is to produce quality wood panel products with a high ecological value to the greatest possible benefit of our customers and our environment." Furthermore, he goes on to emphasise that "renewable raw materials form the basis of our products. Our contribution to a healthy environment includes dealing with natural resources efficiently, ensuring an optimal use of renewable energy feedstock and consistently

monitoring opportunities for improvements in our processes."

These strategic objectives were incorporated within Kronospan's LIFE project proposal which involved a partnership with Germany's Fraunhofer-Institute for Wood Research – the Wilhelm-Klauditz-Institut (FhG-WKI). This technical body works with a variety of wood-processing systems and carries out applied environmental research. Luxembourg's Resource Centre for Environmental Technologies also provided important support and the combined forces from these three sectoral specialists were brought together within LIFE's 2005 'ECOSB' project, which set out to design and implement a new environmentally friendly production process for engineered wood-based panels.

Innovative actions

The LIFE partners' new 'ecoDry' process was to be based on an innovative closed-loop system for drying the OSB raw material. This would allow wood particles to be dried prior to pressing, using an integrated process that purified exhaust gases by incineration. Mr Becker explains: "We wanted to modify our conventional OSB production systems to enable it to capture VOC particles in superheated steam as they evaporate from the wood-flake-drying process. The steam would be fed back into the dryer to secure a closed loop. Additional steam from drying could then be channelled through a burning chamber where organic compounds become neutralised. This should reduce the need for cleaning atmospheric emissions by an electro-static precipitator."

The use of steam to dry wood flakes was also expected to have a positive effect on reducing VOCs in the panels finished by ECOSB since the steam drying was predicted to act as a kind of distilling process, leaving the dried wood flakes with a greatly reduced VOC content. In addition, carbon dioxide emissions would be cut since the closed-loop system involves burning less air and provides a more stable temperature within the heating chamber, which then contributes to lower carbon monoxide outputs during OSB production.

Another innovative element planned for the new environmentally friendly ECOSB production line involved the introduction of a multi-fuel burner that could recycle wood dust from the panel manufacturing process for use as a fuel to heat the closed-loop dryer. The heat exchanger would minimise any loss of heat. Further efficiencies were planned by incorporating new wood flaker blades which could cut the timber at a larger angle and so facilitate more cost-effective production.

These proposals were expected to substantially reduce VOC emissions and have a positive impact on the whole life cycle of the product. Ambitious targets were set to help ensure optimal operational efficiencies for the company and maximise value for money from the LIFE support. Early analysis indicated that the new closed-loop system could aim to:

- reduce primary emissions of VOC by 90% and the content of VOC in panels after the drying process by 75%;
- cut CO_2 emissions per m^3 of board by around 7%, equating to 10.3kg for each m^2; and
- decrease thermal and electrical energy consumption by at least 10% and 5% respectively.

A monitoring programme was set up to track performance against these environmental targets and findings were planned to inform the LIFE project's dissemination activities, as well as the company's ongoing environmental management objectives.

Highly rated results

Kronospan is highly satisfied with the results from its LIFE project which succeeded in achieving all of it objectives. The various testing stages investigated different operational parameters and identified a set of operating procedures that provide the desired technical, economic and environmental outcomes.

Quality of the OSB boards produced using ecoDry technology is rated as excellent and the ecoDry system is now used to manufacture all of Kronospan's different panel types at its Luxembourg plant. These come in a range of thicknesses that can be used in dry or humid conditions and have been designed for different markets including wall coverings, flooring, structural supports and various 'do-it-yourself' uses.

ECOSB panels acknowledge LIFE's support

Photo: Tim Hudson

Alexander Bircumshaw, the plant's OSB Production Line Manager, believes that his ecoDry system has already made a big difference to improving environmental standards in Europe's building industry. He says, "Our new production process allows us to reduce emissions and also use quicker growing, younger wood which creates an important carbon sink opportunity for the construction sector."

The Sanem factory currently produces 160 000 m^3 of the new ECOSB panels each year. These are actively promoted by the company as a green business product on the basis of the environmental benefits achieved by the LIFE-assisted ecoDry system.

All of the LIFE project's main environmental targets were either met or exceeded and a Life-Cycle Analysis (LCA) of the new panel-production process concluded that the ECOSB project helped reduce environmental impacts by between 25% and 50% at the Kronospan factory. VOC emissions from the manufacturing process itself were reduced by up to 97% and emissions from the panels, after production, are down by 90%. Odour emissions have been reduced by 40% and glue consumption also fell.

The new production processes use younger, quicker growing wood which improves environmental performance

Photo: Tim Hudson

Greenhouse gas (GHG) emissions from energy consumption and VOC emissions have been cut by 19% and power inputs are down by 15%, from 751.5 kWh to 651 kWh. These benefits are largely attributed to the heat recovery made possible by the heat exchanger, which achieves a 12% reduction in energy used to heat the dryer. The new flaker system requires 3% less wood consumption and electricity used to power the production line was reduced by 27%, due to the more efficient closed-loop system. The LCA reveals that GHG emissions over the entire production chain are down by 10%. A new type of less toxic glue has now also been introduced following the LIFE-financed LCA findings.

These environmental gains translate into tangible business benefits with the company estimating that the new low-impact, closed-loop OSB production system leads to a cost reduction of about 3.5% (in 2004 prices). This clear economic advantage has made a big difference and helped Kronospan deal with the recent steep increases in costs for timber raw materials.

Green credentials

All of the ECOSB panels are certified by the Programme for the Endorsement of Forest Certification schemes (PEFC). Such internationally recognised environmental standards were awarded as an assurance mechanism for ECOSB buyers that the panels are produced using methods that promote sustainable management of forests. Further acknowledgement of the ECOSB project's green credentials came from the Employers' Federation of Luxembourg whose members selected Kronospan's new closed-loop drying system as the winner of their Environmental Award Scheme.

This prominent recognition reflects the commitment of Kronospan to innovate in environmental management standards and the company is keen to act as a catalyst to boost the ecological performance of other wood-panel producers. This process has been facilitated by an active LIFE dissemination strategy that has already succeeded in demonstrating the value of ecoDry systems for other wood-processing manufacturers, including a production line in Germany that is currently converting to the VOC-limiting process.

Kronospan's Marko Becker is proud to state that "the closed-loop drying system technology's future is secure and the lessons we learned during our LIFE project have been extremely useful. We are now investigating how our medium-density fibreboards might also benefit from the innovations introduced for OSB boards." Such developments could considerably increase the scope of improvements introduced under the ECOSB project and greatly enhance the long-term legacy from LIFE support for European wood-processing plants.

The project team received a prestigious FEDIL Environmental Award

Project Number:
LIFE05 ENV/L/000047

Title: New and environmentally friendly OSB panels

Beneficiary:
Kronospan Luxembourg S.A

Period: Jan-2005 to Dec-2007

Total Budget: € 1 875 000

LIFE Contribution: € 417 000 (maximum)

Website: www.city-board.info

Contact: Marko Becker

Email: m.becker@kronospan.lu

CLEAN DECO: A shining example of good practice in green manufacturing methods

BEST PROJECTS AWARD 2005-2006

Cleaner and more cost-effective alternatives to traditional galvanization manufacturing methods have been successfully demonstrated by an Italian LIFE project that tested new commercial applications for physical vapour deposition (PVD) techniques on tap decoration processes. By doing so, it identified innovative solutions that will help reduce pollution risks from alkaline and acid emissions in effluents and sludge.

PVD is a term covering a set of techniques that use a vacuum chamber to convert coating materials, such as titanium or chromium, into an ion vapour before coating surfaces with the vaporised material. The project beneficiary, based in Caselette, Turin, had the skills to apply PVD techniques through its specialist subsidiary Genta-Platit, which was able to offer thirty years' experience and relevant ISO certification.

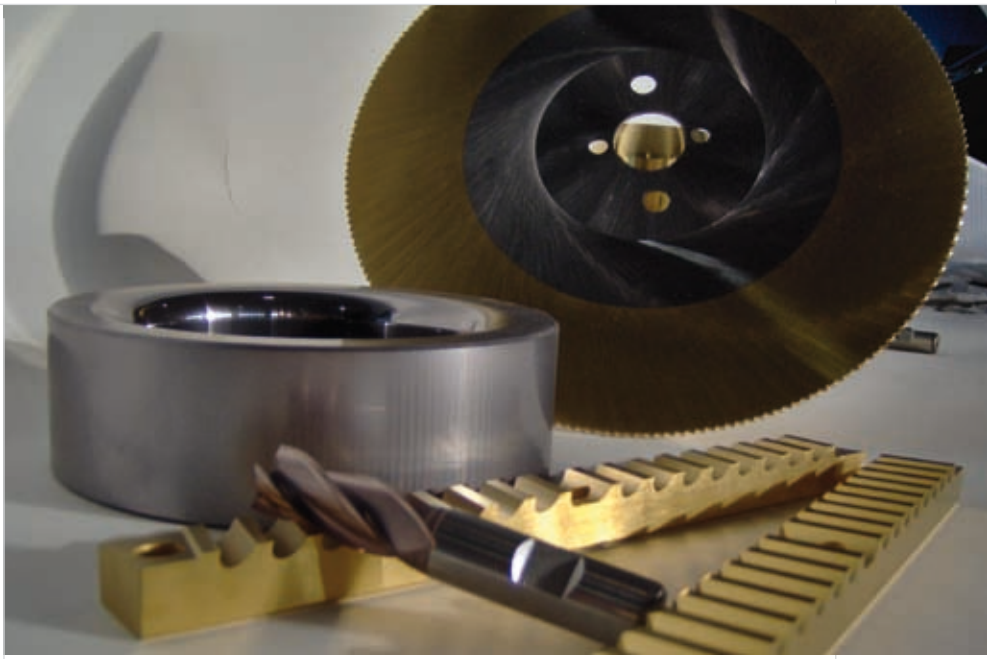
The LIFE project aimed to show that using PVD as a replacement for galvanization in decorative plating would generate both environmental benefits and be economically viable. A demonstration plant was financed with objectives to:

- reduce chromium content in waste water and in toxic sludge;
- lessen the reliance on chromium anhydride, a hazardous raw material; and
- generate savings from more efficient energy and water consumption.

In addition, Genta-Platit aimed to show that PVD techniques could produce high-quality finishes that were comparable with galvanization. This was expected to strengthen the company's market position by attracting new opportunities for a variety of different products.

Sustainability and durability

The CLEAN DECO project achieved all of these goals. Three decorative coating colours were tested – gold, grey and anthracite – with similar characteristics in terms of look and shine to galvanised coatings. Important benefits were discovered during the tests that showed positive results in terms of the coated components' durability; PVD-coated taps were found to be four times more resilient than galvanised equivalents.



The new environmentally friendly PVD coating has a wide variety of applications

These durability benefits were augmented by a range of cost advantages that also reinforced the environmental sustainability of PVD technologies. Robust resource savings were noted during the LIFE project and important outcomes included the following efficiency gains:

- raw material consumption decreased by 80%;
- basic wastes reduced by 40%;
- chromium wastes eliminated altogether;
- considerably lower liquid volumes required for the processes; and
- use of hazardous chemicals greatly reduced or even eliminated.

After LIFE: New opportunities

The success of these results boosted Genta-Platit's commitment to apply the PVD approach on a commercial scale using the LIFE-funded demonstration plant. Further tests were carried out on many kinds of metal objects, extending PVD technology's potential

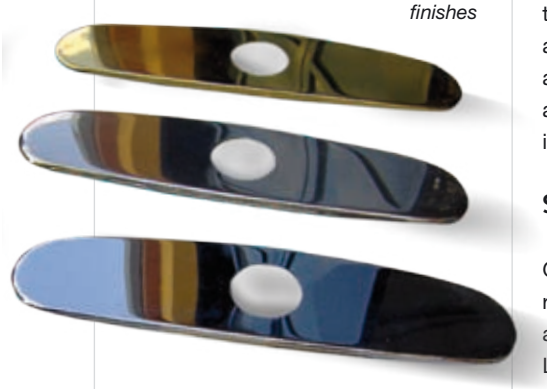
beyond the original tap market and into a previously unforeseen set of market segments where customer satisfaction has been high with the overall product quality.

A strong mix of new commercial opportunities were identified during the four-year period after LIFE and these have proved to be extremely fruitful, leading to an increase in company turnover of some 10%. This achievement has helped the company to enlarge its customer base and so fulfil its strategic objective for the LIFE project.

New applications for PVD coatings have been established for an assortment of different purposes that have helped to diversify and enhance Genta-Platit's operations. These include:

- production of handles, handrails and various other metal accessories for luxury motorboats. PVD coatings were shown to provide excellent protection against salinity and were sufficiently strong to cope with the resistance requirements.
- preparation of specialist treatments for metallic spectacle frames. Valuable contracts were secured with two of the world's largest optical firms to use PVD technology during tempering of stamps for making frames and also for covering frames.
- coating air-supply valves for scuba-diving equipment. PVD treatments were used to seal and secure the safety of under-water technical components.

PVD coatings offer high quality, more resilient finishes



- protecting and styling luxury watches. PVD coatings were selected by a well-known Milan jewellery retailer for use in a limited-edition series of exclusive time-pieces.
- locks of different shapes and sizes were finished using PVD treatments.
- designer cutlery was manufactured using PVD technologies developed by the LIFE project.
- gaming machine components for club-houses and casinos were treated using PVD coatings from Genta-Platit; and
- several fashion accessory firms also purchased PVD applications for metallic products that included buckles, zips and buttons.

Feedback from the fashion clients indicates that even more opportunities exist for PVD technologies if a wider range of coloured coatings can be developed. This goal forms part of the beneficiary's ongoing product development work which continues to explore new uses and markets for the eco-friendly alternative to traditional galvanization.

New opportunities could eventually lead to an industrial-scale plant and LIFE's support during the pilot stages has been acknowledged by the beneficiary as being a key factor in the company's growth. Other factors attributed to the successful shift into more environmentally sensitive production methods include the effective collaboration between partners and sub-contractors involved in the LIFE project. Particularly important relationships were forged with other operators in the galvanic sector, who have also adopted PVD approaches as an alternative to galvanized chrome-plating processes.

Shining example

Genta-Platit's achievements were recognised when the project received an award in 2007 as one of the Best LIFE Environment Projects. The judges were keen to highlight CLEAN DECO's strong demonstration value for tap producers and other companies using traditional galvanic treatment methods.

The pilot plant showed that PVD can be used at an industrial scale

PVD techniques have now been shown to provide cost-effective alternative solutions and offer significant environmental benefits from reduced volumes of chrome-based wastes. European Union legislation discouraging use of dangerous substances, such as chromium, is also expected to increase the attractiveness of the innovations developed during and after the LIFE-funded project, which continues to deserve the attention it receives as a shining example of good practice in clean and efficient industrial manufacturing techniques.

Project Number:
LIFE00 ENV/IT/000213

Title: Development of clean coating technology pvd for decorative applications.

Beneficiary: Trattamenti Termici Ferioli & Gianotti S.p.A., Italy

Period: Sep 2001 to Aug 2004

Total Budget: € 4 873 000

LIFE Contribution: € 1 005 000

Website:
www.ferioliegianotti.it

Contact: Daniele Franchi

Email: gplatit@ferioliegianotti.it

Zero Emission Lacquer: Eco-friendly shock absorbers

LIFE support has been wisely applied by one of Europe's largest manufacturers of vehicle shock absorbers during the conversion of production-line facilities from organic solvent-based materials to waterborne lacquers containing less than 1% volatile organic compounds.

KONI manufactures one million shock absorbers for the automobile and railway industries each year from its Dutch factory located in Oud-Beijerland. This amounts to a weekly production of approximately 22 000 car and 2 000 railway dampers. Virtually all of these are covered with a coating to protect them from corrosion, but also to make them more attractive. These coatings had previously been based on potentially harmful organic solvents, but new national legislation associated with the EC's Solvents Directive (Directive 1999/13/EC) saw the company adopt a state-of-the-art environmentally sensitive manufacturing system based on greener and cleaner waterborne coatings.

LIFE funds were used to help introduce a new mechanised coating line to meet emission requirements and reduce the odour nuisance for the surrounding area. A special water-based epoxy lacquer was developed for the company which contained virtually zero volatile organic compounds (VOCs). LIFE project operations represented the first application of such eco-friendly lacquers in Europe's metal products sector.

The new coating plant began operations in late 2002 and within a year had demonstrated its environmental benefits. These included:

- 99.5% reduction of solvent emissions (from 46 871 to 251 kg/annum);
- 100% reduction in complaints about factory odours from neighbours; and
- greatly improved health and safety conditions for employees since paint sprayers no longer needed to wear masks for all activities.

Equally important, the quality of the new lacquer has been shown to be higher than the previous solvent-based coating and Koni's LIFE-financed production line helped ensure that its Oud-Beijerland factory was able to avoid relocation and so prevented the loss of many local jobs.

After-LIFE achievements

Progress has been sustained at a steady pace during the five years after the LIFE project's end. The zero emissions lacquer recipe has now been refined by a new supplier, Mol Coatings, who has further improved the coating's environmental footprint by removing zinc elements. Additional benefits have been gained by the replacement of iron phosphate, a pollutant, from the shock absorbers' pre-spraying phase. Storage of the lacquer has become more environmentally sound by shifting from disposable 100 litre plastic containers to re-useable 500 litre rust-free containers.

An estimated 7 000 000 shock absorbers have now been produced using the zero emissions lacquer, which amounts to a total reduction of 328 097 kg of solvent use during the post-LIFE period to date. These figures are due to expand rapidly as KONI uses the zero emissions lacquer in a new Chinese plant that will produce 100 000 shock absorbers annually.

Interest in the zero emissions lacquer has also been shown from other industrial sectors including trailer manufacturing companies in Romania, Poland and the Netherlands. Further interest is expected to be shown as stricter environmental regulations on organic solvents increase incentives for production-line conversions. By August 2008, Koni's LIFE-funded plant had achieved estimated savings of €1 million and this was making important contributions to cover the €2.5 million commitment that the company invested in making their production line greener.

LIFE helped transform Koni's whole production line for shock absorbers

Project Number:
LIFE00 ENV/NL/000794

Title: Zero Emission Lacquer

Beneficiary: Koni B.V.

Period: Jul-2001 to Jul-2003

Total Budget: € 1 975 000

LIFE Contribution: € 308 000

Website:
www.koni.com

Contact: Bert Overweg

Email: boverweg@koni.nl

Cool Tech: Lightening the impact of metal lubricants

Swedish metal working companies have benefited from an innovative LIFE project that demonstrated the cost effectiveness of alternative and environmentally sound coolant technologies capable of reducing CO_2 emissions and recycling hazardous sludge elements.

Europe's metal-working industries use a large amount of chemical lubricants to cool metals and tools during working processes. Traditional oil-based lubricants emit high levels of CO_2 when they evaporate during industrial operations and waste lubricants cause further environmental problems. Recycling is rendered difficult by a combination of strong preservatives that are required to inhibit micro-organism growth and the fine-metal particles that collect in used lubricants. Both these elements lead to the sludge being classified as hazardous waste.

Such concerns were recognised by a Swedish development company that applied for LIFE funds to demonstrate alternative and environmentally sound coolant technologies for metal working processes. The new green business approach involved introducing a method which cooled and lubricated aluminium using vegetable oil and a CO_2 mist. A micro-filtration system was also integrated within the beneficiary's Ambi® Lube technology and this removed the need for preservatives.

Pilot plants were set up at large metal-working industries owned by partners in the LIFE project and overall outcomes showed excellent results. Ambi® Lube has been proven to reduce pollution levels by 90% in aluminium-rolling processes working on ingots and the new technology also allows a 50% reduction of process chemicals. Product quality remains high and metal particles from the process sludge can be recovered to help reduce costs associated with treating the hazardous waste, which represented €80 per cubic meter in Sweden.

Photo: Pelle Lindberg

LIFE enabled reduced pollution levels from aluminium-rolling processes

Development of the aluminium-rolling technology continued on a commercial basis after the LIFE support and some applications have also been shown in metal-milling processes. Further scope exists to expand Ambi® Lube's uptake since the new eco-friendly system does not require any significant modifications to conventional processing technologies.

Five years after the project's end, industrial users of the Ambi® Lube system, such as the SAPA Group in Finspång, remain highly satisfied with their new LIFE-assisted metal-working methods. These are considered effective from a productivity perspective and also cost efficient, since the easy recovery of waste aluminium helps to offset the increasing cost of basic metal.

Environmental benefits have been carefully monitored at the SAPA Group plant and conclusions indicate that CO_2 emissions in the aluminium-rolling line were reduced from 6.29 g/tonne to 0.74 g/tonne. Confirmation of reduced sludge volumes has been provided by another industrial user of the Ambi® Lube system, Sandvik Rotary Tools. This company produces hard-metal tools for the mining industry and reports that the volume of sludge from milling or honing of hard-metal parts has been radically cut. In 2008, only 65 m^3 is expected to be created, compared to the 365 m^3 of annual sludge produced by previous oil-based processes.

LIFE legacies

Aspects of the methodology and technology have been patented by the beneficiary. The business-greening activities have been acknowledged within the Swedish public sector as good practice by an award in 2002 for best industrial innovation in the Västmanland county. LIFE's funding has been credited as being very important in helping the project during its initial set-up stages and the results offer excellent demonstration value for other metal-working companies around Europe, as well as important economic and environmental legacies for the LIFE project partners.

Project Number:
LIFE00 ENV/S/000864

Title: The new coolant technologies for metal working

Beneficiary: AB Chem Dimension

Period: Jan-2001 to Dec-2003

Total Budget: € 1 200 000

LIFE Contribution: € 345 000

Website: www.chemdimension.se

Contact: Birger von Essen

Email: b.ve@telia.com

New ESD: Cleaner and greener steel wire production technology

An Italian company has used LIFE assistance to develop a highly innovative clean technology that significantly reduces negative environmental impact from steel-wire-rod production using a combination of new descaling, drawing, lubrication and thermal treatment processes.

Steel wire is used by a wide variety of different European products ranging from office furniture to reinforced concrete. The process involved in wire production has traditionally involved a number of negative environmental impacts. Large amounts of toxic chemicals and energy are used to produce the wires during a procedure known as 'drawing'. This involves repeatedly stretching the heated metal through progressively smaller holes in 'draw plates' and soaking the steel in acid baths to prevent scaling.

Hazardous wastes from these processes include dangerous waste water laced with industrial lubricants and acid sludge, both of which can present serious health and safety risks for Europe's wire-production workforce. These concerns were recognised by one of Italy's largest producers of steel wires, Metallurgica Abruzzese S.p.A. Staff were keen to identify alternative manufacturing systems that used cleaner, greener drawing techniques and resulted in improved energy efficiency for the company. A LIFE Environment project was developed to design and demonstrate new eco-sustainable drawing (ESD) techniques and results from the ESD prototype have been extremely impressive.

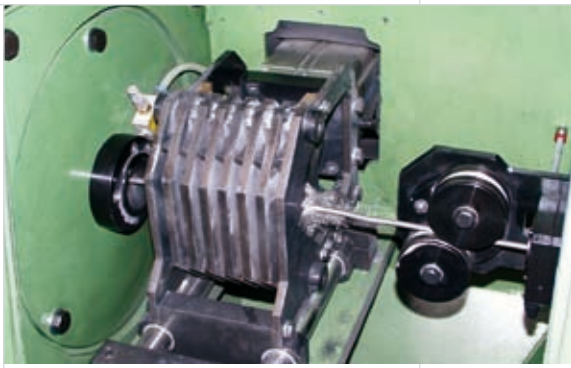
Alternative approaches

The LIFE project focused on a radical redesign of the entire wire-drawing process that targeted the main environmental problems and established an innovative set of manufacturing techniques with excellent transferability for other EU wire producers. LIFE funds were used to introduce three new technologies that were combined within a pilot plant based on: an innovative and acid-free mechanical dry descaling treatment; an energy-efficient thermal-treatment process that works in a controlled atmosphere; and a pioneering drawing system using polycrystalline diamond dies and re-usable sodium lubricants.

These alternative approaches were carefully studied and thoroughly tested during the LIFE project. Highly successful results were produced and the ESD prototype's performance figures surpassed anticipated outcomes. Water consumption was reduced by 99.87% and acids were totally eliminated. This eradicated emissions of toxic-noxious gases and removed all risks from handling or transporting harmful sludge wastes. Recycling allowed unit consumption of lubricant to be reduced by over 39%, compared to traditional methods. Energy savings were also sizable with the new thermal technology reducing power consumption by 59% during cold galvanizing and 35% during hot galvanizing.

Production performances were good with the LIFE prototype demonstrating that ESD technology can provide an average production capacity of 1 tonne each hour. This equates to a standard annual production – applying three shifts – of 5 520 tonnes and the beneficiary estimates that the prototype could increase this to 7 176 tonnes.

Other positive results noted by the beneficiary include: better management of zinc thickness on semi-finished products; improved production capacity, since the ESD technology uses less factory floor space; fewer production wastes; and important improvements to the employees' working environment.



Demonstrating environmentally sustainable steel-wire drawing

All of these outcomes have been widely promoted by Metallurgica Abruzzese S.P.A during the LIFE project's dissemination activities and company representatives are confident that their innovative ESD technology offers valuable environmental and economic benefits for other steel wire producers across the EU.

Project Number:
LIFE04 ENV/IT/000598

Title: New ESD (eco-sustainable drawing)

Beneficiary:
Metallurgica Abruzzese S.p.A

Period: Nov-2004 to Oct-2007

Total Budget: € 3 848 000

LIFE Contribution:
€ 965 000 (maximum)

Website: www.cavatorta.it

Contact: Dr Giovanni Cavatorta

Email: g.cavatorta@cavatorta.it

BASTA: Improving building standards

BEST PROJECTS AWARD 2007-2008

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. A Swedish LIFE project has found an effective way to address these dangers.

No builder wants to construct buildings containing materials that will cause illness or environmental damage. But very often these effects can emerge later on, after construction, when it becomes the responsibility of the building's users to identify the source of 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. Dangers might include compounds that are carcinogenic, mutagenic, allergenic, bio-accumulative, toxic or harmful to ozone. The 11 million people who work in Europe's building industry face such hazards daily, and these substances can have a long life-span, creating long-term impacts.

New EU laws on chemicals, the REACH regulations, came into force last year and will help address some of the problems. However, practical challenges still remain with regard to achieving the regulation's aims.

Re-thinking the system

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

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

Photo: Tim Hudson

The BASTA database lists products meeting safety criteria for the construction sector

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 an inferred 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.

The scheme's future shall be ensured by charging suppliers an annual fee of €1 000 to join. Although the early take-up was small, industry organisations have taken over the running of the scheme and the hope is that its geographical coverage will spread, as well as provide a model for other industries.

Project Number:
LIFE03 ENV/S/000594

Title: Phasing Out Very Dangerous Substances from the Construction Industry

Beneficiary:
NCC Construction Sverige AB

Period: Sep-2003 to Aug-2006

Total Budget: € 1 488 000

LIFE Contribution: € 741 000

Website: www.bastaonline.se

Contact: Lars Jarnhammar

Email: lars.jarnhammar@ivl.se

Tourism

Europe's tourist industry can boast six of the world's top ten holiday destinations and the sector covers a large variety of attractions, quality services and businesses in all Member States. Tourism is recognised as a crucial economic-development tool for many European regions and sustainable tourism approaches are required to manage social and environmental impacts from tourism-related business activities.

Eco-systems, biodiversity, landscapes and other natural resources and heritage can be threatened by uncontrolled tourism and the European Commission has issued a Communication to address these points in its Agenda for a sustainable and competitive European tourism. This balances objectives from the Lisbon Strategy for growth and jobs and the Gothenburg Strategy for environmental sustainability.

LIFE-supported projects have also made important progress in demonstrating effective ways to balance economic, social and environmental factors through a host of different tourism actions dealing with EMAS certification and Eco-labels for tourism businesses, eco-friendly green hotel services, environmental restoration, novel biodegradable materials for tourist use and development of eco-tourism regions.

Eco-camps: Bringing camping even closer to nature

The French Eco-camps project demonstrated how an effective life-cycle approach to the design of campsites and installations can reduce their environmental impact, whilst simultaneously improving the competitivity of this important tourist industry. This LIFE project showed how regional authorities can lead the way in promoting environmentally sustainable business development.

Sustainable camping means considering the environment at the design stage

The natural environment is one of the key attractions of Aquitaine and tourism is a crucial part of its economy. This region of southwest France has 718 campsites and 93 619 pitches, which provided 13 million accommodation nights in 2001.

However, campsites are increasingly offering a wide range of services and facilities, including catering, swimming pools, nightclubs and water games areas. The running of these installations consumes energy and water and disturbs ecosystems and habitats. Furthermore, the transportation of materials and production of building waste involved in the construction of these facilities causes major pollution.

The regional authority of Aquitaine therefore decided to find ways to increase awareness amongst its campsite managers of the environmental and economic benefits of improved environmental performance, including around management of water, energy and waste. The approach adopted was to implement a demonstration tool to tackle environmental issues at the design stage of campsite buildings and facilities.

François Deluga, responsible for tourism policies in the regional government, explained that the Eco-camps LIFE project aimed to be "almost the very definition of sustainable development," showing how a sector of the economy can take the environment to its heart and make it a driver of its development.

High Environmental Quality for campsites

The LIFE project was based on the High Environmental Quality approach (HQE in French), which aims to reduce the environmental impact of a building

or installation during the design phase by considering 14 elements, covering eco-design, eco-management, health and comfort. A batch of indicators is used to evaluate the performance level of an installation for each of the 14 categories.

Three information days were held for 93 regional campsite managers to present the objectives of the Eco-camps project. It was clear that, whilst participants were aware about environmental concerns and the need to, for example, recycle and save electricity, they did not have the practical knowledge and latest technological information on how to implement a comprehensive eco-design and management approach.

Four campsites which were planning development projects and a fifth totally new campsite development were selected to follow the project methodology. Each campsite was supported by a consultant who guided them through the HQE approach. The consultant helped the managers evaluate the environmental impact of their plans, identify areas of weakness and select specific measures to improve performance.

Michel Zugaramurdi, manager of the participating Col d'Ibardin site in Urrugne, highlighted that "the reflection carried out with the support of the Eco-camps LIFE project at the design stage helped us to redefine our development project taking better account of environmental concerns. It also provided reliable analysis on which to base decisions."

To save drinking water, the project promoted both reducing consumption and accessing alternative water sources. Measures included water-free urinals, smaller WC flushing reservoirs and the use of pushbutton taps. Campsites introduced rainwater collection systems for appropriate uses such as watering plants. The new campsite at Bordeaux-Bruges will access groundwater for watering, to supply its feature lakes and - depending on water quality testing - its swimming pool and washrooms. Appropriate chemical-free water-treatment systems were also introduced to make re-use of swimming pool water possible. The total water savings for the five participating campsites are estimated to be 5 000m^3 of drinking water per year.

A key dimension of reducing energy consumption was to design installations so as to reduce their energy needs, for example by insulating buildings, allowing the entry of natural light, installing geothermal air-conditioning systems and using lighting systems triggered by lack of natural light. To promote energy efficiency, 'green roofs' were introduced onto certain buildings including the restaurant at the Chevreuils campsite. Danielle Garcia-Goueythieu, site manager, explained that "Sedum plants on the roof insulate the building keeping it cool in summer and warming it in winter. Additionally, the plants require very little looking after or watering." The second dimension was to use renewable energy sources such as solar panels to limit the use of mains supply.

The methodology informed the development of optimised waste collection areas according to the size of each campsite. Single waste collection areas for rubbish lorries to pick up from were installed to minimise their on-site circulation. Bins were provided in areas surrounded by wooden fencing to allow simple waste separation for tourists whilst limiting the visual impact. Taps were also located by the bins to allow for regular washing to prevent hygiene and odour issues. As Nicolas Maridat, manager of the Les Pins site points out, it is also important not to waste this water: "Before, we didn't have a system in place, but thanks to the project, we now collect and send the water to a treatment station."

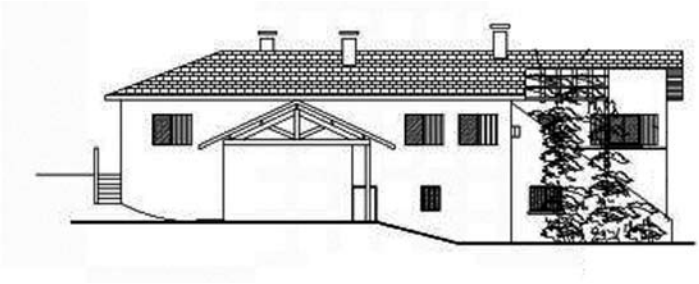
The LIFE project promoted the use of more environmentally friendly materials, particularly wood - a natural, attractive and renewable construction material - from sustainable forests. Each site was helped to identify the wood that would best suit its purpose, for example as a building or a pool-side terrace. Local forests were preferred to limit transport costs and pollution. Finally, environmentally friendly wood treatments were favoured and the use of glue in assembly strictly limited.

The total environmental benefit of the measures recommended by the Eco-camps project - as measured in terms of CO_2 emissions - is estimated at 40 tonnes less CO_2 generation per year.

Eco-design for chalets and mobile homes

Two companies, Dassé Constructeur and O'Hara, who already showed themselves to be dynamic in their environmental approaches to the production of chalets and portable homes were selected to take forward

Green campsite design



Beau Rivage was among the five campsites selected to implement the approach of High Environmental Quality (HQE)

the Eco-camps methodology to produce new design concepts for these types of tourist lodgings.

Life-cycle analysis was used to consider the impact of a construction on people's health from the extraction of raw materials, assembly and transportation, use and end-of-life. It looked at elements including the energy consumption involved, the potential release of dangerous chemicals and the impact on water usage.

Having first worked with the project team to carry out a life-cycle study of one of its chalet models, Dassé Constructeur then developed a new eco-design. It reduced the use of toxic products in the assembly process, replaced imported with local wood and significantly improved the insulation of its chalets. It introduced energy- and water-efficient appliances and systems throughout the chalet. The estimated savings were 45% of water consumption, 28% less energy by electrical appliances and 60% less energy for heating.

O'Hara developed a new concept of portable summerhouse based on improved integration with its natural surroundings. This was conceived both to improve the holiday experience and reduce the amount of material needed, including by removing unnecessary equipment. Lighting is controlled by the key to avoid unnecessary energy consumption and sun shields over the windows regulate the temperature inside. The use of glue in assembly was reduced by 41% and the frame is now made of 95% certified wood.

Sustainability and continuation of approach

One of big achievements of the LIFE project is the creation of a modified HQE specifically four campsites. Jérôme Thévenon, President of the Aquitaine regional federation of campsites (FRAHPA), observed that the HQE approach had provided an efficient framework to tackle environmental questions in campsite design. "The experience also showed us that certain criteria are more important than others for campsites. The Eco-camps project allowed us to learn and adapt the approach to this context."

The LIFE project also produced written advice in French to support implementation of the charter on natural risks - such as storms and flooding - from the European Federation of Campsite Organisations, which is an important project output.

It is now hoped that more campsites will be inspired by the Eco-camps experience and use this adapted HQE approach to ensure that any developments being made to their installations will be done in an environmentally friendly way – thereby making this business sector greener and more sustainable.

The Aquitaine regional government remains committed to this work. Laurent Beaussoubre, from the tourist department, highlights that "Eco-camps is set within a continuous approach of the regional government: it is not just an isolated project." Meetings have already taken place to build on the experiences of the project, focusing on the use of the HQE approach for campsites to obtain the European eco-label.

Another message of the project is that whilst many eco-design measures require an initial financial investment, they also provide savings from the reduced energy and water costs. The project evaluations estimate that investment in the solar-powered water-heating systems will be offset over between six and nine years by the cost savings. A similar timeframe is predicted for offsetting the costs of introducing water saving measures at the Beau-Rivages and Col d'Ibardin campsites.

With regards to the spreading of this message, Mr Beaussoubre takes encouragement from the experiences of the project. "One of the best aspects of our LIFE project was the continued commitment of the campsite managers to the process of eco-design." This seems to reveal an increasing appreciation of the mutual environmental and economic benefits to be obtained from eco-design, which should see it increasingly taken up in the future.

Project Number:
LIFE04 ENV/FR/000321

Title: Eco-design and eco-engineering of buildings, amenities and accommodations in campsites

Beneficiary:
Aquitaine regional authority

Period: Nov-2004 to Dec-2007

Total Budget: € 809 000 (maximum)

LIFE Contribution: € 402 000

Website:
http://ecocamps.aquitaine.fr

Contact: Laurent Beaussoubre

Email:
laurent.beaussoubre@aquitaine.fr

Green Certificate: Eco-labelling for rural tourism providers

BEST PROJECTS AWARD 2004-2005

The Latvian 'Green Certificate' LIFE project aimed to promote carefully considered, balanced and sustainable rural tourism, rather than trying to restrict the future development of tourism, as is sometimes the case in other geographical areas.

Uncontrolled tourism can have a number of negative impacts on the environment. It can lead to an over-exploitation of natural resources and generate significant increases in volumes of waste. It can also create irreversible changes to the landscape and the historical and cultural heritage of regions. On the plus side, tourism generates income and new jobs. While Latvia has no history of mass tourism, its development, particularly in rural areas, needs to be encouraged in a sustainable way that will, hopefully, also stimulate growth of the rural economy.

The LIFE project was led by the Latvian Tourism Association "Lauku celotâjs". Its main objective was to alter people's attitude towards tourism – changing post-Soviet consumers and tourist-providers into eco-friendly tourists and/or entrepreneurs willing to contribute to sustainable development. This would be achieved by the development and implementation of a national eco-label – the 'Green Certificate'.

Other objectives were to: protect Latvia's wealth of ecosystems and maintain its biological diversity; preserve the country's landscapes and cultural and historical heritage; control and prevent pollution and other environmental disturbances; and improve the quality of life of those living in rural communities.

Based on recognised eco-labels

The project team developed the Green Certificate label with national criteria, based on the most recognised European eco-labels. They established eco-labelling procedures and then applied their eco-label to a number of rural tourism providers. These were mainly small businesses offering accommodation. A 'Green Holidays' brand was also developed and promoted through the project website and publications (tour maps and guides, accommodation catalogues and brochures).

Together, the Green Certificate and Green Holidays gained positive publicity and recognition among consumers and rural tourism providers in Latvia. Involvement and interest from the supply side, as well as from the demand side, created favourable conditions for further eco-labelling activities and development of 'green' rural products.

The Green Certificate has joined VISIT – (the European Association of Eco-labels – where it contributes its experience and expertise on small-scale rural accommodation certification. The project has benchmarked the Green Certificate criteria in co-operation with the European Centre for Ecological and Agricultural Tourism (ECEAT), using their environmental criteria. This means an establishment carrying the Green Certificate eco-label will also be able to use the ECEAT logo as a common brand for ecological accommodation in Europe.

Following completion of the project, the eco-labelling activities have continued and the beneficiary has also successfully secured LIFE+ funds for a new initiative that will start in 2009. This latest project will build on outcomes from the Green Certificate work and add value to it by demonstrating the techniques and benefits involved in sustainable tourism management models for Natura 2000 sites. Activities will focus on designing practical and pragmatic tourism support approaches that balance environmental, social and economic factors to highlight green tourism's potential as a sustainable economic driver for Natura 2000 areas in Latvia.

The project team successfully developed the 'Green Certificate' label and the 'Green Holiday' brand

Project Number:
LIFE00 ENV/LV/000959

Title: Development of criteria for the Green Certificate

Beneficiary: Latvian Country Tourism Association

Period: Oct-2001 to Sep-2004

Total Budget: € 311 000

LIFE Contribution: € 149 000

Website: www.eco.celotajs.lv

Contact: Asnate Ziemele

Email: asnate@celotajs.lv

Sutoureelm: Computer-age way to sustainable tourism

To be environmentally sustainable, hotels and other tourism businesses need to understand the risks their activities pose, then identify feasible ways to reduce or prevent these impacts. This German LIFE project demonstrated how an innovative computer tool can help achieve this aim.

Sustainable tourism is a key challenge for all European destinations. The industry is of huge economic value, but often carries significant environmental cost through consumption of non-renewable energy, emission of gasses and pollutants, negative impacts from transport and noise, and increased pressure on sewage systems.

Owners and managers of hotels, restaurants, camp sites and other tourism businesses often have only a limited understanding of the environmental effects from their activities or of measures that could counteract the damage. They may be aware that the quality of their offering to guests is affected by the surrounding environment; but under pressure from time and costs, many may not be willing to take necessary action unless they have access to solid information and easy-to-follow recommendations.

This LIFE project used a multi-language computer software tool and audit system to demonstrate how the situation can be addressed. Developed by the beneficiary, a German university, the tools allow stakeholders to obtain specific recommendations for action and achieve a systematic approach to environmental management.

The system provides answers to questions such as:

- How good is the environmental performance of my business compared to others? (Benchmarking)
- Do my environmental activities meet the expectations of my customers? (Do they meet requirements of national or EU eco-labelling schemes)
- Is investment in equipment and process change affordable? (Cost-benefit calculation)
- Where can I find more in-depth information? (Addresses and contacts)
- And: How can I improve my overall environmental performance systematically and continuously?

EMAS compliance

The tools provide users with specific recommendations on how to comply with EMAS, the Eco-Management and Audit Scheme established by European regulation. This recognises and rewards organisations which voluntarily go beyond minimum legal compliance and continuously improve environmental performance.

By the end of the project the software had been translated and applied in four languages: German, French, English and Greek - Spanish and Italian versions are also under preparation. A website had been set up in five languages - adding Italian - and a download link for the Sutour software will be provided.

The system was used in environmental audits of 22 tourist businesses around Europe. Seven companies - six hotels and one caterer - became EMAS certified and 69 companies achieved an eco-label, either at national level or the 'European Flower' awarded to greener products and services. Target savings in energy, water and waste had been set at 10% for users of the system. This average was met and sometimes exceeded by users during the project.

Sutoureelm tools show tourist businesses how to achieve optimum environmental performance in four languages

Success will eventually be judged by the number of tourist enterprises using the system, but it has already succeeded in demonstrating how the system can be used to encourage synergies between the EMAS approach, focusing on environmental management processes, and eco-labels which emphasise the fulfilment of environmental criteria.

The project highlights the possible benefits of exchange of best-practice information in this sector, particularly for small and medium enterprises. Furthermore, the results of the project can be easily and effectively transferred across tourist sectors and countries.

Project Number:
LIFE04 ENV/DE/000055

Title: Supporting Tourism Enterprises for Eco-Labelling and Environmental Management

Beneficiary: University of Stuttgart

Period: Jan-2004 to Mar-2007

Total Budget: € 744 000

LIFE Contribution: € 350 000 (maximum)

Website:
http://sutour.ier.uni-stuttgart.de

Contact: Dr. Sven Eckardt

Email: se@ier.uni-stuttgart.de

Food industries

Europe's food and drink industry includes some 280 000 companies which support 4 million jobs. The sector covers a diverse range of different products which contribute to its estimated annual turnover of over €800 billion. It is recognised as one of Europe's most important and dynamic industrial sectors which enjoys a strong export base and has experienced steady growth in recent years.

SMEs dominate the food industry which is regulated by a range of environmental and health-related controls that influence business competitiveness, growth and employment performance. The IPPC Directive plays an important role in supporting sustainable food production systems, as do the packaging and waste directives.

LIFE projects have been used by food processors and manufacturers to demonstrate a broad mix of innovative approaches for greening their business operations. These include recycling of food packaging, re-use of waste waters, improving energy efficiency, composting agro-industrial waste and applying Life-Cycle Assessment as a support tool for making green business decisions.

CLB: Environmentally friendly sugar removal in potato processing

This Dutch LIFE project demonstrated a closed-loop blanching technology for the potato-processing industry that uses new selective de-sugaring technology to avoid the loss of valuable potato mass, re-use water and reduce energy consumption.

The beneficiary, Aviko, processed 1.7 million tonnes of potatoes in its 12 production units in 2008.

Founded in 1962 in the Netherlands, Aviko is the world's fourth largest potato-processing company. Each year, it uses upwards of 1.7 billion tonnes of potatoes, across 12 different factories, to produce 750 000 tonnes of high quality golden chips and other potato products.

Production processes involve washing, peeling and cutting the potatoes. The golden colour of deep-frozen or chilled specialty products - such as chips - requires an additional step, namely blanching. This process involves immersing the peeled and cut potatoes in hot water to reduce the amount of natural sugars within the potatoes. High levels of glucose and fructose during frying result in chips that are too dark in colour which is not attractive to customers. The hot water blanching process overcomes this problem by leaching out the sugars.

While removing the sugars can prevent the unwanted browning, traditional blanching methods have several disadvantages, including:

- valuable substances such as minerals, amino acids, anti-oxidants and vitamins are also extracted from the potatoes during the hot water blanching process.
- relatively large volumes of 'fresh' water are required to replace the saturated water used by the blanching process.
- the waste water contains high levels of potato mass that requires treatment before the effluent can be discharged into surface waters.
- the water needs to be heated to about 70°C, but the energy is usually lost since the waste water is not recycled within the blancher.

Increasing process efficiency

Avoiding these known disadvantages was the main objective of a LIFE project implemented between 2005 and 2007 by Aviko in its Dutch

premises at Steenderen. An additional driving force behind the project was the results from a yield analysis conducted by the company about a decade ago. “In most of the potato-processing industries, 30-40% of the costs are due to the purchase of raw material. An improved raw-material-yield efficiency is therefore of major importance for the wellbeing of a company,” concluded Dr. Derk Somsen, Head of Aviko’s Process Research & Technology Department. Comparison of the actual production yield and the maximum production yield showed strong potential for improvement, such as the possibility to minimise the unwanted mass losses at source.

The LIFE project idea originated in the R&D department, which started investigating ways to retain the valuable substances, such as vitamins, while still reducing the sugars. This work focused on the blanching process and the solution proposed was a new Closed-Loop Blanching (CLB) technology, which applied an innovative approach to achieve selective leaching of the sugars during blanching in a closed-loop system.

The critical factor for the CLB system involved balancing the concentration levels of all components – ions, enzymes, amino acids and organic acids – in the blanching water. Studies showed that the valuable products did not leach out from the potatoes into the hot water if the hot water was already saturated with a constant concentration of similar substances. Reducing the concentration of a particular substance in the hot water therefore changed the overall balance and resulted in an increased amount of that substance leaching from the potatoes into the hot water.

Confirmation of this discovery allowed the Aviko team to establish a system to control which substances they wanted to leach from the potatoes. Reducing the concentration of sugars in the hot water should mean they could increase the amount of sugars leached from the potatoes. Their theory was tested using a batch fermentor to remove sugars from the hot water after it had been used in the blancher. The same hot water, now with a lower sugar concentration, was then pumped back into the blancher and the difference in sugar concentrations between the water and the potatoes successfully drove the leaching process.

The LIFE prototype

“As the CLB is a very innovative technology concept and of strategic importance for our company, we quickly went for patenting it, to ensure a better protection of this valuable knowledge,” stressed Mr Somsen. “However, we still needed to test the effectiveness of the theory in practice. Here, LIFE co-funding was an important tool.”

Tests trials under the LIFE CLB project were started in October 2005. The prototype consisted of a non-commercial, semi-industrial scale installation with a capacity of 150-250kg of potatoes per hour. Two different parts of the installations can be distinguished:
(1) The first part contains the classic components of a traditional blanching system, including an input system, in which the potato strips are transported towards a very small blancher that heats up the potatoes to inactivate surface enzymes.
(2) The second part includes the equipment needed for the CLB process, i.e. a long blancher that can extract potato sugars using the batch fermentor unit. After the de-sugaring of the blanching water, the water is pumped back into the long blancher.

LIFE supported the testing of the prototype processes

“We could have used the CLB prototype on any of our Aviko production lines, and we chose to implement it at the factory producing chilled French fries.” explains Caspar Maan, Senior Process Engineer, responsible for the implementation of the prototype. “This was mainly due to reasons of space. The ‘baby’ blancher fitted best there.” The CLB prototype was installed alongside the factory’s normal blancher, which processes 20 tonnes of potatoes each hour.

The simultaneous use of both blanchers in parallel enabled the project team to test under real conditions the effectiveness of the new process. The location, within a fully operational factory environment, allowed close

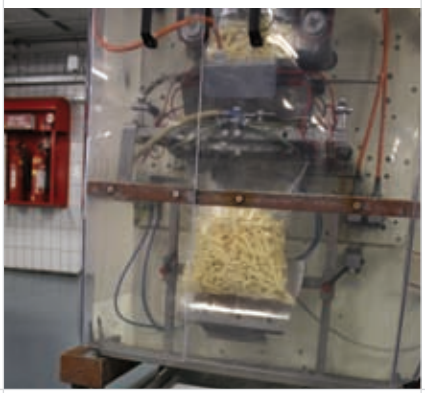
The final product is attractive to consumers

Christian Knoef and Caspar Maan are proud of the LIFE project's achievements

monitoring and meant that any productivity problems could be identified early and resolved. "Lab-scale testing would not have been useful enough, since potato processing is a continuous process," highlights Derk Somsen. "All the more, we were happy to see that no major changes were necessary while moving from sketch to pilot-scale." Christiaan Knoef, Process Engineer, continued: "Fine-tuning, measuring and some adjustments were all we needed to do to make the system work well."

These adjustments included the inclusion of an additional electrical heater

The success of the prototype could lead to full-scale implementation



in a vessel that collects the filtered water and an additional two-way filter after the vacuum filter. The vacuum filter was later replaced by a self-cleaning filter, which was cheaper to install and operate.

"It is our job to work within a result-oriented approach. Nevertheless, we experienced that it is far more difficult to achieve results sometimes during development work than during research," said Mr Maan. "Available space to install test installations for example can create a real headache. But if we find a workable and efficient solution, such as the CLB concept, we are then of course very happy with the results."

Environmental benefits

The project's patented CLB technique did indeed achieve remarkable economic and environmental results while being tested under LIFE, including:

- savings of 3.6% of raw material, equalling 43 tonnes;
- reduction of 240 litres of freshwater extraction per tonne of potatoes;
- prevention of waste water and corresponding treatment requirements for 240 litres of water per tonne of potatoes;
- energy consumption down by a total of 94MJ/tonne of potatoes. A saving of 53.4-73.6 MJ/tonne is due to the elimination of the need to heat freshwater to the necessary blanching temperature – from 12°C up to 65-85°C – and a saving of 20-40 MJ/tonne of potatoes is achieved during combined drying and frying; and
- emission reductions totalling 5.4kg of CO_2 and 4.6g of NO_x per tonne of processed potatoes. 5.3kg CO_2 and 3.1g NO_x less are the result of the energy savings achieved and a reduction of 0.121kg CO_2 and 1.5g NO_x is due to savings in transport thanks to reduced truck movements as a result of raw material savings.

According to the beneficiary, the CLB potato products are also better than the products produced with the traditional blanching process with regard to taste, smell and colour.

Going large-scale

Such findings offer important opportunities for Europe's food processing factories, since the technology can be adapted for use in all potato processing companies, as well as other food production systems that use blanching procedures. Further opportunities are available to harness the CLB approach to introduce additional nutrients and extract other undesirable elements.

Aviko is also currently considering plans for the first full-scale CLB installation. An analysis of the likely investment costs is being carried out and a decision by the company's board of directors is foreseen for August 2009. If an agreement can be reached, the new blanching technology will be tested at full scale from 2010 onwards.

"Profitability, high quality products and sustainability are not contradictory concepts," concludes Derk Somsen. "We are very proud to have shown with our LIFE project that an improved yield, additional profit and reduced costs go hand in hand with meeting environmental concerns."

Project Number:
LIFE05 ENV/NL/000035

Title: Demonstration of a closed loop blanching system for the potato processing industry

Beneficiary: Aviko B.V.

Period: Jan-2005 to Dec-2007

Total Budget: € 1 008 000

LIFE Contribution:
€ 302 000 (maximum)

Website:
www.cosun.nl/nl/406/415/1858/default.aspx

Contact: Dr. Derk J. Somsen

Email: d.somsen@aviko.nl

RETOXMET: Yeast-based pollution control

The Hungarian RETOXMET LIFE project successfully demonstrated the re-use of highly polluting food industry wastes to produce cost-effective yeast-based bio-conversion materials capable of cleaning drinking or waste water from dangerous contaminants.

Current technology involved in cleaning Hungary's industrial waste waters relies on resource-intensive techniques that experience disadvantages and problems associated with high energy and chemical demand, incomplete extraction and creation of hazardous wastes.

An alternative solution was found within the food industry by VIRECO, a Budapest-based company specialising in manufacturing yeasts for nutritional products. LIFE support helped demonstrate the potential of a new, environmentally friendly and cost-efficient, integrated pollution control method based on natural yeasts. VIRECO's Managing Director, Dr György Radnai, explains, "We thought that if yeast can bind together nutritional compounds that are good for our health then maybe it could be used to bind pollutants, too."

The RETOXMET approach was "an ideal solution since it reduces the pollution risks from food-industry wastes by converting them into a yeast product capable of cleaning waste waters containing toxic heavy metals," explained Dr Gábor Vereczkey, from the Central Food Research Institute.

LIFE project plan

Seven yeast phyla were selected for the LIFE project. Three phyla capable of decomposing dairy wastes were chosen and four others were to be tested on starchy sediments. 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 by-products to produce a biomaterial that absorbed heavy-metal pollutants from waste-water samples.

To replicate the laboratory experiments in semi-industrial-scale conditions, a demonstration plant was set up in Tatabánya, where local food and metal plating companies agreed to participate in the LIFE demonstration trials. The trials proved very successful and all of the yeast species used were shown to produce biomaterial that succeeded in accumulating heavy metals. The biosorbent produced with the yeast proved to be particularly productive at concentrating the pollutants, making it easier to extract them from the treated water.

Four different RETOXMET demonstration runs were carried out on various effluents, including waste water from a metal-galvanising factory and contaminated groundwater. Analysis showed that the new 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, being especially relevant for Hungary's rural communities where polluted drinking water continues to represent a real health hazard.

RETOXMET's potential

The project showed that the RETOXMET technology was highly effective at purifying polluted water sources. The technology's optimum economic potential could be achieved in a purpose-built operational plant with a fermentation capacity of 160 m^3. The RETOXMET team is confident that their new technology provides a realistic cost alternative to conventional treatment options. Written declarations of intent have been received from 19 different organisations and interest continues to grow.

Using yeast-based bioconversion materials

Sustainability of the LIFE project outcomes is being guaranteed by the project partners' commitment to their technology's uptake on a commercial scale. Proposals are being developed for further collaboration with the galvanising factory that provided waste water material for the RETOXMET demonstration runs.

BEST OF THE BEST 2007-2008

Project Number:
LIFE04 ENV/HU/000374

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

Beneficiary: TIARA Co. Ltd.

Period: Oct-2004 to June-2007

Total Budget: € 1 144 000

LIFE Contribution:
€ 565 000 (maximum)

Website: www.retoxmet.hu

Contact: Dr György Radnai

Email: radnaigy@vireco.hu

ENVACIO: Pollutant-free rice packing

The LIFE Environment project of a Spanish rice producing co-operative demonstrated the commercial viability of a new pollutant-free food-processing technology by applying eco-friendly vacuum-packing facilities as an alternative to toxic fumigants.

Situated 200km south of Barcelona, Spain's Ebre Delta is an important biodiversity resource hosting a wide range of wildlife species, including flamingos and eagles. The delta also supports a large number of commercial rice producers, which presented environmental threats to Ebre's wildlife through the use of chemical pesticides during rice packing. The LIFE project ENVACIO sought to help local farmers find better alternatives.

The project was managed by a co-operative, Cámara Arrossera del Montsia y Seccion de Credito SCCL, which includes some 4 500 members and has a long tradition of working closely with the Ebre environment dating back to 1927. Members of the beneficiary were aware that the fumigant methyl bromide (MB), used to protect rice from insects, was being banned due to its ozone-depleting properties and so LIFE assistance was sought to develop a greener option for the co-operative's rice packing business.

Vacuum-packing technology was identified as a cost-effective alternative to MB with significant local and global environmental benefits in terms of reduced pesticide pollution risks for the delta and improved macro-level atmospheric impacts. A demonstration plant was established to test and highlight the potential of this new approach to eco-friendly food processing. No such system had been used before and LIFE-financed results showed that vacuum packing was both technically and economically viable as well as environmentally friendly. Other benefits include lower health and safety risks for rice-packing workers from effects arising from the use and handling of chemical products.

Demonstration value

About 800 farmers and food producers participated in the LIFE project using the new packing facilities. The beneficiary noted an important attitude change among contributing farmers who are now more aware of the benefits from involvement in a 'green project' that promotes their role in supporting sustainable agriculture.

As a post-project follow-up study showed in July 2008, the system operates continuously, producing 1 200 packets of rice daily for sale to supermarkets and restaurants. The vacuum-packing production line has sufficient capacity to deal with all of the processed rice available for commercial use by the beneficiary.

Demand for the vacuum-packed rice has remained stable during the three years after LIFE. Analysis of the product's commercial properties indicates a longer shelf-life potential than rice treated with chemicals. Strong competition remains from production lines using the more cost-effective phosphine fumigants but these are also considered hazardous and pest resistance to this chemical has already been observed in various places.

The beneficiary aims to exploit these drawbacks of phosphine packing and take full advantage of their LIFE-funded production facilities' green credentials. In 2008, these continue to be actively promoted as an integral part of the co-operative's business strategy and deployed to help maintain their market share in rice sales, which they intend to boost by introducing a new form of packaging that does not use cardboard and will lead to cheaper production costs. This waste-minimising innovation is anticipated to further improve the commercial viability of vacuum-packed rice and strengthen the LIFE project's demonstration value for other EU food producers, including grain suppliers, as a cost effective and environmentally sound alternative to pesticide-based preservation processes.

Vacuum packing rice has reduced pesticide pollution risks to the Ebre Delta

Project Number:
LIFE02 ENV/E/000255

Title: Demonstration title of the progressive elimination of Methyl Bromide in the processed rice fumigation, due to the substitution of the vacuum packed rice, minimised the environmental impact and the emission of gases into the atmosphere

Beneficiary: Cámara Arrossera del Montsia y Seccion de Credito SCCL

Period: Oct-2002 to Sep-2005

Total Budget: € 1 571 000

LIFE Contribution: € 623 000

Website:
www.lacamara.es/life/index.htm

Contact: Juan Espelta Puell

Email: jespelta@lacamara.es

Machine & system industries

Europe's machine and systems industries incorporate businesses within the information and communications technology (ICT) sector as well as both electrical and mechanical engineering companies. These industries continue to experience high growth rates and invest significantly in R&D work, which has helped them expand to enjoy about one third of the EU's manufacturing value added.

Key environmental legislation that applies to these industries includes: the RoHS Directive, that restricts use of certain hazardous substances in electrical equipment; the WEEE Directive, that regulates collection, recovery, re-use and recycling of waste from electrical and electronic equipment; and the Energy-using Products Directive, that sets eco-design requirements for energy-using products.

Many LIFE projects have been active in theses areas, producing results that demonstrate important innovations to help strengthen the machine and systems industries' green credentials. These include work on Integrated Product Policy in telecoms, low impact engine components, eco-friendly refrigeration systems and integration of environmental issues in supply chains for vehicle manufacturers.

CO_2Ref: Back to the future for climate-friendly refrigeration

This Danish LIFE project successfully demonstrated how greenhouse gas emissions and energy consumption from supermarket refrigeration systems can be dramatically reduced in the future – by looking back and adapting what was once a common technology in the distant past, the use of CO_2 as a refrigerant.

Increasing demand for cooling and freezing facilities in supermarkets is a growing threat in the battle against climate-change. Current best practice encourages installation of centralised refrigeration systems as the most effective way of trying to reduce energy consumption. But these systems mostly rely on use of the heavy greenhouse gases hydrofluorocarbons (HFCs) as their refrigerant.

This LIFE project was innovative in investigating the use of carbon dioxide (CO_2) as a more environmentally friendly alternative to HFCs - then finding and trialling a way to introduce it in a prototype centralised supermarket system.

CO_2Ref technology is now in use in 26 systems in Danish supermarkets

CO_2 has a global warming potential two to three thousand times smaller than HFCs and is not unknown as a refrigerant. On the contrary, from 1850 to 1930 it had been widely used in all kinds of refrigerant systems, as had hydrocarbons and ammonia. These were forced out of the market during the 1930s by the chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) gases because these had lower toxicity, were non-flammable and worked at lower pressures.

About half a century later however, CFCs and HCFCs were linked to the hole in the ozone layer and the Montreal Protocol enforced their phase-out from 1989. They were substituted by HFC gases, but these also turned out to be problematic. Despite containing chlorine, they are based on fluorine, making HFCs potent greenhouse gases. The Kyoto Protocol bans them in new installations from 2010 and a total ban throughout the EU will be implemented by 2015.

Leading the world to a solution

Denmark, where this project was run, has been at the forefront in promoting use of climate-friendly refrigerants. In 1996, it decided to shift its industry's main focus from HFCs to natural refrigerants. A dual approach of high taxes and a complete phase-out of HFC refrigerants succeeded in achieving a quick technology shift within the country.

"These clear political signals in Denmark were an important catalyst for action by its refrigeration industry," remembers Finn Christensen, Research and Development Manager at Knudsen Køling, the beneficiary of this project and a leader in supermarket refrigeration systems in Denmark. "Since the mid-90s we knew we needed to find a suitable and cost-efficient replacement for CFCs. When Denmark also decided – as the first country in the world - to drastically phase out refrigerants with global warming potential with a general ban on HFCs in new installations from January 1st 2007, all our efforts were targeted on R&D."

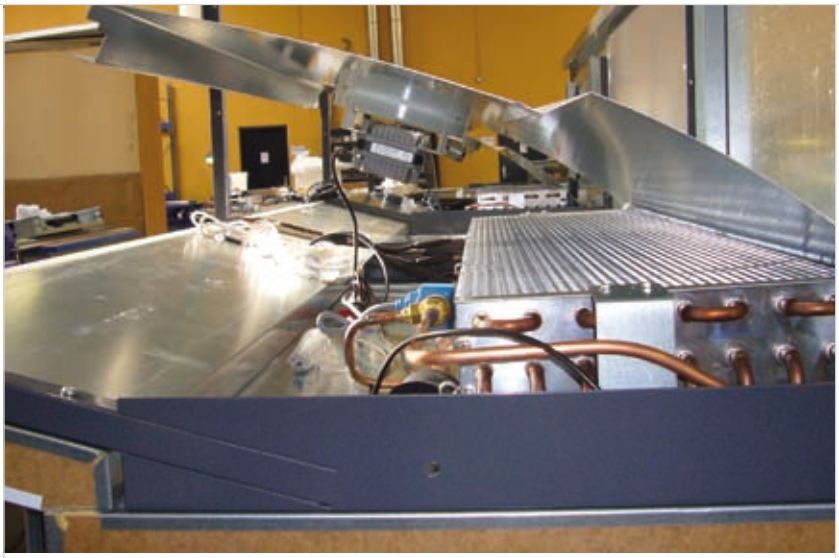
The hunt for climate-friendly alternatives led them to consider three natural refrigerants as possible alternatives to the synthetic ones: 1) Hydrocarbons, such as propane or isobutene, but they are highly inflammable; 2) Ammonia, which is

also inflammable as well as being toxic; 3) CO_2, which is non- or low toxic and non-inflammable. So CO_2 was chosen.

The problem is that CO_2 is a high-pressure refrigerant and requires a very special, redesigned technology. In the years leading up to this project breakthrough, the company gradually developed and launched on to the market several different systems using collected and cleaned CO_2 in the refrigeration process. Originally they had to use it as a linked system alongside HFC technology, but finally succeeded in finding the right partners and components to allow them to design a test system that did not require any synthetic refrigerant in the process.

Other projects had also been run investigating use of CO_2 and these had resulted in development of 'cascade systems', where the gas is compressed with a low-pressure compressor and another refrigerant is used to cool it and cause it to liquefy. The problem with this solution is that it is expensive. Systems with this technology are not economic for smaller supermarkets.

The main obstacle to further development was the compressor – the core constituent of the new technology. Knudsen Køling, worked with the German Bock Kältemaschinen GmbH, who were able to provide the compressor technology needed for use in a stand-alone CO_2 system. These two companies, together with the Danish Technological Institute (DTI) and Danfoss, one of the world's largest refrigeration companies, then applied for LIFE funding to develop what is termed a transcritical system – referring to the low critical temperature of CO_2 with 31°C, that is an obtainable condensation temperature – that would answer the technical challenges and bring environmental gain while being commercially attractive.



The CO_2 based technology requires special components, such as gas coolers

Giving developments a new lease of LIFE

The CO_2Ref LIFE project system works by using high pressure to compress the CO_2 to 90- bar, 130°C, where it does not condense but is cooled as a gas, passed through a pressure reduction valve and circulated as a liquid towards the refrigeration cabinets. In a closed loop, it is then passed back to the two Bock high-pressure compressors for the cycle to start again.

The LIFE supported system is designed to be as reliable and functional as conventional systems, uses the same or even less energy and requires no more servicing than the old-style alternatives. It is the first CO_2 system to use the concept of a booster - commonly used with other refrigerants - which reduces the number of heat exchanges and therefore the system's energy consumption as well as giving a safe oil return. The booster is built with a gas bypass to ensure a low pressure in the distribution system. Gas from a low pressure compressor is mixed with gas from the gas bypass as well as a medium temperature evaporators. When the gas is flashed, a small amount of liquid is formed, that is then used to cool the gas exiting the low pressure compressor. Other components include high temperature heat exchanger and expansion valves, a separator, gas bypass and medium temperature expansion valves.

This system was first tested as a laboratory prototype by the partner DTI, to probe reliability and performance of the components and their interaction. Issues such as higher energy consumption and noise were revealed. Valuable data was also provided for the particular problem of high-pressure control. These issues were addressed, leading to the production of a new generation of controllers that were then used in a prototype commercial system.

The prototype was installed in March 2007 at a Rema 1000 supermarket in Esbjerg, on the west coast of Denmark. The full system involved cold storage rooms within the building and refrigeration cabinets on the shop floor. The compressor was set up in a combined machine and stock room.

Results of the new system show that the final design has achieved an energy consumption about 4% lower than that of a conventional HFC or CO_2 cascade system. Studies also indicate that the new system has halved the contribution to global

warming of the reference HFC system. The global warming impact in this system comes from the generation of the electric energy needed to run the system.

Furthermore, indications are that service costs may be 15% lower than for the conventional systems, mainly because of the inexpensive refrigerant. In Denmark, the system is cost-neutral compared to other systems, because of the effects of taxation and national regulations on the capital costs. In other countries, initial costs would be likely to be 10-20% higher than for a conventional system. But as the technology matures, the prices of the more expensive specialised components will also decline.

Now the market choice

Crucially, the project has been a commercial as well as technical success with its results being welcomed by manufacturers of refrigeration systems and clients alike. The beneficiary has been excited about the expansion of the product thanks to the project. "We have and always had complete solutions for a whole supermarket," says Finn Christensen, who co-initiated the LIFE project, "but now our clients not only get their cabinets from us, but also an environmentally friendly refrigeration system."

Knudson Køling has improved its environmental and business performance

Finn Christensen presents the CO_2Ref compressor system installed in a Roskilde supermarket

LIFE co-funding helped to support the beneficiary be at the forefront of new technical developments. The partners Danfoss and Bock also profited from the experiences to develop their respective markets, such as for refrigeration-related equipment and medium-sized compressors. "The LIFE project was a great experience," adds Mr Christensen. "Co-operation with the partners was extraordinary, everybody was very dedicated. We are still working together as a result - and not only because we continue to sell components from these partners."

By July 2008, a total of 26 CO_2Ref systems were in operation, including 155 transcritical compressors with 3.0 MW cooling capacity and 80 subcritical compressors with 900kW freezing capacity. Another seven systems have already been ordered and will be in operation by the end of the year.

The most recent client is a brand new supermarket in the university area of Roskilde, which has installed the CO_2Ref technology. Hidden in the compressor room, a 2x4m^2 compressor system stands ready to cool all the shop's beverages, dairy products, fruits and vegetables. Insulated piping systems connect the different cooling islands and multidecks, each guaranteeing the respective required temperatures and without the emissions generated by other systems.

Thomas Munch Nielsen, MD at Knudsen Køling, concludes that the project "not only helped us to meet the legal requirements and protect the environment, but it has also been a great commercial success. That is fantastic." These benefits have already been noticed by the beneficiary's competitors. Other companies are also starting to offer systems based on a return to the use of CO_2 as refrigerant. As Mr Christensen points out, "CO_2 is for them, as for us, the best solution."

Project Number:
LIFE05 ENV/DK/000156

Title: Development and demonstration of a prototype transcritical CO_2 refrigeration system

Beneficiary: Knudsen Køling

Total Budget: € 556 000

LIFE Contribution:
€ 167 000 (maximum)

Period: Oct-2005 to Oct-2007

Website: http://knudsenkoling.itide.dk/Default.asp?Id=880

Contact: Finn Christensen

Email: fc@knudsenkoling.dk

IPP TEL: Telecom solutions for a lifetime … and beyond

This Greek LIFE project succeeded in redesigning and manufacturing a modem device using whole-of-life environmental considerations. This represented a groundbreaking implementation of the EU's preferred Integrated Product Policy and helped define new eco-label criteria for the telecommunications sector.

EU policy recognises that making products truly eco-friendly requires a fully integrated approach by looking at the environmental aspects of a product during its whole life cycle. This is known as Integrated Product Policy (IPP) and means tackling environmental problems before they arise by designing innovative solutions and giving consumers the ability to make environmentally informed choices.

The EU has sought to promote this approach to restrict use of hazardous substances in electric and electronic equipment and promote sound management of their waste by encouraging producers to consider all aspects of a product's life cycle from design to disposal.

The LIFE project IPP TEL was the first full-scale application of IPP in Greece and was groundbreaking in the European telecommunications sector. It worked on all aspects of the production, use and disposal of a modem device (netMod) and of a fixed telephone (IRIS 6001) to develop a detailed end-of-life management strategy reducing their environmental impact, whilst maintaining their economic efficiency.

Full life-cycle management

Led by the largest multinational provider of telecommunications products, solutions and services in Greece, INTRACOM TELECOM, the project used Life-Cycle Analysis to identify the major environmental risks from conventional manufacturing of the two devices. These risks are

IPP TEL developed eco-design of telecommunication devices

associated with the release of heavy metals - e.g. lead - and acidification. An analysis was carried out for eventual disassembly and component re-use as well as the recycling potential of alternative materials. The netMod device selected for redesign provided the basis for the redesign of the production cycle and the pilot programme.

After a small-scale test production of the re-designed modems, the project moved to full manufacturing and a few thousand eco-designed modems were produced using the new processes. These included the use of alternative manufacturing equipment to enable use of lead-free solders.

The project also investigated end-of-life management techniques for a wider range of devices to provide insight to help future eco-design decisions and waste management. A number of computer towers and telephone sets as well as modems (200 each) were disassembled and separated into hazardous and non-hazardous materials. The parts and materials were then recycled wherever possible or stored properly for future disposal by other Greek recycling companies.

Using all aspects of the project's work, a list of potential eco-label criteria - sorted by step within the product's life cycle - was drawn up for ISDN modems and fixed telephone devices. The resulting data has been submitted by the Greek Ministry of Environment for assessment and also to the EU Eco-label Board for consideration as a future standard.

Sustainability should be guaranteed as the project is of inherent interest to the beneficiary and regular production of eco-designed modems is already well underway. Market research undertaken by the project team indicates that consumers are generally willing to choose eco-designed products where they know them to be available and if they are no more expensive than conventional ones. This should encourage manufacturers to build on the project's achievements.

Project Number:
LIFE04 ENV/GR/000138

Title: Integrated Product Policy in the Telecommunication Sector

Beneficiary: INTRACOM S.A. TELECOM SOLUTIONS

Total Budget: € 1 287 000

LIFE Contribution: € 356 000 (maximum)

Period: Oct-2004 to Sep-2007

Website: www.ipp-tel.gr

Contact: Ms. Dimitra Pli

Email: dimpl@intracom.gr

INOCAST: Casting green engine blocks

BEST PROJECTS AWARD 2007-2008

The effectiveness of a less polluting alternative to the cold-box technique for casting aluminium for engine blocks has been demonstrated by Nemak Dillingen GmbH in Germany, who used its LIFE Environment INOCAST project to develop an innovative core production and casting unit using the 'inorganic warm box' (AWB) method.

At the heart of every motor vehicle is an engine block, which is 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 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 is 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 any 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.

Excellent results

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 de-coring process is achieved," explains process engineer, Dr. Ingo Prass. If the new technology was 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 to cut energy consumption by 37% overall and dust pollution by 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.

From pilot plant to mass market

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.

Photo: Thomas Mayer

INOCAST produced engine block casts with an inorganic warm box

The 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

Period: Jan-2005 to Jul-2007

Website: www.nemak.com/socialresponsibility/inocast

Contact: Joachim Kahn

Email: Joachim.kahn@nemak.com

EDIT: Eco-design throughout the supply chain for new vehicles

The French LIFE project EDIT created tools to promote and facilitate eco-design of new motor vehicles. It provided easy access to the information needed by manufacturers and clients all along the chain of production to ensure that environmental factors are fully taken into account in the process of developing vehicles, without compromising on quality or cost.

End-of-Life Vehicles (ELVs) in Europe represent a major environmental challenge. Around nine million vehicles reach the end of their functioning life each year, causing about 1 000kg of waste each. About one third of this waste ends up in landfills. To tackle this problem, the EU's ELV Directive aims to extend recycling and thus reduce landfill dumping to 5% by 2015.

The ability to recycle vehicle parts is significantly increased by the implementation of eco-design from the very conception of a new vehicle. By planning for the whole life cycle of the vehicle, eco-design ensures that environmental impact can be minimised, whilst maintaining performance and quality standards, and without increasing costs.

The complexity of vehicle production is such that constructors assemble more than 5 000 parts, of which 80% come from external suppliers. This creates an additional challenge as it means that implementing eco-design requires the participation of carmakers, parts manufacturers and raw material suppliers.

Creating tools to inform eco-design

To meet these challenges, the French plastic converters' association worked to engage the whole vehicle supply chain in improving their eco-design performance through the LIFE project EDIT. Basing their work on EMAS, ISO 14 001 and the emerging ISO 14 062 on eco-design standards, they brought together a representative panel of 20 companies involved at different stages of the vehicle production process.

They reflected on their working methods and discussed a common position on the sharing of material-substance information of parts with vehicle manufacturers. This is significant in ensuring that the composition of a part can be traced throughout the life cycle of the vehicle, without the know-how of the supplier being compromised. It enables informed end-of-life solutions to be planned.

The project successfully developed four integrated eco-design tools for members at all levels of the car industry supply chain to consult. The tools cover material, substance and end-of-life issues and provide all the information they need to comply with the ELV Directive.

SIGMA is a complete reference library of (dangerous) substances whose use is regulated in Europe. OMEGA is a database of specifications for recycling or re-use of end-of-life vehicle parts, including on issues of compatibility and separability of plastics. GAMMA is a database of worldwide regulations and the specific requirements of car manufacturers on the utilisation of dangerous substances. Finally, APM is a platform allowing suppliers and clients to exchange important information for the development of an environmentally and economically successful final product. For example, manufacturers can request a material-substance analysis of a vehicle part so that they know exactly what is in it.

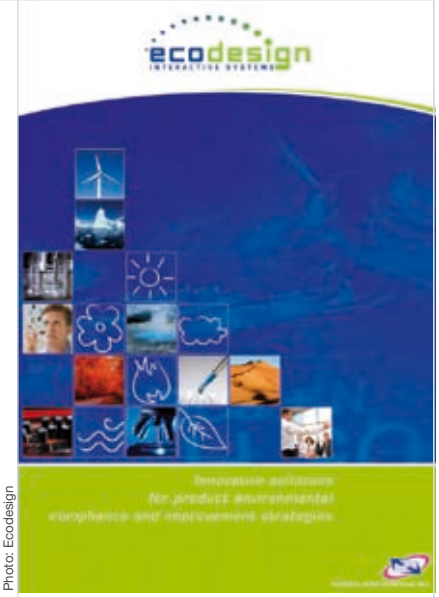


Photo: Ecodesign

Eco-design tools enable planned end-of-life solutions

These integrated tools allow suppliers and manufacturers to include environmental as well as technical specifications in the design phase of their product. These tools for applying the eco-design concept were successfully tested and validated by the project team.

Spreading the news

To ensure that the tools developed by the project were taken on board and used by manufacturers, the project provided training to companies: over 150 during the project and another 250 since the project's end. The on-site training started by presenting the environmental and

political importance of eco-design. It went on to show participants how to use the tools to better inform planning and design processes to meet the required environmental standards.

It was aimed at various levels within companies working in the vehicle supply chain, including management, research teams, buyers, and environmental and quality controllers. It sought to instil a sense of ownership of the EDIT tools so that they would be integrated into existing practices.

Although only three companies fully integrated the eco-design tools within their organisation during the course of the project, the training was important in raising awareness of the eco-design concept and where the necessary support information could be found. The Renault Institute agreed to be a partner in the promotion of the training.

This work is valuable as part of a longer process of changing mentalities and attitudes within the sector to include improved environmental performance - throughout the life cycle - within the key design concepts of a vehicle. EDIT organised conferences with leading actors in the field and published numerous articles in relevant industry magazines to increase their awareness-raising work.

Ongoing progress after LIFE

Following the project, partner companies submitted updated environmental performance reports. These found that the dangerous heavy metal lead had been removed from most products and that more recycled materials were being used in the production of vehicles. The recyclability of new vehicles was strongly improved, often through the use of mono-materials and the identification of oil-drain and separation points for the different materials.

Photo: Ecodesign

The upgraded software tools "X-Mat" and "X-change" are based on the EDIT LIFE tools

Four suppliers participating at the project - Po, Faurecia, Inergy and Delphi - have each now developed a specific part that is less polluting or more easily recyclable than previous models. Renault has now included 15kg of recycled material in the design of its new model, Modus. These are concrete improvements in the design of vehicles that will reduce their environmental impact over the long term.

With support of EU research funding, the beneficiary launched a follow-up project, ECODIS. This aimed to promote the transferability of the project into other sectors and products, including packaging, electronics and hazardous wastes, which are facing similar regulatory pressures to the car industry. It is working to upgrade the software used and strengthen the content. Through this, the EDIT tool SIGMA has become "X-Mat" and the exchange software "X-change".

About four years after the project's end, 25 big companies such as Renault, Po and Airbus are using the EDIT/ECODIS tools. These have also been selected as the official national reference for the implementation of eco-design in four industrial sectors in France: mechanics; electric and electrical equipment; plastics; and motor vehicles. Vincent Hauville from Ecodis is proud that "we were almost alone in developing the eco-design concept. At the time, few people believed in it; now it is the norm."

In 2007, an independent society, SAS ECOMUNDO, was created to commercialise the EDIT-based products and training. Based on the high value of the products and the level of demand, the aim is to achieve a turnover of one million Euro by 2009.

Project Number:
LIFE00 ENV/F/000593

Title: Eco Design Interactive Tools.

Beneficiary: FPA – Federation Plasturgie Activities

Total Budget: € 2 502 000

LIFE Contribution: € 747 000

Period: Jan-2001 to Dec-2004

Website: www.ecodis.org

Contact: Vincent Hauville

Email:
vincent.hauville@ecoconcept.com

Clothing & design industries

Europe's clothing and design sector comprises diverse companies producing everything from high fashion garments to furniture and footwear. A broad spectrum of different business processes and production systems operate within this sector, which is characterised by a mix of labour-intensive industrial activities and highly automated technology-based enterprises.

The manufacture of textiles, clothing, fur and leather goods uses many natural resources and can pose considerable environmental problems vis-à-vis pollution risks and waste treatment requirements. The main piece of legislation at EU level affecting these industries is the Integrated Pollution Prevention and Control (IPPC) Directive, which targets business activities such as pre-treatment or dyeing of fibres and textiles. Implementation of IPPC-related technologies have been shown to assist modernisation processes within companies and create considerably less pollution. This in turn creates savings through reduced treatment costs. Other key legislation affecting the clothing and design industries include REACH and the Water Framework Directive.

An interesting collection of LIFE projects have helped businesses attain and surpass the required standards via technology that demonstrates new green approaches such as: improving water management systems and sustainable consumption guidance for textile producers; reducing chemical wastes from dyeing processes; and establishing different Best Available Technologies (BATs) for tannery-related activities.

Dyeing bath re-use: Cutting through waste with a laser

Textile finishing is notorious for the environmental problems caused by its dyeing processes, in particular high water consumption and discharge of pollutants. This Spanish LIFE project used laser technology to enable the reutilisation of residual dye baths and thus reduce consumption and waste.

It has long been a challenge for the textile industry to manage its dyeing processes effectively to achieve consistency of colour and quality, to control costs and in recent years to try to minimise environmental impacts. Characteristically, the principal problems are very heavy water usage and high levels of pollutants produced from large numbers of residual dye baths.

The increasing requirement of environmental law to minimise these effects poses acute problems for the mainly small to medium-sized enterprises that make up most of Europe's textile finishing sector. These businesses find it difficult to remain competitive while meeting the costs of investing in and maintaining effluent-purification plants. This has resulted in stagnation within the industry, reduced employment, and many of the businesses disappearing altogether.

A key solution to these problems is the re-utilisation of residual dye baths, thus reducing demand on water supply and achieving big savings in the cost and environmental impact of waste water and its treatment. The problem has always been that existing technology could not provide sufficiently effective measurement and control of dye content. This meant that it was impossible to adapt and re-use the residue of one dyeing process in another batch while meeting the industry's demands for exact colour match and standards of colour-fastness.

Performance benefits from laser technology

The beneficiary in this LIFE project, the Polytechnic University of Catalonia, and its manufacturing partner, found a way of using laser technology to meet these demands. They achieved spectacular environmental benefits by preventing contamination at source and saving scarce resources – particularly water – following their idea that knowledge on the chemical reactions in the dyeing process enables the re-use of residual dyeing baths.

Two dyeing systems were investigated during the project: cotton (cellulose) fibres with direct colourants and polyester with disperse colourants. The technique involved using a RAMAN laser spectroscope to determine precisely the volume, content and concentrations of every one of the colourants and other residual chemicals left in a dye bath once a first dye had been performed.

A more conventional UV-VIS spectroscope was tried but found to be too imprecise when more than one colour was used. The laser spectroscope could measure and identify a process liquid's contents precisely.

Using the data from the laser spectroscope, a software system was able to calculate the required quantities of pigment and water to be added to the residual bath to maintain the desired ratios. It could then be prepared for re-use in the next dyeing process instead of the whole contents being discharged as waste. This technology thus enabled the creation of an exact match with a previously used colour in an extremely efficient way.

Furthermore, extended testing to emulate manufacturing processes showed that repeated re-use of dye baths in this way has no adverse effect on quality and effectiveness of

High technology solutions enable the re-use of residual dye baths

The accuracy of the measurements ensures the re-used dye provides consistent colour quality

dye or on ability to reproduce colour to required levels of match. The study found that 24 successive re-uses of dye-bath residue could be achieved with this process while maintaining the required quality of product. Correct dyeing performance improved from 80% to 98%.

Environmental benefits

The savings achieved equated to 72% of the water, moisturiser and sulphates, and just under 10% of the colourants. In real terms, based on dyeing typical industrial average batches of 100 kg of cotton yarn with direct colourants in one initial use and 24 re-uses of a dye bath using a three-colour dye – i.e. a total of 2 500 kg of material – the following benefits were achieved:

- Prevention of 18m^3 of chemical-loaded waste-water discharge - and the concomitant water consumption.
- Avoidance of emission of 7kg of soluble, non-biodegradable colourants and related waste sludge.
- Reduction by 360 kg of sodium chloride or sulphate discharge. These wastes are not eliminated by traditional treatment systems because of their solubility and contribute significantly to the salinisation of water.
- Avoidance of the discharge of 18 kg of surfactant – moisturising - products. Although these substances can be biodegradable, they contribute to formation of foams, both in treatment facilities and the natural waterways, because 100% purification is difficult.

Figures for the polyester dyeing process with disperse colourants were even more impressive. From an equivalent amount of dyeing, the reductions achieved were nearly 90% of sulphates, ammonium and dispersants, and 21.5m^2 of water. Most of the colourant is exhausted by both dyeing processes, meaning a 5% saving. Energy consumption was reduced in both processes by between 20-25%, since reheating the baths was avoided.

Recovering the cost

After such promising results, the major outstanding concern is cost-benefit. The laser spectroscope currently costs between € 80 000 and € 100 000. It is newly developed and at the moment has a limited range of applications. However, the beneficiary thinks that rapid advances in the technology will lead to equally rapid price reductions and that the cost could reduce to as little as € 15 000. This would make the investment easily recoverable in two to three years on a wholly commercial basis, without taking the environmental gain into account.

The project's original idea was for continuous on-line detection and analysis of dye-bath contents, but this was found to be more costly and time-consuming than envisaged. Nevertheless, it was established that this analysis needs only to be carried out at the start and finish of a dyeing process to achieve the necessary results. The original idea may become more feasible in the future.

Since the project ended, its technology has been exported and is currently used very successfully at textile mills in Brazil and Peru. Tests have also been carried out on more fabrics and types of colourants, with promising results. Success has also been achieved using reactant dyes.

The hope now is that the concept of closed-cycle technology can be taken forward another stage by extending the use of spectroscopic analysis into other commercial processes where water is used and discharged and where the possibility of re-use has not yet been considered. Likely sectors are food - particularly processing of dairy products - wood, paints and varnishes and other areas of the chemical industry.

The project team has great ambitions for the laser technology

Project Number:
LIFE03 ENV/E/000166

Title: Direct Reutilization of Dye Baths and Self-Monitoring of the Process "on line".

Beneficiary:
Polytechnic University of Catalonia

Total Budget: € 702 000

LIFE Contribution: € 267 000

Period: Sep-2003 to Aug-2005

Website: www.upc.es/ctt

Contact:
Prof. José Valldeperas Morell

Email: valldeperas@intexter.upc.es

PROWATER: Re-using water in the textile wet processing industry

This Italian LIFE project demonstrated at pre-industrial scale the technical and economic viability of an innovative recycling system for textile effluents.

For the MA-VI dyeing mill in Prato, saving water is good for the environment and essential for saving costs

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. "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. “Without the EC co-funding the implementation of the pilot plants would not have been possible,” states Federico Tognotti, the technical project manager from Tecnotessile.

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 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 project used a large balance tank to treat waste 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 10m^3/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.

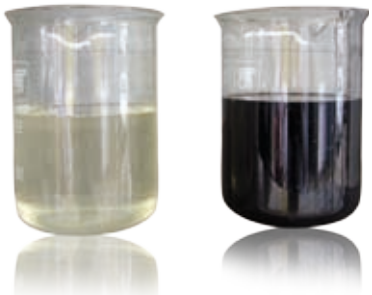
Clarification, ultrafiltration and ozonation were used in series for three of the companies (FIN, MA-VI, VIG), and clarification, ozonation and ultrafiltration for the fourth one (LIT). Further variations included: the use of an ultrafiltration membrane working under pressure instead of under vacuum 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.

The PROWATER technology was tested by four end-users, including a dyeing mill

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, 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



White and black: the difference between treated and untreated effluents.

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.

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."

"It was thanks to the great technical experience of the whole team that the project could be brought to a successful conclusion," adds Maria Paola Breghi, from ENEA – 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.

The project team hopes to continue developing the PROWATER concept

Project Number:
LIFE04 ENV/IT/000583

Title: Sustainable water management in the textile wet industry through an innovative treatment process for waste water 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

Resitex: Helping make green fashionable every year

Europe's many small and medium-sized textile businesses have to be quick to adapt to the changing demands of fashion. But they have been slower to move to environmentally friendly manufacturing processes. This LIFE project from Spain showed them how it can be done.

Huge volumes of waste water are discharged by Europe's textile manufacturing industry. The chemical load this carries is the sector's major environmental concern, but there are also many other issues such as energy consumption, gas emissions, solid wastes and odours.

Small-to-medium enterprises (SMEs) may play a leading role in the fashion world, but often lack the capacity to be at the forefront of environmental performance. They can find it hard to invest in the research and development necessary to identify environmentally friendly technologies or lack awareness of the existing possibilities.

In Spain, more than 70% of textile SMEs had no plan for waste reduction or waste management. The project therefore worked to identify and validate a catalogue of specific ways in which waste can be managed and reduced in the textile-finishing sector. This sector includes printing and dyeing and is where scope for environmental savings was greatest.

Guide for action

Work to gather the information was carried out by AITEX, a non-profit Spanish beneficiary, and ten companies in Spain and Portugal. The information was then classified and used to compile and produce a document "Procedure for Waste Management in the Textile Sector» as a reference point providing practical and specific advice on reducing waste and saving costs.

Advice in the guide is divided into four categories:

1. Good management practices – including advice on training, use of chemicals and colour management, for example highlighting water savings to be made by moving from light to dark colours during a production cycle.
2. Selection and substitution of chemicals – for instance replacing toxic surfactants with bio-degradable ones, or using anti-foaming agents free from mineral oils.
3. Minimisation of resources and recycling opportunities – such as recovery and re-use of printing pastes or rinsing water, and use of biological sludge on agricultural land.
4. Equipment and new technologies – highlighting such areas as digital printing, automated chemical dispensing, and ozone systems for waste water colour removal.

The identification and dissemination of these best practices will enable Europe's textile SMEs to reduce their waste. This in turn should help them comply with growing environmental requirements while keeping costs down. This will be increasingly important as the sector faces greater competition from producers in China and India.

Furthermore, whilst the Resitex project focused on the textile-finishing sector, its results are applicable to the whole industry including spinning, weaving and clothing. They are also transferable across Europe, although solutions will not always be the same.

"We are very glad with the project's achievements," says Korina Molla Latorre from AITEX. "For us, the Resitex procedure is the most advantageous waste-management option, applicable to any company and European textile sub-sector. Since the project's end, we have not only been contacted by Spanish clothing firms and European research centres, but also by a Brazilian chemical company interested in the process."

Resitex showed the textile finishing sector how to reduce its levels of pollution

The beneficiary's successes were recognised in 2008, when Resitex received a Regional Government award as Best European Project of the Valencian Community.

Project Number:
LIFE05 ENV/E/000285

Title: Alternatives for waste volume reduction in the textile sector through the application of minimisation measures in the process and in the consumption

Beneficiary: AITEX - Asociación de Investigación de la Industria Textil

Total Budget: € 375 000

LIFE Contribution:
€ 187 000 (maximum)

Period: Dec-2005 to Dec-2007

Website: www.aitex.es/resitex

Contact: Rosa López

Email: rlopez@aitex.es

Greening Europe's leather industry

The EU is the world's largest supplier of leather. However, the tanning industry in Europe experiences intense international competition and at the same time faces considerable environmental challenges. Most of the raw hide weight converts to waste during the tanning process and every tonne of raw hide produces an average of 500 kg of sludge from effluent treatment. The adoption of cost-effective clean technologies is essential for the European leather industry. LIFE support has been well used by a broad mix of different beneficiaries to improve the green credentials of Europe's tanning industry.

Photo: LIFE04 ENV/E/000237

LIFE has supported the greening of the tannery sector in Europe – and in neighbouring countries

Leather tanning - the process of converting raw hides into leather - is a resource-intensive industry using large amounts of raw materials and capital. The industry also involves serious pollution risks and EU tanners' environmental protection costs can be as high as 5% of their turnover.

Tanneries' environmental impacts originate from liquid, solid and gaseous waste streams and from the consumption of raw materials such as raw hides, energy, chemicals and water. Key negative impacts occur from:

- hazardous releases to waste water that stem from wet processing and the post-tanning operations.
- air emissions that arise mostly during dry-finishing processes but can also be released from all other parts of the tannery.
- solid wastes that derive from fleshing, splitting and shaving. A further potential source of solid waste is the sludge from effluent treatment plants; however, many of these wastes may be sold and used as raw materials in other industry sectors.

LIFE funding has enabled cutting-edge laboratory trials

Photo: LIFE04 ENV/E/000237

Environmental legislation

The main environmental legislation directly affecting the EU leather tanning industry is the IPPC Directive on integrated pollution prevention and control. It represents a cornerstone of EU environmental legislation addressing industrial installations with high pollution potential. Significantly, "The tanning of hides and skins" is listed in Annex 1 of the directive as an activity for which integrated prevention and control of pollution has to be achieved.

The directive requires that all tanneries, where the treatment capacity exceeds 12 tonnes of finished products per day, operate according to an integrated permit containing operating conditions based on 'best avail-

able techniques' (BATs). A general BAT definition is provided in Article 2 of the directive and the Commission has also published more detailed BAT requirements for tanneries in a dedicated set of reference documents, known as 'BREF'.

The current BREF for the tanning industry - Reference Document on Best Available Techniques for the Tanning of Hides and Skins - was adopted in February 2003 following an extensive consultation between stakeholders. In 2007 the European IPPC Bureau initiated a review of the BREF for the tanning industry with aims to issue a revised BREF in 2010.

Other important EU legislation includes the Water Framework Directive (WFD) and REACH. The former obliges leather sector businesses to take measures to reduce water pollution and the latter remains highly relevant since leather industries are important downstream users of many different chemical preparations.

LIFE support portfolio

LIFE has supported the greening of the tannery sector in Europe by co-funding the development and demonstration of many different projects highlighting the emergence of cleaner technologies linked with waste-water management or integrated prevention and control of pollution associated with implementation of the IPPC Directive.

This portfolio of LIFE assistance now represents a cluster of expertise in sustainable tannery management where a large library of good practice has been accumulated. The following projects offer particularly strong demonstration value, highlighting pertinent examples of best practice in the greening of Europe's leather industry.

Spanish expertise

Like all other EU countries, Spain's tanneries consume vast quantities of water and chemical reagents that consequently produce large volumes of potentially hazardous effluent. Eastern Spain's Technological Institute of Footwear and Related Industries (INESCOP) recognised these problems and established the LIFE project *Tannery Waste Water Recycling in Leather Industries* (**LIFE00 ENV/E/000498**) to demonstrate a technology for recycling waste water from tanning baths. A pilot plant was built to treat and re-use up to 25 m^3 of tanning bath fluid waste each day. Results offered strong transferability with leather quality remaining good from a 97% decrease in water use. The LIFE project also demonstrated lower demands for reactive agents, using 55% less sodium chloride and 14% fewer chromium salts. This led to a 27% reduction in the chromium content of sludge, thereby decreasing sludge-management costs, and overall effluent salinity was cut by 18% which greatly improved waste-water treatment efficiencies.

Water quality featured prominently in another important Spanish LIFE project that targeted the Alicante region's La Serrata industrial estate, where 40% of national leather production takes place. The private sector beneficiary, AQUAGEST Levante, S. A., launched its LIFE project *Development of a new salt water purification system in the tanning sector for re-use* (**LIFE02 ENV/E/000216**) with objectives to establish a new treatment process that increased the quality of waste-water effluents by removing organic and mineral pollutants. The

Photo: LIFE02 ENV/E/000236

One project demonstrated the recycling of natural sheepskin fat generated by degreasing operations

Photo: LIFE04 ENV/E/000237

Grape seed residue from the Spanish wine sector was used as a more environmentally friendly tanning compound

Photo: LIFE02 ENV/NL/000114

Taneftreat significantly improved the existing best available technology for tannery waste-water treatment

project used a biological reactor to separate waste components into efluent, which is treated by a combination of ultra-filtration membranes, reverse osmosis procedures and thermal drying systems, to produce inert solid waste and waste water with a considerably improved quality compared to previous approaches. The end products can be recycled for agricultural or industrial purposes and the LIFE-financed plant can treat up to 8 000 m^3 of water each day.

An equally innovative solution to help EU tanneries 'close the loop' of waste streams was developed by INQUIMICA in their LIFE project *Demonstration plant for the recycling of fat produced by processes of degreasing skins* (**LIFE02 ENV/E/000236**). Here, wastes from degreased sheep skins were treated using new technology capable of extracting valuable compounds that can then be reapplied in lubricating products for sheep hides. Results demonstrated that up to 700 tonnes of grease could be recycled each year and the beneficiary has extracted three new products using recycled raw material. These represent win-win economic benefits from environmental protection activities since they provide an alternative for high-cost raw materials such as fish oils.

Environmental impacts from degreasing processes have been further improved by the Spanish Leather Research Centre's LIFE project *DEGREASING* (**LIFE02 ENV/E/00019**) that adopted a holistic approach to improve the environmental sensitivity of tanning elements used during sheepskin degreasing. Special attention was paid to replacing polluting chemicals, such as ethoxylated nonylphenols, with a new surfactant that provided the leather sector with an inventive tool to fulfil WFD requirements concerning the List of Priority Substances that need to be reduced. Furthermore, the new surfactant was shown to be recyclable and the resulting separated fat can be recovered for sale as an industrial by-product.

Tanning elements also formed the focus of a forest conservation project that explored the use of wine grape seed waste as alternative tanning compounds to replace traditional tannins sourced from deciduous woods of high natural value. Similarly co-funded by Spain's Leather Research Centre, the LIFE project *GRAPE TANNINS* (**LIFE04 ENV/ES/00023**) demonstrated the effectiveness of a prototype technology for collecting and concentrating grape tannin extract. Two tanneries participated in the pioneering project that used grape-based compounds to tan cow hides for shoe-sole leather and sheepskin for lining leather. Outcomes were positive with

Environmental improvements are possible at each of the four tanning production cycle stages: liming, tanning, dyeing and finishing

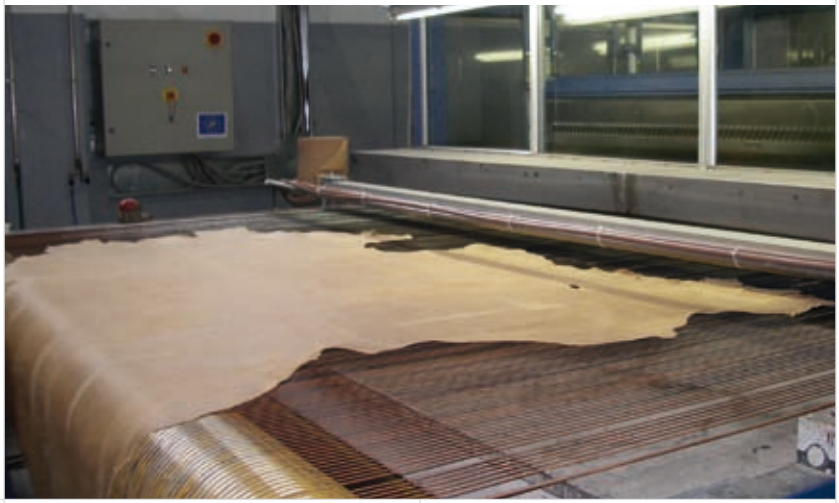


Photo: LIFE04 ENV/IT/000414

Photo: LIFE04 ENV/IT/000414

The N.E.S.S. project worked to clean up the spraying technology used in the skin-finishing phase

the grape tannins offering improved values in 'light fastness', competitive production prices and potential nature conservation savings from limiting deforestation by over 550 000 trees a year.

Italian innovations

A number of interesting and innovative developments in sustainable tannery management systems have been progressed by Italian beneficiaries including SICA S.p.A.'s *NESS - New Eco Spray System* project (**LIFE04 ENV/IT/000414**) which designed new technology to improve the environmental footprint of skin finishing phases in the tanning production cycle.

A range of toxic chemicals are commonly used during finishing such as synthetic resins, organic and non-organic pigments, nitrocellulose binders, waxes, emulsions and plastifying agents. Conventional finishing plants have in the past had very low efficiencies with up to 85% of the chemicals sprayed becoming waste products. These generate high levels of volatile organic compound (VOC) emissions, hazardous sludge effluent and produce potentially noxious working environments. The NESS project aimed to address these issues by innovating the spraying technology used in tannery processes. In particular, LIFE funds were used to introduce new technology based on: eliminating rotating spraying structures and replacing these with linear bars; switching from sprayers to aerographs to enhance the accuracy of colouring applications; and automating the overall finishing system.

Results from the project offer excellent demonstration value for other EU tanneries and the LIFE project highlighted the suitability of NESS technology from both economic and technical perspectives. Thorough tests were carried out over the entire leather-finishing cycle and outcomes clearly showed that final product quality remained high and comparable with products treated in a traditional way. Operating costs of the new finishing line were also lower than conventional systems and this is in part due to time savings achieved during finishing. Additional economic savings were made from reduced consumption of energy by as much as 75% and 95% less water was used. Raw material savings significantly lowered VOC emissions by up to 95% and other important health and safety benefits were noted by the NESS technology; it created about 85% less acoustic pollution and the use of water-based colours improved employees' working conditions.

NESS project outcomes were based on some of the BAT elements developed through the GIADA LIFE project (**LIFE00/ENV/IT/000184**) which helped to establish a pragmatic environmental policy for the Italian tannery sector. Another spin-off from this landmark LIFE project is *RIWAC - Project for recovery and re-use of industrial waters and trivalent chromium generated by tannery waste processing* (**LIFE05 ENV/IT/000812**), This project involves introducing new methods for purifying tannery waste water by destroying ammonia and converting it to nitrogen through a thermal catalytic system. In addition, the LIFE project technology aims to recover chrome and calcium sulphate from tannery sludge.

Dutch developments

Good practice in greening tannery management systems has been developed further by the Hulshof Royal Dutch Tanneries' LIFE project, *TANEFTREAT - Demonstration of effective and efficient TANnery EFfluent TREATment using an innovative integrated and compact biological and physical treatment plant* (**LIFE02 ENV/NL/000114**) - that succeeded in boosting tannery waste-water treatments with 'better than best' technology. Hulshof tanneries' LIFE project demonstrated a new, compact, integrated plant for the treatment of tannery effluent that improved current BATs in tannery waste-water treatment.

The new Taneftreat plant combined 'process-integrated' and 'end-of-pipe' measures. 'Process-integrated' measures separate different waste streams generated in the tannery, which are then treated by various 'end-of-pipe' processes to reduce toxicity, limit sludge volumes and generate biogas. Results from the LIFE-funded development have been compelling and demonstrated a 95% removal rate of chemical oxygen demand (COD). This compares favourably against the BAT, which had a COD removal rate of below 90%. Sulphur removal also showed considerable improvement as the project achieved a 70% removal rate, compared with a BAT removal rate of 40%.

Photo: LIFE03 ENV/S/000595

Tanwater's Elmo tannery is one of the oldest and largest tanneries in western Sweden

Additional advantages included: an 80% reduction in the amount of chemicals used by the BAT; 30% lower net energy demands, because biogas from the installation is used to produce its energy; and the installation costs were shown to be 35% lower than the BAT, thus improving the cost-benefit ratio appreciably. All these factors highlight the wider EU benefits that could be gained by incorporating Taneftreat technology as part of the new BREF and the beneficiary has been discussing such opportunities with the European IPPC Bureau's tannery working group.

Swedish success

Another successful BAT development with EU-wide relevance was taken forward by the Swedish *TANWATER - Reduction of the nitrogen discharge from the leather industry* (**LIFE03 ENV/S/00059**). Implemented at western Sweden's Elmo tannery, the project established new cost-effective methods to reduce nitrogen discharges from leather industry operations. The LIFE project outcomes were based on an innovative waste-water treatment process and displayed consistent outputs under different weather conditions. Results have been substantial, achieving nitrogen reduction levels of 86%. This was higher than the project's 80% target and far exceeded other technologies that achieve a reduction of about 30%.

Nitrogen loads were also lowered considerably by the LIFE-funded treatment plant - it created only 21 tonnes a year compared to the previous conventional biological process that produced 104 tonnes a year. Moreover, ongoing monitoring of the tannery's environmental impact showed a reduction in biochemical oxygen demand (BOD) of 98%, COD of 92% and chromium of 87%. Tanwater's more efficient concept of treating waste water from the leather industry costs approximately € 1.5 / m^3, including the original investment outlays, and this is around the same as conventional treatment costs.

Mediterranean management

All of these LIFE-funded improvements to environmental standards at European tanneries have been led by the industry itself. This demonstrates their commitment to the EU's sustainable business development agendas and LIFE support has helped to extend these principles beyond EU borders into neighbouring countries.

LIFE TCY funds have been used in Tunisia, for example, to assist the National Centre for Leather and Shoes to explore new ways to enhance waste-water management from tanneries and enhance integrated approaches to pollution prevention. Operated with Spanish partners, the, *EAUCUIR - Demonstration of waste water treatment in Tunisian tanneries* (**LIFE04 TCY/TN/000063)** project installed two new mobile pilot plants to demonstrate best practices using physical, chemical and biological treatment methods. The project included a dedicated training element and overall results indicate important capacity-building gains that will have long-term knock-on benefits for the Mediterranean area's environment.

LIFE funding also supported improved clean technologies and waste-water treatment in non-EU Mediterranean countries

Photo: LIFE04 TCY/ET/000045

Photo: LIFE04 TCY/TN/000063

Further successful and promising projects

The table below presents some of the numerous past and current LIFE projects focussing on greening businesses. For more information on individual projects, visit the online LIFE database at: http://ec.europa.eu/environment/life/project/Projects/index.cfm or the section 'LIFE by theme: Industry & production' at: http://ec.europa.eu/environment/life/themes/industry/index.htm.

Start	Country	Number	Acronym	Title
Basic industries				
2006	Belgium	LIFE06 ENV/B/000356	CLEAN SITE	Demonstrate and implement a self-supportive selective collection system for plastic packaging waste in the construction sector involving all stakeholders along the value chain and to show sustainability of the concept
2006	Spain	LIFE06 ENV/E/000001	ReLiStoP	Resin-free Liquid-Stone Process elimination of ynthetic polluting resins and toxic solvents used in the production of decorative elements in bass-relief with high artistic contents, substituted by eco sustainable and natural row materials imparting similar effect.
2006	Italy	LIFE06 ENV/IT/000254	UME	Ultrasound micro-cut ecosustainable
2006	The Netherlands	LIFE06 ENV/NL/000176	Green Bearings	Demonstrating innovative technologies that significantly improve the environmental performance of bearings
2005	Belgium	LIFE05 ENV/B/000517	INSIMEP	In Situ Metal Precipitation for remediation of groundwater contaminated with non ferrous metals
2005	Germany	LIFE05 ENV/D/000207	HVD	Hydro-Mechanical Descaling Process based on High-Pressure Vacuum Technology Using Scales as Abrasive Blast Medium
2005	Spain	LIFE05 ENV/E/000256	ZERO PLUS	Integral liquid residuals management model for surface treatment industries through BAT's
2005	Spain	LIFE05 ENV/E/000301	ECO-CERAMICS	Ecological ceramics optimization. Alternative to sludge disposal
2005	Italy	LIFE05 ENV/IT/000875	P.S.V.	Polishing Sludge Valorisation
2004	Italy	LIFE04 ENV/IT/000589	EWG	New clean technology for the decoration of all kinds of ceramic surfaces, whether flat or textured, with a minimal use of raw noble materials
2004	Sweden	LIFE04 ENV/SE/000765	Biored	Multi-Stage Biological Reduction of EDTA in Pulp Industries
2003	Germany	LIFE03 ENV/D/000043	Recarc ✪	Recycling of residues from metallurgical industry with the arc furnace technology
2003	Italy	LIFE03 ENV/IT/000421	PIONEER	Paper Industry Operating in Network: an experiment for Emas Revision
2003	The Netherlands	LIFE03 ENV/NL/000464	WAHEPHO	High quality water recycling including thermal energy recovery in photo film and photo paper production
2003	The Netherlands	LIFE03 ENV/NL/000476	Empereur ✪	Emulsion Pertraction for Europe
2003	Turkey	LIFE03 TCY/TR/000064	SEVESO-TR	Approximation of SEVESO-II Directive in Turkey
2003	Spain	LIFE03 ENV/E/000150	Recons	Reducing Construction Environmental Impact
2002	Italy	LIFE02 ENV/IT/000052	Micro-finishing ✪	A new dry process of microfinishing of grey porcelain and natural stone surfaces
2000	Sweden	LIFE00 ENV/S/000853	Picked	Recycling of Nitric Acid from Waste Pickling Acid by Electrodialysis

Start	Country	Number	Acronym	Title
2000	Sweden	LIFE00 ENV/S/000864	Cool Tech	The new coolant technologies for metalworking
2000	The Netherlands	LIFE00 ENV/NL/000808	EQuation	Demonstration and dissemination project for stimulating architects and local governments to build sustainable with help of innovative design tools
Tourism				
2004	France	LIFE04 ENV/FR/000340	ShMILE	Sustainable hotels in Mediterranean Islands and area - A demonstration project in Corsica, Sardinia and Halkidiki for EU-wide promotion of the EU eco-label on tourist accommodation service
2004	Italy	LIFE04 ENV/IT/000437	PHAROS	Playground harbour and research of sustainability
2003	Spain	LIFE03 ENV/E/000161	TIERMES	Tiermes-Caracena Valley
2003	France	LIFE03 ENV/F/000260	Promesse	Promotion of Environmental management on a sensitive ecotouristical site in Camargue
2003	The Netherlands	LIFE03 ENV/NL/000473	TOURBENCH	European Monitor and Benchmarking Initiative for Environmental Impacts and Costs of Tourist Accomodations
2002	Spain	LIFE02 ENV/E/000199	JARA	Sustainable tourism and environmental restoration in territory affect for the mining action
2002	Spain	LIFE02 ENV/E/000263	PEDRA TOSCA	Pedra Tosca Park
2000	Spain	LIFE00 ENV/E/000389	SITUR	Integral sustainability of Tourism
2000	Italy	LIFE00 ENV/IT/000064	ECO-FIMON	Ecological upgrading and tourist promotion of lake Fimon basin Eco-Fimon
2000	Italy	LIFE00 ENV/IT/000132	TOVEL	A concerted model of sustainable development of tourism
Food industries				
2005	Spain	LIFE05 ENV/E/000251	OZONECIP	Ozone clean in place in food industries
2005	Spain	LIFE05 ENV/E/000267	Be-fair	Benign and environmentally friendly fish processing practices to provide added value and innovative solutions for a responsible and sustainable management of fisheries.
2004	Denmark	LIFE04 ENV/DK/000067	New potatopro	Novel energy efficient process for potato protein extraction
2004	Spain	LIFE04 ENV/ES/000224	JELLY	Demonstration project for gelatine production with use of innovative technology achieving an important
2004	Greece	LIFE04 ENV/GR/000110	ECOIL	Life Cycle Assessment (LCA) as a decision support tool (DST) for the eco-production of olive oil.
2004	Italy	LIFE04 ENV/IT/000409	Olèico	A new application of phytodepuration as a treatment for the olive mill waste water disposal
2003	Spain	LIFE03 ENV/E/000085	SYNERGY	Quality and respect for environment
2003	Spain	LIFE03 ENV/E/000114	BIOVID	Alternative to wine shoots' incineration
2003	Greece	LIFE03 ENV/GR/000223	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
2003	Italy	LIFE03 ENV/IT/000321	FREEPCB	Elimination of PCBs from the Food Chain through Bioremediation of agricultural superficies
2003	The Netherlands	LIFE03 ENV/NL/000465	ANPHOS	Environmentally friendly phosphorus removal in anaerobe effluent by means of the struvite process
2003	The Netherlands	LIFE03 ENV/NL/000488	Dairy, no water!	A dairy industry which is self-supporting in water

Start	Country	Number	Acronym	Title
2003	Sweden	LIFE03 ENV/S/000593	Cleantreat	Clean Technology for Rest Product Treatment
2003	Sweden	LIFE03 ENV/S/000600	Stiim	System for Thermal Sedd Treatment - an Integrated Approach to Implementation and Management in the EU Seed Industry
2000	Greece	LIFE00 ENV/GR/000671	MINOS	Process development for an integrated olive oil mill waste management recovering natural antioxidants and producing organic fertilizer
2000	Sweden	LIFE00 ENV/S/000867	Eurocrate	Integrated reusable plastic crates and pallets, eliminating package waste, for sustainable distribution of everyday commodities in Europe
Machine & system industries				
2005	France	LIFE05 ENV/F/000062	GAP ✪	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
2005	Germany	LIFE05 ENV/D/000197	LEADFREE	Demonstration and Training Lead-Free Soldering for European Industry in Order to Promote Environment-Friendly Electronic Production
2005	Spain	LIFE05 ENV/E/000317	ELVES ✪	Development of a system for high-quality separation of metal alloys from end-of-life-vehicle engines...
2004	Germany	LIFE04 ENV/DE/000047	Resolved	Recovery of Solar Valuable Materials, Enrichment and Decontamination
2003	Greece	LIFE03 ENV/GR/000219	ETRES	Applying European Emissions Trading & Renewable energy support mechanisms in the Greek electricity sector
2003	Germany	LIFE03 ENV/D/000044	DAMIVOC	Development of an Aerospace Minimized VOC Exterior System
2003	Spain	LIFE03 ENV/E/000106	RECIPLAS ✪	Recycling plastic from vehicle factory waste to produce packaging and pallets
2003	Spain	LIFE03 ENV/E/000160	URBANBAT ✪	Integral waste management model for urban transport infrastructure
2003	France	LIFE03 ENV/F/000263	RENOFAP	Industrial pilot project for remanufacturing and reusing of diesel passenger cars particle filter
2003	The Netherlands	LIFE03 ENV/NL/000474	LNG Tanker	Demonstrating the effective and safe use of liquid natural gas as fuel
2003	Sweden	LIFE03 ENV/S/000596	Reuseoil ✪	Recovery of Used Oil filters generating recyclable metal and oil fractions
2002	Spain	LIFE02 ENV/E/000177	TRAGAMOVIL	Demonstration Project of Separate Collection and recycling of Waste from Mobile Phones
2002	Spain	LIFE02 ENV/E/000253	ECOBUS ✪	Collecting used cooking oils to their recycling as biofuel for diesel engines
2002	Finland	LIFE02 ENV/FIN/000321		Tool for small and medium sized transportation companies to improve their environmental performance
2000	Spain	LIFE00 ENV/E/000484	PC-NEW	Personal computers new equipments
Clothing & design industries				
2006	Germany	LIFE06 ENV/D/000471	INSU-SHELL	Environmentally Friendly Façade Elements made of thermal insulated Textile Reinforced Concrete
2005	Germany	LIFE05 ENV/D/000195	SuperWool	Sustainable, AOX-free Superwash Finishing of Wool Tops for the Yarn Production

Start	Country	Number	Acronym	Title
2005	Italy	LIFE05 ENV/IT/000846	BATTLE	Best Available Technique for water reuse in TexTiLE SMEs
2004	Spain	LIFE04 ENV/ES/000237	GRAPE TANNINS	Saving of forest exploitation for obtaining of tanning extracts through valorisation of wine waste
2004	Italy	LIFE04 ENV/IT/000414	N.E.S.S.	New Eco Spray System
2004	Tunesia	LIFE04 TCY/TN/000063	EAUCUIR	Demonstration of wastewater treatment in Tunisian tanneries
2003	Spain	LIFE03 ENV/E/000102	FOTOTEX	Water Purification Tertiary Treatment using Photooxidation at semi-industrial scale
2003	Greece	LIFE03 ENV/GR/000204	ECO-TEXTILE	Introduction and Promotion of the ECO-LABEL to the greek textile industry
2003	Portugal	LIFE03 ENV/P/000521	SONATURA ✪	Vapour Phase Bioreactors for Agro-non-Food Industries
2003	Sweden	LIFE03 ENV/S/000595	Tanwater ✪	Reduction of the nitrogen discharge from the leather industry
2002	Spain	LIFE02 ENV/E/000194	DEGREASING	Aqueous degreasing of fatty sheepskins through the replacement of ethoxylated nonylphenol by biodegradable ethoxylated alcohols and further recycling
2002	Spain	LIFE02 ENV/E/000216		Development of a new salt water purification system in the tanning sector for reuse
2002	Spain	LIFE02 ENV/E/000236		Demonstration plant for the recycling of fat produced by processes of degreasing skins
2002	The Netherlands	LIFE02 ENV/NL/000114	TANEF-TREAT ✪	Demonstration of effective and efficient TANnery Effluent TREATment using an innnovative integrated and compact biological and physical treatment plant
2000	Spain	LIFE00 ENV/E/000498	TARELI	Tannery Wastewater Recycling in Leather Industries
2000	Italy	LIFE00 ENV/IT/000034	ECO.FUTURE	Ecofriendly Furniture
2000	Italy	LIFE00 ENV/IT/000184	GIADA ✪	Integrated Environmental Management in the tannery district of Chiampo Valley (Italy)
2000	The Netherlands	LIFE00 ENV/NL/000797	DETECTIVE ✪	Demonstration Textile CO_2 Treatment Introduction Validation Effort

✪ 'Best Projects' award ✪ 'Best of the Best Projects' award

Competitiveness and Innovation Framework Program (2007-2013): Supporting innovative green technologies

The Competitiveness and Innovation Framework Programme (CIP) is a new Community instrument which aims to promote the competitiveness of European enterprises. With small and medium-sized enterprises (SMEs) as its main target group, the programme includes support for innovation activities, including eco-innovation, and for the promotion of renewable energies and energy efficiency. The eco-innovation strand within CIP has a budget of €430 million and specifically aims to support products, processes and services that help to reduce environmental impacts and promote the sustainable use of natural resources. It also supports the implementation of the Environmental Technologies Action Plan (ETAP), focusing primarily on market-oriented activities related to the take-up of environmental technologies, and also eco-innovation activities by enterprises and entrepreneurs oriented towards commercialisation.

Programme website: http://ec.europa.eu/cip/index_en.htm

Environmental Technologies Action Plan

The Environmental Technologies Action Plan (ETAP) was launched in 2004 to stimulate the development and use of environmental technologies. ETAP covers a spectrum of actions to promote eco-innovation and the take-up of environmental technologies. It includes priority actions along several lines, such as promoting research and development, mobilising funds, and helping to drive demand and improving market conditions.

Plan website: http://ec.europa.eu/environment/etap/index_en.htm

Available LIFE publications

LIFE-Focus brochures

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

LIFE and endangered plants: Conserving Europe's threatened flora (2008 - 52p - 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 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

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

LIFE and agri-environment supporting Natura 2000: Experience from the LIFE programme (2003 - 72 pp. – ISBN 92-894-6023-7 – ISSN N° 1725-5619)
http://ec.europa.eu/environment/life/publications/lifepublications/lifefocus/documents/agrienvironment_en.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/life/publications/order.htm*

Other publications

Best LIFE-Environment Projects 2007-2008 (2008, 44 pp.-ISBN 978-92-79-09325-8 ISSN 1725-5619)
http://ec.europa.eu/environment/life/publications/lifepublications/bestprojects/documents/bestenv08.pdf

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

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

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

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/publications/lifepublications/compilations/documents/tcycompilation06.pdf

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/environment/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 / "Breathing LIFE into greener businesses: Demonstrating innovative approaches to improving the environmental performance of European businesses"

Luxembourg: Office for Official Publications of the European Communities

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