



# Living with water

49 water projects in the Netherlands within the context of  
LIFE Environment (1992-2006)

commissioned by





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# Introduction

## *Water for the future*

Which new ways are there to use water, both in industrial contexts and in private households? Which solutions have (local) authorities devised to give water an appropriate place in our living environment? The 49 LIFE environmental projects set out in this brochure, which are all Dutch water initiatives, provide inspirational answers to these questions.

The Netherlands lives with water. Developments such as population growth, urbanisation and the rising sea level are making it an ever greater challenge to make sure that water is managed sustainably. Ingenuity is needed to ensure that the right quality water is available constantly, and in the right quantities.

LIFE (L'Instrument Financier pour l'Environnement) is the European financing tool for the environment. The 49 projects in this brochure provide innovative and sustainable solutions for current environmental issues. Water plays a main role: as a resource for industrial processes and private households, or as an indispensable element in our landscapes.

It is wonderful to see what is already possible. These projects illustrate how collaboration and innovation in the water sector can result in clean water and improved export opportunities. As such,

they are very much in line with the Future Environment Agenda [Toekomstagenda Milieu] developed by the Ministry of Housing, Spatial Planning and the Environment (VROM) and the key-area approach adopted by the Innovation Platform and the Ministry of Economic Affairs. These projects also emphasize the usefulness of combining the strengths of companies and knowledge institutions. This successful approach is evident at Wetsus, a new university research institute that is focusing on the development of new technologies in the field of sustainable water.

The best innovations in this brochure deserve to be followed up, as does the enterprising attitude of their initiators. It is important that the knowledge and experience gained are shared and that they hail the start of even more decisive collaborations and successful innovations. By doing this, we will be assured of an ongoing, sufficient supply of good-quality water in the future and will strengthen our position in the international market.

The LIFE environment programme ran from 1992 to 2006. In this period, a total of 750 million euros was awarded to 1400 projects in 25 countries. We should not let the end of this programme be the end of innovation. This brochure is packed full of inspirational ideas. This marks the start of a promising future, with water as the key.

*The Director-General for Environmental Management at the Ministry of Housing, Spatial Planning and the Environment*

*Hans van der Vlist*



# Structure







The 49 projects in this brochure have been clustered in themes. These are recognisable by the different symbols used, which are explained in the table on page 4. See pages 4, 5 and 6 for an overview of the projects plus keywords. The overview refers the reader to a brief description of each project, which includes a summary and a weblink. A deliberate decision has been made to include projects that have not (yet) been completed or implemented, since this will provide readers with a broad overview of all of the various initiatives.

More information about the LIFE programme can be found on these websites:

<http://www.senternovem.nl/life/english.asp> (SenterNovem)

<http://ec.europa.eu/environment/life/home.htm> (European Commission)










## EXPLANATION OF SYMBOLS USED

	Wastewater		Groundwater		Water and green
	Drinking-water and industrial-water supply		Maritime		Water management

TITLE	KEYWORDS	THEME	PAGE
Effective and efficient wastewater treatment in leather tannery, through innovative biological and physical treatment	Waste processing, leather industry		9
Stripping method for aircraft-engine parts, by Ultra High-Pressure Waterjet Stripping	Clean technology, (technical) maintenance		10
Clean technology for colouring of synthetic polymers with supercritical carbon dioxide	Solvent, clean technology, coating		10
Recovery of sulphur from tannery wastewater	Leather industry, industrial wastewater, removal of contaminated substances		11
Total Paste Return system for printing of textiles	Clean technology, industrial waste, textile industry, water contamination		11
Processing disposable diapers and incontinence materials	Wastewater treatment, hospital waste, reuse, separate collection, technology transfer		12
Biological wastewater treatment during the production of printed circuit boards	Wastewater treatment, paint, industrial wastewater, end-of-pipe technology		12
Environment-friendly phosphate removal in anaerobic effluent by means of struvite process	Wastewater treatment, food production		15
Demonstration project for fixation of reactive dyes onto cotton using Electron Beam Fixation	Clean technology, emission reduction, textile industry		16
Demonstration of the use of an environment-friendly cleaning liquid on the basis of the production's raw material	Solvent, working conditions, reuse of materials, air pollution, alternative technology		16
Reducing emission of ethylene oxide during production of starch derivatives	Emission reduction, food production, industrial process, hazardous substance, alternative technology		17
Membrane bioreactor (MBR) sewage treatment plant Varsseveld	Wastewater treatment		17
High-quality water recycling for photo, film and paper industries at Fuji Film	Wastewater reduction, reuse, paper industry		18
Reactor for the Bavaria brewery wastewater treatment plant	Wastewater treatment, removal of pollutants, drinks industry		18
DOC Kaas dairy industry, with closed water cycle	Water saving, food production	 	22
Demonstration of Rotating Filter Technology in seven industrial waste streams	Food industry, glass industry, filtration, cellulose, paper industry, wastewater treatment, waste processing, industrial wastewater, starch, by-product, industrial waste, chemical industry, physical treatment, textile wastewater		22
Demonstration of a closed system for potato blanching using hot water	Clean technology, food production, sustainable production		23
WET: Wastewater & Effluent Treatment	Wastewater treatment		23
Salinitrify: a solution for saline industrial wastewater	Wastewater treatment, saline wastewater		24
Reuse of drinking-water sediment, in replacement of iron salts in wastewater treatment and industrial applications	Water reuse, drinking water, treatment of sediment	 	24

TITLE	KEYWORDS	THEME	PAGE
Treatment of wastewater using dead-end membrane filtration	Water reuse, drinking water, alternative technology, water treatment	 	28
Maastricht cluster project: integral water management for eight industrial companies with central supply and semi-collective wastewater processing	Integral management, industrial wastewater, water management	  	30
Wastewater management saves natural ecosystems	Wastewater treatment, water reuse, groundwater	  	35
Sustainable drinking-water production from low-quality groundwater through decolourisation and softening	Water-quality improvement, drinking water, physical treatment, water management, water treatment, water demineralisation, groundwater	 	21
Decision-support system for the prediction of groundwater quality	Modelling, prediction, drinking water, environmental impact assessment, groundwater, decision-support	 	27
Reuse of excess water via a double mains system	Water savings, rainwater, residential area, public-private partnership, water supply, groundwater		28
Innovative drinking-water treatment method through bank infiltration	Drinking water, water supply, groundwater	 	29
Sustainable and integrated water and energy system in the Hessenpoort industrial area	Integral management, industrial area, water supply, energy supply		29
Infiltration Maaskant: drinking water from infiltrated surface water as an alternative to groundwater	Water supply	 	36
Use of local surface water as domestic and industrial water	Water supply, end-of-pipe technology, groundwater	 	47
Decontamination of polluted groundwater by in-situ injection of molasses	Volatile organic matter, removal of contaminant, disinfection, groundwater		30
Implementation of a 'smart' pump-and-treat system by influencing natural groundwater flow	Soil contamination, groundwater, management of contamination, water contamination		34
Decision-support system for environmentally friendly and cost-effective weed control on paved surfaces	Decision-support, environmental management, diffuse contamination, integral management, water conservation, pest control		34
Ecodock: recycling of single-hull tankers and discarded ships with hazardous waste	Waste processing, hazardous waste, shipbuilding		33
Campaign to demonstrate the adverse effects of tributyltin (TBT) to researchers and policymakers	Environmental awareness, pollution of marine waters, prevention of contamination, paint, information system		35
Demonstration of an underwater robot for salvaging of hazardous substances from shipwrecks	Pollution of marine waters, oil pollution, hazardous substance		36
Leidsche Rijn treatment filter: a natural way to treat urban water	Decontamination, environmental impact of agriculture		39
Development of a general method for the monitoring of atmospheric deposition	Air pollution, monitoring of contaminated substances		40
Development of a general method for quality determination and management of contaminated river basins	Decision-support, monitoring system, evaluation method, river, hydrographic basin, environmental assessment, toxicological assessment		40
Biocontrol for sustainable greenhouse horticulture	Greenhouse horticulture, alternative technology, damage to the ozone layer, pest control		41



TITLE	KEYWORDS	THEME	PAGE
Reduction of pesticides in horticulture through the constant monitoring and early treatment of diseases	Agricultural method, environmental impact of agriculture, groundwater, horticulture, pest control		41
Integral management plans for catchment areas of trans-border rivers: the River Dommel	Hydrographic basin, integral management, modelling, border area, river management		42
Development of the Oude Diep through integral land development	Policy integration, land-use planning		42
Smart Flow in Reiderland	Wastewater treatment, urban area, prevention of pollution, sewers		45
Sustainable urban technology in Schoonebeek	Urban development, sustainable development, human settlement		46
The Blue Transformation: towards a water-friendly city	Rain water, water management, urban wastewater		46
Integral sustainable urban drainage and core approach to rainwater filtration	Rainwater, sewers, drainage system		47
Smart Drain: disconnection of roofs and streets in the city centre	Integral management, urban area, water management		48
Groundwater suppletion through rainwater and treatment of overflow water by a helophyte filter	Water management		48







**Eef Leeuw:**

***'The wastewater produced by the leather tanning industry is complex'***

**Herman Hulshof:**

***'If we can market this technology, it will benefit the Dutch economy'***



# Responsibly treating leather

## Hulshof and Waterstromen invest in sustainability

Fats, sulphur, nitrogen, calcium, chrome, salt, preservatives and, in particular: proteins. The leather industry has possibly the highest concentration of pollutants in its wastewater compared to other industries. This is inherent to the special treatment necessary for the perishable animal skins. Traditionally, treatment of the wastewater requires large quantities of chemicals and lots of energy, and generates large quantities of residual substances. Hulshof Royal Dutch Tanneries in the Achterhoek (in the east of the Netherlands) has pioneered in developing a sustainable treatment technology in collaboration with Waterstromen B.V. Does this set the standard for all leather tanneries?

means that it stays a reasonably closed process.' The reason behind the internal development of a wastewater treatment system was increased discharge requirements and a vision toward a better environment. 'Environmental friendliness and cost savings often go hand in hand', believes Hulshof. 'The Netherlands is small and even though it's below sea level, we shouldn't fill it with waste.' As a member of the water board management in 2001, Hulshof felt that treatment was not arranged properly. 'Sludge removal was our biggest cost item. Price differentiation was not a possibility for the water board: all pollution units were the same price, so economies of scale could not be utilised.' Waterstromen B.V. was set up as a sister company of the water board, as an independent operator of systems, and, in this way, was able to provide custom service.



'Wherever skins were leftover, a tannery sprang up', says Herman Hulshof, fourth-generation director of family company Hulshof Royal Dutch Tanneries. 'A skin represents slaughter waste. Currently we recycle 250,000 skins per year into leather for furniture, aircraft and car seats. The fibre from the lower skin layer is used as a structure enhancer in sausages. Our wastewater flow, containing high levels of protein, is then recycled into biogas, which is then converted into green energy. This

### Anammox bacteria

The wastewater treatment of the tannery, which occurs in a streamlined system outside the residential centre, is based on three processes. Anaerobic pre-treatment converts organic substances into carbon dioxide and methane gas. A combined heat and power plant then converts this gas into green electricity – approximately 2.5 million kWh per year – and heat. Sulphur is reduced to its elementary solid state; further studies are being conducted regarding possible recycling. Nitrogen removal occurs by means of anammox bacteria amongst other things. This results in saving three-quarters of the quantity of oxygen and energy. Eef Leeuw at Waterstromen: 'This technology has a wide application for various types of industrial wastewater, such as wastewater from dairies and breweries. What makes this

### TANNING

*Establishment of Hulshof Royal Dutch Tanneries from Lichtenvoorde, Gelderland, dates back to 1876. Traditionally, tanning consists of four stages using turning tanning barrels. In the past, skins had to be left to ripen for a year between sheets of oak bark; now, this takes just one week. Urine is no longer being used. Bulls provide the highest quality leather. Using the present treatment system, Hulshof can process up to 300,000 skins a year. The waste flow generated is comparable to that produced by 45,000 inhabitants of a medium-sized municipality. In Europe, 240 million m<sup>2</sup> of cowhide is processed annually, largely in Italy and Eastern Europe. The biggest competitor is Brazil, which has a high level of beef production and low wages. With some 1000 companies worldwide, three of which in the Netherlands, there are still big environmental advances to be made.*





### Teething problems

Eligibility for a LIFE subsidy depends on costs exceeding the best available technology (BAT). This was certainly the case: 'Because it's so new, you encounter a lot of problems', says Leeuw. Hulshof: 'You invest five million and then find out that you easily need another four. The designer, Paques, had given insufficient thought to teething problems and adjustments are expensive. Together, we spent a long time looking for the perfect use of the technology, which delayed its introduction. The fixed costs of the old system continued for almost two years, alongside the investment costs for the new system. In retrospect, it was an unacceptable risk. The object is to gain recognition for this treatment method as BAT: then our financial deficit will become an advantageous head start.' Profit through the serial sale of this technology will not benefit the leather tanning industry - the patent is owned by Paques. 'Innovation is found not only in an idea, but also in putting it into practice', Hulshof says. 'We have shown that it is possible, by commissioning the development of expertise, in a public-private partnership. We have experimented for years. We will need to recover the start-up costs incurred.'

system unique is the integration of the system with a domestic wastewater treatment plant and a biomass plant.' This can be used to degrade fats from the catering industry, waste from abattoirs and rejected foodstuffs, for instance. Leeuw: 'There are various links between gas, heat, energy and water treatment, each with their own synergic effect. It is complex, but does have its advantages.'



#### EFFECTIVE AND EFFICIENT WASTEWATER TREATMENT IN LEATHER TANNERY, THROUGH INNOVATIVE BIOLOGICAL AND PHYSICAL TREATMENT

<b>SPECIAL</b>	Water treatment is outsourced
<b>BRIEF SUMMARY</b>	Leather tanneries produce highly contaminated wastewater, which is why they are subject to European legislation (IPPC). In the Hulshof leather tannery, Tanefreat (Tannery Effluent Treatment) is being used. The object is to remove organic matter and nitrogen sustainably, resulting in the consumption of considerably less energy and chemicals and with the generation of less sludge. Moreover, sulphur is largely removed. An additional advantage is its compact set-up. Another special aspect is the fact that the entire treatment process has been outsourced to Waterstromen; the leather tannery only supplies the wastewater.
<b>OF INTEREST TO</b>	Leather tanneries in Europe, but also the food, textile and paper industries
<b>ENVIRONMENTAL IMPACT</b>	Less energy and chemical consumption and less sludge generation
<b>SUBMITTED BY</b>	Waterstromen
<b>PARTNERS</b>	Hulshof Royal Dutch Tanneries
<b>DURATION</b>	December 2001 - July 2006
<b>PROJECT NUMBER</b>	LIFE02 ENV/NL/000114
<b>CONTACT PERSON</b>	Mr. E. Leeuw, +31 (0)573 29 85 51, e.leeuw@waterstromen.nl
<b>WEB LINK</b>	www.waterstromen.nl
<b>KEYWORDS</b>	Waste processing, leather industry





### STRIPPING METHOD FOR AIRCRAFT-ENGINE PARTS, BY ULTRA HIGH-PRESSURE WATERJET STRIPPING

<b>SPECIAL</b>	Technology award for new stripping method
<b>BRIEF SUMMARY</b>	In order to avoid wear, aircraft-engine parts are sprayed with a thermal coating. Old coating layers are usually removed mechanically or chemically. However, this is not always effective and raises a number of environmental problems. Therefore, KLM has developed a new stripping method: Ultra High-Pressure Waterjet Stripping (UHPW). Using the UHPW method, a computer-controlled, rotating jet nozzle sprays water at ultra high pressure over the surface of the engine part to be treated, which removes old metallic layers amongst other things. This method is not only particularly effective, but it also generates savings in terms of materials and energy. The success of the UHPW method was even emphasised when it was awarded the Milieuprijs voor industrie 1995 (an environmental award for energy), in the 'clean technology' category.
<b>OF INTEREST TO</b>	Airlines
<b>ENVIRONMENTAL IMPACT</b>	Less contaminated wastewater and chemical waste, no need for use of chemicals as in the old process
<b>SUBMITTED BY</b>	KLM Royal Dutch Airlines
<b>DURATION</b>	November 2003 - June 2005
<b>PROJECT NUMBER</b>	LIFE93 ENV/NL/003504
<b>CONTACT PERSON</b>	Mr. M. van Wonderen, +31 (0)20 649 05 58, mseg.van.wonderen@klm.com
<b>WEB LINK</b>	<a href="http://www.klm.nl">www.klm.nl</a>
<b>KEYWORDS</b>	Clean technology, (technical) maintenance



### CLEAN TECHNOLOGY FOR COLOURING OF SYNTHETIC POLYMERS WITH SUPERCRITICAL CARBON DIOXIDE

<b>SPECIAL</b>	Breakthrough technology eliminates water consumption
<b>BRIEF SUMMARY</b>	When painting polymers, such as textile, large quantities of water are needed: up to 300 m3 per ton. In the past, other solvents were tested as alternatives, but these remained problematic. TNO has demonstrated a zero-discharge technique at pilot scale that could mean a worldwide breakthrough in the colouring of polymers: supercritical carbon dioxide technology. The polymers have an affinity for the supercritical medium. Under high pressure, carbon dioxide dissolves in the polymer, causing it to swell up and allowing the paint to penetrate the polymer. After reducing the pressure, the paint remains in the polymer. The most important environmental improvement achieved through this process is the complete elimination of water consumption.
<b>OF INTEREST TO</b>	Producers of polymeric materials (fibres, sheets, films, clothing)
<b>ENVIRONMENTAL IMPACT</b>	Water consumption eliminated
<b>SUBMITTED BY</b>	TNO and KRI/BC
<b>PARTNERS</b>	DTNW, Uhde (Germany), ENERO (France), KPMG (the Netherlands)
<b>DURATION</b>	May 1994 - December 1997
<b>PROJECT NUMBER</b>	LIFE94 ENV/NL/001002
<b>CONTACT PERSON</b>	Mr. F. de Walle, +31 (0)15 269 68 86, dewalsev@wxs.nl
<b>KEYWORDS</b>	Solvent, clean technology, coating



### RECOVERY OF SULPHUR FROM TANNERY WASTEWATER

<b>SPECIAL</b>	Cleaner wastewater and the production of biogas
<b>BRIEF SUMMARY</b>	<p>Wastewater generated in tanneries contains high concentrations of sulphates, sulphide and organic matter. These cause corrosion to sewers and contaminate the surface water. A new technique makes it possible to remove the sulphur from the wastewater and to process the water in such a way that it is safe to discharge it into the sewerage system for further treatment in a biological water treatment plant. The process consists of two stages: in the first stage, an anaerobic treatment is used to produce sulphide from sulphur compounds. In the second stage, the sulphide is reduced to sulphur in a separate bioreactor. The resulting wastewater is discharged after an aerobic post-treatment applied to it.</p>
<b>OF INTEREST TO</b>	Tanneries and other industries with high levels of sulphur compounds in the wastewater
<b>ENVIRONMENTAL IMPACT</b>	Cleaner wastewater, less energy and chemical consumption, production of energy (biogas) and sulphur (can be sold to the chemical industry)
<b>SUBMITTED BY</b>	Biothane Systems International
<b>PARTNERS</b>	TNO
<b>DURATION</b>	February 1995 - December 1998
<b>PROJECT NUMBER</b>	LIFE94 ENV/NL/001016
<b>CONTACT PERSON</b>	Mr. A.I. Versprille, +31 (0)15 270 01 11, brv@biothane.com
<b>WEB LINK</b>	<a href="http://www.biothane.com">www.biothane.com</a>
<b>KEYWORDS</b>	Leather industry, industrial wastewater, removal of contaminated substances



### TOTAL PASTE RETURN SYSTEM FOR PRINTING OF TEXTILES

<b>SPECIAL</b>	Reuse of printing paste results in decreased levels of contaminated water
<b>BRIEF SUMMARY</b>	<p>Textile companies discharge excess printing paste from textile printing machines into the European sewers. In order to reduce the environmental impact of textile printers and to improve the competitive position of the European textile industry, a Total Paste Return system (TPR) has been developed, which means that excess paste can be collected and reused. The paste collected is first separated by colour and composition and then processed in order to achieve the right colour and viscosity. Following this process, the paste is ready for immediate reuse.</p>
<b>OF INTEREST TO</b>	Textile industry (financially, only feasible for large textile printers)
<b>ENVIRONMENTAL IMPACT</b>	Reduction in the amount of waste generated and raw materials used; improved quality of wastewater, since less waste ends up in it
<b>SUBMITTED BY</b>	GSE
<b>PARTNERS</b>	Stork
<b>DURATION</b>	July 1996 - January 1999
<b>PROJECT NUMBER</b>	LIFE96 ENV/NL/000224
<b>CONTACT PERSON</b>	Mr. H. Ensing, +31 (0)575 56 26 29
<b>WEB LINK</b>	<a href="http://www.storkgsedisensing.com">www.storkgsedisensing.com</a>
<b>KEYWORDS</b>	Clean technology, industrial waste, textile industry, water contamination



## PROCESSING DISPOSABLE DIAPERS AND INCONTINENCE MATERIALS

<b>SPECIAL</b>	Broadly applicable recycling method for nappy and incontinence waste
<b>BRIEF SUMMARY</b>	Disposable diapers and other incontinence materials are a large source of waste. A method has been developed for the recycling of disposable diapers and other incontinence materials into three high-quality raw material streams. Fibres, plastic and super-absorbent polymers are recovered from the used diapers and incontinence materials. Recycling these products means that raw materials are spared, since the method strives to achieve high-grade reuse of all materials from diapers and other incontinence materials.
<b>OF INTEREST TO</b>	Applicable in all regions with more than 20 million residents living within a 200 km radius
<b>ENVIRONMENTAL IMPACT</b>	Reuse of waste, reduction of raw materials usage, improved wastewater quality
<b>SUBMITTED BY</b>	Knowaste
<b>DURATION</b>	March 1997 - December 1999
<b>PROJECT NUMBER</b>	LIFE97 ENV/NL/000120
<b>CONTACT PERSON</b>	Mr. A. Visser, +31 (0)24 328 42 84, a.visser@royalhaskoning.com
<b>WEB LINK</b>	<a href="http://www.knowaste.org">www.knowaste.org</a>
<b>KEYWORDS</b>	Wastewater treatment, hospital waste, reuse, separate collection, technology transfer



## BIOLOGICAL WASTEWATER TREATMENT DURING THE PRODUCTION OF PRINTED CIRCUIT BOARDS

<b>SPECIAL</b>	Inexpensive approach to complex contamination
<b>BRIEF SUMMARY</b>	The production of printed circuit boards involves a wide range of chemicals and large quantities of water. This results in complex and heavily contaminated wastewater. Physical and chemical techniques for wastewater treatment do not offer sufficient results for this complicated problem. At Mommers, an innovative biological method for the removal of sulphur compounds, nitrogen compounds and metals from the wastewater was implemented in a pilot installation. This anaerobic method makes it possible to reduce the concentrations of the above-mentioned contaminating substances to a level below the Dutch discharge standards. Moreover, this biological process is far less expensive than the conventional physical and chemical treatment methods.
<b>OF INTEREST TO</b>	Limited, project not completed
<b>ENVIRONMENTAL IMPACT</b>	Limited, since implementation was not complete (takeover, product shift)
<b>SUBMITTED BY</b>	Mommers Print Service
<b>PARTNERS</b>	Paques Bio Systems
<b>DURATION</b>	September 1997 - January 2001
<b>PROJECT NUMBER</b>	LIFE97 ENV/NL/000124
<b>CONTACT PERSON</b>	Mr. C. Kuhlman, +31 (0)475 47 93 33
<b>WEB LINK</b>	<a href="http://www.mps.nl/index.htm">www.mps.nl/index.htm</a>
<b>KEYWORDS</b>	Wastewater treatment, paint, industrial wastewater, end-of-pipe technology





# Optimal use of nature

## Wastewater treatment according to Lamb-Weston/Meijer and Colsen

A closed cycle in the potato-processing industry: an environmentally friendly method is used to convert phosphate from wastewater into usable artificial fertiliser. It might sound easy, but it was preceded by a huge amount of research. Reason being that wastewater is characterised by the complexity of the material. However, the decision to choose this method was the right one: the system is a success and the first clones are already appearing on the market.



Big factories like Lamb-Weston/Meijer have so much wastewater, with high concentrations of starch and fats, that they treat it themselves. Before, only carbon needed to be removed from the water. Now, nitrogen and phosphate are removed as well, because of excessive algal growth. As legislation changes, industry develops. 'It's our responsibility to make sure that our business practices are sustainable', says Cees van Rij at Lamb-Weston/ Meijer. 'From the point of view of the environment, waste and wastewater are unwanted products. For phosphate removal, we ought to add metal salt: we predicted problems disposing of this contaminated treatment sludge.' Joop Colsen from the engineering consultancy of

the same name explains the solution: 'We add magnesium to wastewater that is anaerobically pre-treated and that is rich in ammonium and phosphate. In the resulting natural reaction, the substances crystallise into magnesium-ammonium-phosphate, also referred to as struvite. The clean water is then emptied into the Westerschelde and the struvite can be sold as manure.'

Time was needed to develop this principle: 'The process did not run smoothly during pilot tests. We found that we had to start by removing certain substances, such as CO<sub>2</sub>. Therefore, the essence lies in the separate stripping of the ingredients, followed by the crystallisation process.' Next, the removal of nitrogen was optimised. 'Ammonium nitrogen is converted into nitrogen gas instantaneously, in combination with aerobic post-treatment. As the new nitrogen removal process means that more wastewater can be treated anaerobically, energy efficiency has increased. In addition, anaerobic treatment generates a considerable amount of energy in the form of biogas.' As a whole this is a closed system, virtually without any residue, with low costs and a minimal impact on the environment. And it can be used by all companies that process agricultural products, from dairies and beer breweries to starch producers.

### Robust

There was hardly any reference material available. Van Rij: 'It is a risk to work with a new technology that hasn't yet been tried and tested. A subsidy provides you with just that extra bit of support needed to go ahead. It took us approximately one year to convince the shareholders.'

### POTATO BUSINESS

*Meijer's potato business in Zeeland, in the south-west of the Netherlands, was set up in the nineteen-twenties. In the nineteen-eighties, the company developed into a large chip factory. The American Lamb-Weston company's knowledge gave it a considerable head start in the field of chip production: they made a good partner for Meijer, which knew the European potato market inside out and back to front. In 1994, the amalgamation of the two resulted in a 50-50 joint venture. Lamb-Weston/Meijer has 3 Dutch branches and a staff of approximately 1000 employees. The company exports 90% of its production, supplying its product to large restaurant chains in particular. Good chips demand a good quality potato: the potatoes come from controlled crops grown in the Dutch provinces of Zeeland and North Brabant, and Belgium, Germany, France and England.*



The introduction took place in stages. Colsen: 'You start with a lab scale, followed by a pilot system of several cubic metres per hour. Despite this, it's still a nail-biting time, waiting to see which problems arise on a large scale. This is why we started off with a half system. The second line has been operational since January 2005.' Colsen believes that a down-to-earth approach is important. 'It's a normal system that doesn't require any extra or especially trained staff. We build robust systems and don't bother ourselves too much about 'high-tech' features. This leads to fewer problems during use.'

### Internationalisation

The engineering consultancy has been working with the potato processor for fifteen years now. 'It's a fruitful combination, one that I would like to continue for another fifteen years', says Colsen.

'Both parties have an interest in the collaboration. Our ideas are put into practice and the company maintains optimal environmental systems and a good name in terms of its policy towards the environment. It's fun to devise new solutions and to be ahead in new developments.' The current application is innovative as well. The technique developed for phosphate and nitrogen removal is also being used to treat fermented manure. Colsen: 'This is currently the only (robust) technique available for manure processing. All other experiments have been a fiasco. So, there's still a lot of work to be done in the future.' The subsidy allows us to internationalise: 'LIFE is awarding large subsidies, which really helps in the further development of the application. In Cyprus, for example, urgent action is needed. It has an enormous manure surplus. We are running a demonstration project there now', says Colsen. Van Rij concludes: 'We are very open about environmental aspects. We have to make our money from chips, not from water treatment. If we can help others with new water treatment technology, we are pleased to do so.'



## ENVIRONMENT-FRIENDLY PHOSPHATE REMOVAL IN ANAEROBIC EFFLUENT BY MEANS OF STRUVITE PROCESS

<b>SPECIAL</b>	Converting phosphates from wastewater into fertiliser
<b>BRIEF SUMMARY</b>	Potato-processing company Lamb-Weston/Meijer, from Kruiningen, has developed a wastewater treatment system that converts phosphates into fertiliser. This is referred to as the ANPHOS® method. This system uses magnesium salts instead of iron salts or aluminium salts. Magnesium salts are less expensive and have a low environmental impact. During processing, phosphates and ammonium are converted into magnesium ammonium phosphate ( $MgNH_4PO_4$ ), otherwise referred to as struvite. The residual product can be used as fertiliser or can be added to various fertilisers. An additional environmental advantage is that less sludge is produced. This sludge is also of a higher quality. Moreover, far less energy is needed for the aeration of the aerobic treatment process. The system functions at 200 m <sup>3</sup> /hour and to full satisfaction.
<b>OF INTEREST TO</b>	Food industry and other relevant parties
<b>ENVIRONMENTAL IMPACT</b>	Reduction of phosphor discharge into surface water
<b>SUBMITTED BY</b>	Lamb-Weston/Meijer
<b>PARTNERS</b>	Colsen
<b>DURATION</b>	December 2002 - June 2005
<b>PROJECT NUMBER</b>	LIFE03 ENV/NL/000465
<b>CONTACT PERSON</b>	Mr. C. van Rij, +31 (0)113 39 49 55, ceesvanrij@lambweston-nl.com
<b>WEB LINK</b>	www.lambwestonmeijer.nl; www.colsen.nl
<b>KEYWORDS</b>	Wastewater treatment, food production





### DEMONSTRATION PROJECT FOR FIXATION OF REACTIVE DYES ONTO COTTON USING ELECTRON BEAM FIXATION

<b>SPECIAL</b>	Improved fixation leads to less water contamination
<b>BRIEF SUMMARY</b>	When dyeing textiles, it is vital that the reactive dyes attach extremely well to the textile fibres. The disadvantage of the conventional fixation method is that the dyes react with water. As a result, the efficiency of the fixation does not exceed 70%. The non-fixed dyes and chemicals, which are harmful to the environment, are rinsed away at the end of the dyeing process. Electron Beam Fixation would achieve higher fixation efficiency, as a result of which fewer chemicals and pigments would end up in the environment.
<b>OF INTEREST TO</b>	Textile industry
<b>ENVIRONMENTAL IMPACT</b>	This project's objectives were not achieved. The system was found to generate a lower fixation efficiency than originally expected.
<b>SUBMITTED BY</b>	Vlisco
<b>DURATION</b>	February 1997 - December 2000
<b>PROJECT NUMBER</b>	LIFE97 ENV/NL/000125
<b>CONTACT PERSON</b>	Mr. W. Coerver, +31 (0)492 57 09 22, w.coerver@vlisco.nl
<b>WEB LINK</b>	<a href="http://www.vlisco.nl">www.vlisco.nl</a>
<b>KEYWORDS</b>	Clean technology, emission reduction, textile industry



### DEMONSTRATION OF THE USE OF AN ENVIRONMENT-FRIENDLY CLEANING LIQUID ON THE BASIS OF THE PRODUCTION'S RAW MATERIAL

<b>SPECIAL</b>	Cleaning more cheaply and chlorine-free
<b>BRIEF SUMMARY</b>	When colouring altuglass (methyl-metha-acrylate or MMA), the same vessel is used for different colours. In order to prevent the colours from mixing, the vessel must be cleaned after each colouring. Until mid- 2000, this was done using the hazardous chlorinated solvent DCM (dichloromethane). In order to eliminate the use of this solvent, a method was developed where the vessels were cleaned using the raw material MMA. After use, this 'rinsing MMA' can be filtered and reused for cleaning purposes. This method is more environmentally friendly, promotes a more hygienic work environment and is cheaper than cleaning with chlorinated DCM.
<b>OF INTEREST TO</b>	Chemical sector, polymer and paint companies
<b>ENVIRONMENTAL IMPACT</b>	Reduction of DCM emission and exposure to DCM, in other words: reduction of emissions to air, improved working conditions and reduction of waste streams
<b>SUBMITTED BY</b>	Altuglas International (formerly Atoglas Nederland)
<b>DURATION</b>	February 1999 - December 2002
<b>PROJECT NUMBER</b>	LIFE98 ENV/NL/000189
<b>CONTACT PERSON</b>	Mr. H.J.C. Mutsters, +31 (0)58 233 68 00, bart.mutsters@atoglas.com
<b>WEB LINK</b>	<a href="http://www.atoglas.com">www.atoglas.com</a>
<b>KEYWORDS</b>	Solvent, working conditions, reuse of materials, air pollution, alternative technology



### REDUCING EMISSION OF ETHYLENE OXIDE DURING PRODUCTION OF STARCH DERIVATIVES

SPECIAL	Almost complete elimination of hazardous substances from wastewater
BRIEF SUMMARY	During the production of certain starch derivatives, starch is treated with ethylene oxide. This is a very toxic substance with very negative long-term effects for humans and the environment. When cleaning starch products, ethylene oxide ends up in the environment via cleaning water and air used for drying. A new cleaning process has been developed in which ethylene oxide bonds with nitrogen. The nitrogen is then treated with sulphuric acid. This results, on the one hand, in nitrogen that is suitable for reuse and, on the other hand, ethylene glycol that can be used in other processes. At first, an in-line spraying tower was used. When this was found not to be satisfactory, a switch was made to a new technique: acid disintegration.
OF INTEREST TO	Other, similar factories in Europe; these also use considerable quantities of ethylene oxide
ENVIRONMENTAL IMPACT	Greater than initially expected, through developments not originally included in the project: reduction of ethylene oxide emissions to almost zero
SUBMITTED BY	Avebe
DURATION	May 1999 - May 2002
PROJECT NUMBER	LIFE99 ENV/NL/000231
CONTACT PERSON	Mr. J.H. Stuut, +31 (0)598 66 12 60, stuuth@avebe.com
WEB LINK	<a href="http://www.avebe.nl">www.avebe.nl</a>
KEYWORDS	Emission reduction, food production, industrial process, hazardous substance, alternative technology



### MEMBRANE BIOREACTOR (MBR) SEWAGE TREATMENT PLANT VARSSEVELD

SPECIAL	First large-scale MBR for domestic wastewater
BRIEF SUMMARY	The first MBR to be used for domestic wastewater treatment was brought into use in December 2004. Since this time, practical experience has been gained and various studies have been conducted. The objective is to demonstrate that this technology can be used on a large scale, and could also be used for other sewage treatment plants. It results in a compact plant with excellent effluent quality. Noise and odour emissions are limited too.
OF INTEREST TO	Sewage treatment plants, consultancies
ENVIRONMENTAL IMPACT	Not completed yet, possible reduction of noise, odour emissions and sludge production
SUBMITTED BY	Rijn en IJssel water board
PARTNERS	DHV Water, Foundation for Applied Water Research [Stichting toegepast onderzoek waterbeheer (STOWA)]
DURATION	October 2002 - June 2006
PROJECT NUMBER	LIFE02 ENV/NL/000117
CONTACT PERSON	Mr. P. Schyns, +31 (0)314 36 93 69, p.schyns@wrij.nl
WEB LINK	<a href="http://www.wrij.nl">www.wrij.nl</a>
KEYWORDS	Wastewater treatment



## HIGH-QUALITY WATER RECYCLING FOR PHOTO, FILM AND PAPER INDUSTRIES AT FUJI FILM

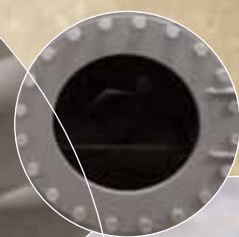
<b>SPECIAL</b>	Combination of techniques for water and energy savings
<b>BRIEF SUMMARY</b>	By use of a combination of innovative techniques, it was demonstrated in full size that it is possible to recycle high-quality wastewater in the photo, film and paper industries. The techniques used to do this are a membrane bioreactor and reverse osmosis. Using the new plant, sludge production is reduced by at least half the previous amount, which has resulted in reduced transport and processing costs for Fuji. Maximum quantities of silver are recovered. Plant capacity is a maximum of 45 m <sup>3</sup> /hour. At the same time, a heat pump and heat exchangers are used to recover heat. This heat is used to heat up the feed water for the steam boilers.
<b>OF INTEREST TO</b>	Photo, film and paper industry and industry in general
<b>ENVIRONMENTAL IMPACT</b>	Reduction of quantity of Chemical Oxygen Demand (COD), silver and chemicals in wastewater
<b>SUBMITTED BY</b>	Fuji Foto Film
<b>DURATION</b>	January 2003 - January 2006
<b>PROJECT NUMBER</b>	LIFE03 ENV/NL/000464
<b>CONTACT PERSON</b>	Mr. H. Notenboom, +31 (0)13 579 19 30, hn@fuji-ef.nl
<b>WEB LINK</b>	<a href="http://www.fujitilburg.nl">www.fujitilburg.nl</a>
<b>KEYWORDS</b>	Wastewater reduction, reuse, paper industry



## REACTOR FOR THE BAVARIA BREWERY WASTEWATER TREATMENT PLANT

<b>SPECIAL</b>	Not implemented, return on investment didn't seem interesting enough
<b>BRIEF SUMMARY</b>	Besides beer, beer breweries produce sludge. In Europe, brewers produce approximately 1.5 million tons per year. They also discharge nutrients into the surface water. The object of this project was to study the CIRCOX® reactor. This reactor facilitates the proper control of biological activity. This results in the reduction of Chemical Oxygen Demand (COD), nitrate and phosphorus discharge, as well as a reduction in sludge production, energy consumption and operational costs. Moreover, a full-scale demonstration reactor was to be built, which Paques could use to market this technology.
<b>OF INTEREST TO</b>	Not implemented
<b>ENVIRONMENTAL IMPACT</b>	Not implemented
<b>SUBMITTED BY</b>	Bavaria
<b>PARTNERS</b>	Paques
<b>DURATION</b>	Project not implemented
<b>PROJECT NUMBER</b>	LIFE03 ENV/NL/000466
<b>CONTACT PERSON</b>	+31 (0)499 42 81 11
<b>WEB LINK</b>	<a href="http://www.bavaria.nl">www.bavaria.nl</a>
<b>KEYWORDS</b>	Wastewater treatment, removal of pollutants, drinks industry





***Klaas Wiersma:***  
***'Water is a beautiful product'***



# Struggling with humic acids

## Soft and clear water from Vitens

Water, the miracle from the tap: this really is true in Oldeholtpade. Because of the composition of the groundwater, the area between Tjonger and Linde in the south of the Dutch province of Friesland experienced years of slightly harder, yellowish water. Fine to drink, but the quality could certainly be improved. 'If you saw a white bathtub filled with water, you could see that it had a different colour', explains Klaas Wiersma. He is a project leader at drinking water company Vitens and was involved with setting up the intensive improvement project. Due to an innovative treatment method, involving the decolouring and softening of the water, Oldeholtpade's water is now soft and clear.



The usual advantages of groundwater did not apply for Oldeholtpade. This peat area has many humus layers and this discolours the water that washes over it. 'I like to compare it to making tea', says Wiersma. 'Humic acids not only turn the water slightly yellow, it is also more sensitive to bacteriological growth.' The water hardness was also relatively high. Oldeholtpade's water is naturally 12 degrees German Hardness (° DH), and is even 18° DH in the surrounding area. Vitens is trying to achieve 7° DH for each production location. 'All our customers must have the same water hardness, regardless of their drinking-water

station. What is more, we want to protect people's domestic equipment as well as our own equipment against lime scale.' Abstracting groundwater from elevated areas could affect the ground and result in desiccation damage. All in all, Vitens was faced with a challenge and started to look for an environmentally friendly and economically viable way to soften and decolour the water.

### Resin particles

'We arrived at ion exchange using resin particles. In itself, this is nothing new: but the scale at which we are using it is, with an enormous throughput velocity of 1 million litres per hour.' So, the old water treatment plant in Oldeholtpade is being converted into a new, ingenious, environmentally friendly and profitable tool: using sand filters for the removal of iron, manganese and ammonium; pellet bed reactors for the removal of calcium; and various cylinders in which substances such as CO<sub>2</sub>, methane gas and the notorious humus are extracted. After treatment, the remainder is discharged. Salt and water that are still usable, will be recovered using an innovative membrane filter system. 'This reuse enables us to save groundwater', explains Wiersma.

Besides being a water-saving, innovative and relatively inexpensive solution, the European LIFE subsidy programme was positive about the steps taken to counteract the desiccation of sand-rich soils. Now that high-quality groundwater from waterlogged peat areas can be used, we have an alternative. 'We can be pioneers in this area: we have done the calculations and are showing that it works', says Wiersma. He strongly supports the environmental aspect. 'Water is our source. We know that certain limitations apply to freshwater

### GROUNDWATER

*Two-thirds of Dutch drinking water production comes from groundwater. This is rainwater that has penetrated down to some 40 to 200 metres under the ground. This water is rich in minerals, chiefly iron, carbon dioxide, methane, calcium and magnesium. Drinking water companies prefer groundwater, because, from a bacteriological standpoint, it is often more reliable than surface water. There are barely any health risks and it is relatively inexpensive and simple to treat.*



sources. So, this is why we need to use it wisely. We like to abstract it from the ground, but no more than strictly necessary. It's in Vitens' best interest to ensure that the treatment process does as little damage to the environment as possible.'

### Customer satisfaction

The groundwater at Oldeholtpade, situated at a depth of 100 metres, was still sufficiently attractive for the drinking water company – building a new production station elsewhere would be less profitable. 'Drinking water companies do not recover their investments. The return is customer satisfaction and complying with all relevant requirements. The water abstracted here can now

be put to broader use in the province, from Lemmer to Drachten. That's where profits lie.' The project is a successful example for others: 'We have taken the lead, and others elsewhere in Europe will be able to utilise this knowledge. It is interesting to see the project at the implementation stage.' Residents are very much involved in the process, and, through congresses in Morocco and Japan, professionals are aware at an international level of the solution adopted in Oldeholtpade too. The European requirements applicable to decolouration could be tightened now that we have alternatives available. And, not unimportantly: the new soft and clear water tastes good. But does this mean that people will start to drink more of it? 'Probably not', Wiersma thinks. 'But perhaps they will buy less bottled mineral water from the supermarket. For € 1.18 per 1,000 litres, you are getting excellent drinking water. This certainly is an advantage for the customer.'



## SUSTAINABLE DRINKING-WATER PRODUCTION FROM LOW-QUALITY GROUNDWATER THROUGH DECOLOURISATION AND SOFTENING

<b>SPECIAL</b>	Softer drinking water for households
<b>BRIEF SUMMARY</b>	The drinking water in the Dutch province of Friesland is generally quite soft. However, the water supplied to households in the south of Friesland is an exception to the rule. The quality of the water is good, but its colour and hardness could be improved. The technique used to decolour and soften the water is unique, and can also be used to produce drinking water from groundwater that is more difficult to treat. Decolourisation occurs by means of ion exchange; softening is achieved on the basis of a reaction of calcium with sodium hydroxide solution.
<b>OF INTEREST TO</b>	Areas with shortage of high-quality groundwater as a source of drinking water
<b>ENVIRONMENTAL IMPACT</b>	Reduction of wastewater production, low use of chemicals
<b>SUBMITTED BY</b>	Vitens NV
<b>PARTNERS</b>	Drinking-water production company Oldeholtpade
<b>DURATION</b>	December 2003 - June 2006
<b>PROJECT NUMBER</b>	LIFE04 ENV/NL/000652
<b>CONTACT PERSON</b>	Mr. K. Wiersma, +31 (0)58 294 53 26, klaas.wiersma@vitens.nl
<b>WEB LINK</b>	<a href="http://www.vitens.nl">www.vitens.nl</a>
<b>KEYWORDS</b>	Water-quality improvement, drinking water, physical treatment, water management, water treatment, water demineralisation, groundwater



### DOC KAAS DAIRY INDUSTRY, WITH CLOSED WATER CYCLE

<b>SPECIAL</b>	A new cheese factory, completely self-sufficient in terms of water supply
<b>BRIEF SUMMARY</b>	A new cheese factory is being built for DOC Kaas at the new site Zuivelpark Hoogeveen (Buitenvaart II in Hoogeveen). The factory will be completely self-sufficient in terms of its water supply. This means that it will no longer need to buy mains water, pump up groundwater or use surface water. All the process water, sanitary water and cooling water required will be obtained from the milk and whey, and will be reused. The water will be extracted from the whey through evaporation. The condensate will be recycled into process water by means of reverse osmosis: it will be used as curd treatment water during cheese preparation and as cooling water. The heated cooling water will be reused in heating processes. After further treatment, the water will also be used as drinking water.
<b>OF INTEREST TO</b>	Dairy factories throughout Europe
<b>ENVIRONMENTAL IMPACT</b>	Sharp reduction in total water consumption during the process
<b>SUBMITTED BY</b>	DOC Kaas Hoogeveen
<b>DURATION</b>	December 2002 - July 2005
<b>PROJECT NUMBER</b>	LIFE03 ENV/NL/000488
<b>CONTACT PERSON</b>	Mr. J. L. Oosterveld, +31 (0)528 28 04 40, info@dockaas.nl
<b>WEB LINK</b>	<a href="http://www.dockaas.nl">www.dockaas.nl</a>
<b>KEYWORDS</b>	Water saving, food production



### DEMONSTRATION OF ROTATING FILTER TECHNOLOGY IN SEVEN INDUSTRIAL WASTE STREAMS

<b>SPECIAL</b>	New centrifuge makes separation even more efficient
<b>BRIEF SUMMARY</b>	Waste streams from industrial processes contain both hazardous and valuable substances. Separation techniques make it possible to keep the latter out of the environment and to reuse them. In this project, a new gravitational separation technique is demonstrated for liquid and solid waste streams. Rotating Filter Technology (Rofitec) is a new type of centrifuge that, when compared to conventional systems, is more efficient and highly space-efficient. Within this project, a Rofitec separator is built. As such, this technology is demonstrated in seven different industries.
<b>OF INTEREST TO</b>	All industries in which liquid and solid mixtures are separated; the food, glass, chemical, textile and paper industries
<b>ENVIRONMENTAL IMPACT</b>	Limited
<b>SUBMITTED BY</b>	Speciaal Machinebouw Apeldoorn
<b>DURATION</b>	March 2004 - August 2005
<b>PROJECT NUMBER</b>	LIFE04 ENV/NL/000660
<b>CONTACT PERSON</b>	Mr. G. Groeneveld, +31 (0)55 542 32 22, smb@smbapeldoorn.nl
<b>WEB LINK</b>	<a href="http://www.smbapeldoorn.nl">www.smbapeldoorn.nl</a>
<b>KEYWORDS</b>	Food industry, glass industry, filtration, cellulose, paper industry, wastewater treatment, waste processing, industrial wastewater, starch, by-product, industrial waste, chemical industry, physical treatment, textile wastewater





## DEMONSTRATION OF A CLOSED SYSTEM FOR POTATO BLANCHING USING HOT WATER

SPECIAL	More yield from potatoes, using less water and energy
BRIEF SUMMARY	<p>The Aviko project focuses on a new blanching technology in which sugar in blanching water is converted into another natural substance. In this process, the quantity of valuable substances absorbed in the blanching water remains more or less the same. The 'desugared' blanching water can absorb sugars again, while there is no room for the absorption of the valuable substances: these remain in the potato. Therefore, Aviko continually uses the same water to blanch potatoes. This results in a closed blanching system. As a result, Aviko has significantly lower water and energy consumption, and a higher yield from its potatoes. Aviko has applied for a patent for this technology.</p>
OF INTEREST TO	Potato processors, crisp producers, vegetable processing industry
ENVIRONMENTAL IMPACT	Reduction of wastewater production by reuse in the process
SUBMITTED BY	Aviko
DURATION	January 2005 - December 2007
PROJECT NUMBER	LIFE05 ENV/NL/000035
CONTACT PERSON	Mr. D. Somsen, +31 (0)575 45 83 55, d.somsen@aviko.nl
WEB LINK	<a href="http://www.cosun.nl/nl/406/415/1858/">www.cosun.nl/nl/406/415/1858/</a>
KEYWORDS	Clean technology, food production, sustainable production



## WET: WASTEWATER & EFFLUENT TREATMENT

SPECIAL	Compliance with the European Water Framework Directive well before 2015
BRIEF SUMMARY	<p>The European Water Framework Directive demands a significant improvement in the quality of surface water before 2015. Effluents from sewage treatment plants are an important source of emissions of priority substances. The object of the LIFE project is to demonstrate the technical feasibility of cost-effective, advanced post-treatment techniques for the timely realisation of the quality improvements required. In this project, two processes are used involving coagulation/flocculation, combined with filtration. The first consists of a single-stage flocculation/biofilter, followed by oxidation and an active carbon filter. The second starts with a biofilter, followed by oxidation and the in-line addition of pulverised coal and coagulant to precipitate phosphates, followed by fixed-bed filtration.</p>
OF INTEREST TO	Water boards, and industries with complex wastewater streams operating their own wastewater treatment plants
ENVIRONMENTAL IMPACT	Reduction in discharges from sewage treatment plant, improved quality of surface water
SUBMITTED BY	Rijnland District Water Control Board
PARTNERS	STOWA
DURATION	1 December 2005 - 31 December 2008
PROJECT NUMBER	LIFE06 ENV/NL/000167
CONTACT PERSON	Mr. B. van Randtwijk, +31 (0)71 306 30 63, bas.randtwijk@rijnland.net
WEB LINK	<a href="http://www.rijnland.net">www.rijnland.net</a>
KEYWORDS	Wastewater treatment



## **SALINITRIFY: A SOLUTION FOR SALINE INDUSTRIAL WASTEWATER**

<b>SPECIAL</b>	Biological treatment of saline wastewater possible
<b>BRIEF SUMMARY</b>	The Dutch city of Delfzijl has a number of industries that produce saline wastewater. Saline water can be discharged into the Waddenzee, but the contamination of nutrients, certain forms of Chemical Oxygen Demand (COD) and toxic contaminations pose a problem. Recent research has shown that, at a very constant salinity, it is possible to biologically treat water. In this project, a biological sewage treatment plant is introduced for saline water, where a whole industrial area is involved. Through a public-private partnership, the investment needed from the public sector is limited. Wastewater is neutralised in a central basin and modified to a constant salt concentration. The sewage treatment plant will be optimised for nitrogen, phosphorus and organic carbon.
<b>OF INTEREST TO</b>	Industries with saline wastewater
<b>ENVIRONMENTAL IMPACT</b>	Reduction of discharges into the Waddenzee
<b>SUBMITTED BY</b>	Evides, water company
<b>PARTNERS</b>	Hunze and Aa's water board, Port Authority Delfzijl/Eemshaven
<b>DURATION</b>	2 January 2006 - 31 December 2008
<b>PROJECT NUMBER</b>	LIFE06 ENV/NL/000180
<b>CONTACT PERSON</b>	Mr. P. De Boks, +31 (0)10 293 52 64, p.deboks@evides.nl
<b>WEB LINK</b>	<a href="http://www.evides.nl">www.evides.nl</a>
<b>KEYWORDS</b>	Wastewater treatment, saline wastewater



## **REUSE OF DRINKING-WATER SEDIMENT, IN REPLACEMENT OF IRON SALTS IN WASTEWATER TREATMENT AND INDUSTRIAL APPLICATIONS**

<b>SPECIAL</b>	New application for sediment in phosphate removal
<b>BRIEF SUMMARY</b>	During the production of drinking water, large quantities of sediment are released, which are disposed of as waste. This is bad for the environment and is accompanied by high disposal costs. For this reason, a method has been developed for the reuse of sediment released during the production of drinking water. By subjecting sediment, which is rich in iron oxides, to an acid treatment, the sediment can be reused for phosphate removal from sewage water and industrial wastewater.
<b>OF INTEREST TO</b>	Drinking-water companies
<b>ENVIRONMENTAL IMPACT</b>	Less chemicals are needed to remove phosphate from wastewater, reduction in the sediment discharged to virtually zero
<b>SUBMITTED BY</b>	PWN Waterleidingbedrijf Noord-Holland
<b>DURATION</b>	August 1996 – February 1999
<b>PROJECT NUMBER</b>	LIFE96 ENV/NL/000211
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<b>WEB LINK</b>	<a href="http://www.pwn.nl">www.pwn.nl</a>
<b>KEYWORDS</b>	Water reuse, drinking water, treatment of sediment



**Kees Vink:**

***'By applying a genetic algorithm the system is state of the art'***



**Paul Schot:**

***'We are looking for a more effective way of spending money'***

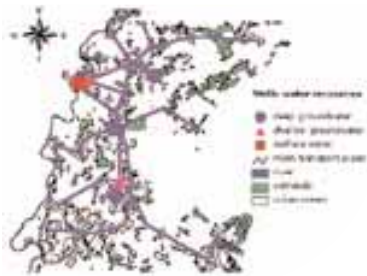


# Higher maths for sustainable groundwater abstraction

## Utrecht University's integral approach

A broad outlook, advanced software and perseverance. These are the project's three main ingredients for which Utrecht University received a LIFE subsidy. The Geosciences faculty developed a computer system to gain an insight into the interaction between land planning and groundwater abstraction for the production of drinking water.

'Amongst other things, the system analyses the quality of groundwater in the Netherlands', says hydrologist and project leader Paul Schot. 'This helps drinking water companies to anticipate decisions they will need to make in the future.'



Two-thirds of Dutch drinking water comes from groundwater. The quality of this groundwater is not always the same everywhere. Agricultural and industrial land use leaves its traces in the soil. Sometimes, the effect on groundwater quality only becomes evident decades later. Schot: 'So, it really does make a difference where drinking water is abstracted. At some sites more water treatment is needed than at others, which means not only extra costs, but also a greater impact on the environment, because of the chemicals used. The Groundwater Quality Prediction System (GQPS), which we have developed, offers an integral

approach and ensures optimal use of resources and possibilities for the abstraction of drinking water.'

### Follow-up

GQPS provides a good risk analysis of groundwater quality throughout the Netherlands. However, the system does not generate exact data on precise locations. 'To do this, you have to know about the composition of the substrate from one metre to the next', says Kees Vink, explaining the system's limitations. 'And, of course, it would be impossible to take soil samples everywhere on this scale.' Vink is closely involved in Utrecht University's LIFE project as an independent hydrologist. At the request of the Dutch Kiwa research institute for water, he is now working on a follow-up, in which the integral approach of the GQPS will be developed into a decision-support tool for drinking water companies in the Netherlands and Belgium. Vink: 'All of the factors relevant for the choice of groundwater abstraction are integrated into this tool. From cost indications and information about land-use plans, to analyses about environmental impact and energy consumption. The system is such that it analyses all of the solutions for a certain issue. 'Silly' solutions are filtered out, such as groundwater abstraction that would be both expensive and damaging to the environment at a certain location. Incidentally, the system does not select the best solution. Naturally, subjective values also play a role and depend on the decision makers involved.'

### DECISION-SUPPORT TOOL

*The project implemented by Utrecht University has resulted in a decision-support tool for water companies in the Netherlands and Belgium. The integral approach is special: the system weighs up all of the factors relevant for the abstraction of groundwater. Moreover, when developing the system, a genetic algorithm was used. Inspired by Darwin's theory of evolution, the computer calculates new solutions based on the most optimal outcomes.*

### European Framework Directive

In 2006, a number of pilot studies will be conducted in order to test the system in practice. For example, Vitens, a drinking water company in





the Dutch region of Noordoostpolder, will subject the usability of the multicriteria analysis to an in-depth study. A number of years ago, during the LIFE project, Utrecht University conducted a large-scale case study in collaboration with Waterleiding Maatschappij Limburg, Kiwa and the province of Limburg. A genetic algorithm forms the computing core of the system's optimisation module. At the National Institute for Public Health and the Environment [Rijksinstituut voor Volksgezondheid en Milieu], Vink has used this technology to optimise the positioning of agricultural areas and nature conservation areas. In this way, nature is only required to process the minimum of nitrogen

deposits from agricultural areas and the agriculture sector is only minimally hindered by rules and regulations applicable to using land which is in the vicinity of vulnerable nature conservation areas. According to Paul Schot, the application possibilities are endless. 'Our integral approach is completely in line with current policy developments in the field of sustainability. One example is the European Water Framework Directive, which is intended to ensure that the quality of groundwater and surface water improves. Implementation within the operations undertaken by drinking water companies is still progressing slowly, but we have every confidence.'



## DECISION-SUPPORT SYSTEM FOR THE PREDICTION OF GROUNDWATER QUALITY

<b>SPECIAL</b>	Sharing of knowledge distribution amongst local authorities promotes more conscious use of land
<b>BRIEF SUMMARY</b>	The Groundwater Quality Prediction System (GQPS) was developed in order to make it possible to assess the impact of land planning on drinking-water production. GQPS combines advanced groundwater flow models with digital visualisation techniques to assess the effects of land-use development on drinking-water production. The use of the system by local authorities will contribute to greater awareness on how land use affects the water quality. This will also lead to a more efficient use of financial and natural resources.
<b>OF INTEREST TO</b>	Local authorities
<b>ENVIRONMENTAL IMPACT</b>	Less groundwater contamination through greater awareness amongst local authorities, less waste generation
<b>SUBMITTED BY</b>	Utrecht University, Faculty of Geosciences
<b>PARTNERS</b>	Kiwa, Limburg drinking-water company, local authorities, Waterleiding Maatschappij Limburg (WML)
<b>DURATION</b>	April 1997 - June 2001
<b>PROJECT NUMBER</b>	LIFE96 ENV/NL/000230
<b>CONTACT PERSON</b>	Mr. P.P. Schot, +31 (0)30 253 23 59, p.schot@frw.ruu.nl
<b>WEB LINK</b>	<a href="http://mk.geog.uu.nl/research/LIFE_EG_VinkSchot/index.html">http://mk.geog.uu.nl/research/LIFE_EG_VinkSchot/index.html</a>
<b>KEYWORDS</b>	Modelling, prediction, drinking water, environmental impact assessment, groundwater, decision-support



<b>REUSE OF EXCESS WATER VIA A DOUBLE MAINS SYSTEM</b>	
<b>SPECIAL</b>	Unfortunately, environmental advantage limited
<b>BRIEF SUMMARY</b>	A double mains system has been installed in a new district in Wageningen. Households are able to use two different types of water: high-quality drinking water and domestic water of a lower quality (rainwater). The 'domestic water' is obtained by collecting rainwater in a basin and then leading it through a membrane filter. In addition, water-saving measures have been applied in these houses.
<b>OF INTEREST TO</b>	Possibly for larger municipalities, but not actually of interest due to the high cost involved and the limited advantages to the environment
<b>ENVIRONMENTAL IMPACT</b>	The double mains system spares groundwater, which can then be used for the production of drinking water. In this way, high investments needed to produce drinking water from the more heavily contaminated surface water can be avoided. Apart from that, benefits to the environment are limited.
<b>SUBMITTED BY</b>	Nuon Water
<b>PARTNERS</b>	Municipality of Wageningen
<b>DURATION</b>	May 1997 - September 2000
<b>PROJECT NUMBER</b>	LIFE96 ENV/NL/000216
<b>CONTACT PERSON</b>	Mr. A.A.L. van Kessel, +31 (0)26 362 58 00, vankessela@nuon.com
<b>WEB LINK</b>	<a href="http://www.nuon.com">www.nuon.com</a>
<b>KEYWORDS</b>	Water savings, rainwater, residential area, public-private partnership, water supply, groundwater



<b>TREATMENT OF WASTEWATER USING DEAD-END MEMBRANE FILTRATION</b>	
<b>SPECIAL</b>	Results have exceeded expectations
<b>BRIEF SUMMARY</b>	The wastewater stream that originates from the production of drinking water is usually discharged into the sewer or directly into the surface water, which leads to serious environmental pollution. In a partnership, a membrane filtration system has been set up for the treatment of this wastewater. The system consists consecutively of a buffer unit, a filtration unit with an ultrafiltration membrane, a membrane cleaning unit and a UV disinfection unit.
<b>OF INTEREST TO</b>	Drinking-water companies throughout Europe
<b>ENVIRONMENTAL IMPACT</b>	Energy savings, limiting the use of chemicals, less waste, reduction of water loss. After completion of the LIFE project, the use of the demonstration system was continued in practice. All of the project's objectives were achieved. Results even exceeded expectations. For example, the amount of energy consumed and the quantity of chemicals required were found to be considerably lower than predicted. Construction of the system was also found to be relatively simple.
<b>SUBMITTED BY</b>	Nutsbedrijf Regio Eindhoven
<b>PARTNERS</b>	WOB, Haskoning, Stork Friesland, X-flow (membrane producers), PIDPA (BE), Kobenhavns Vandforsyning (DK), Energie- und Wasserversorgung (DE), Goodtech AMI (NO), VITO (BE), DHV, Norit Membraan Technologie
<b>DURATION</b>	June 1996 - December 1998
<b>PROJECT NUMBER</b>	LIFE96 ENV/NL/000219
<b>CONTACT PERSON</b>	Mr. R.G.A. Broeks, +31 (0)73 683 75 51, richard.broeks@brabantwater.nl
<b>WEB LINK</b>	<a href="http://www.brabantwater.nl">www.brabantwater.nl</a>
<b>KEYWORDS</b>	Water reuse, drinking water, alternative technology, water treatment



## INNOVATIVE DRINKING-WATER TREATMENT METHOD THROUGH BANK INFILTRATION

SPECIAL	Limited contribution to resolving desiccation
BRIEF SUMMARY	Given the problem of drying out vegetation, it is becoming more interesting to use surface water to generate drinking-water. The Midden-Nederland water company has developed an innovative technology, which means that drinking water can be produced from surface water using Dopass (Double aquifer passage). This technology is based on double filtration through the river bed. The water is extracted using extraction pumps situated alongside the river. The sandy river bed forms a natural filter. In this concept, the effect of the lowered water table on wildlife areas is zero. Moreover, the water abstraction project includes a substantial reorganisation of the flood plains, as such restoring its natural function. In this way, flora and fauna can develop and reach maturity.
OF INTEREST TO	Not realised
ENVIRONMENTAL IMPACT	This project was not implemented, because the use of surface water instead of groundwater for drinking-water production would only contribute 5% to resolving the drying-out problem. It was possible to solve the problem more effectively using local measures and the updated management of surface water.
SUBMITTED BY	Waterbedrijf Midden-Nederland (Hydron)
DURATION	Project not implemented
PROJECT NUMBER	LIFE99 ENV/NL/000257
CONTACT PERSON	Mr. C. Heikoop, +31 (0)30 248 72 39, cheikoop@hydron-mn.nl
WEB LINK	<a href="http://www.hydron.nl">www.hydron.nl</a>
KEYWORDS	Drinking water, water supply, groundwater



## SUSTAINABLE AND INTEGRATED WATER AND ENERGY SYSTEM IN THE HESSENPOORT INDUSTRIAL AREA

SPECIAL	Interest from companies was found to be insufficient
BRIEF SUMMARY	The water supplied by water boards in the Netherlands is of a very high quality. This is not always necessary: for their production processes, industries can suffice with a water quality that is lower than the quality of drinking water. Two water distribution systems were installed in a new to be developed industrial zone. In this way, companies can choose to use industrial water for their processes instead of scarce drinking water. The system is innovative in the respect that it supplies water solely for cooling and heating, not actually for consumption. Excess heat and cold can be stored underground and reused later.
OF INTEREST TO	This concept has potential for new industrial zones with sufficient heat and cold demand. Ultimately, the system was not developed, since companies were not interested. An important lesson is to have a good overall impression of the companies involved, in order to ensure that their specific needs can be met.
ENVIRONMENTAL IMPACT	Less high-quality drinking water needed; less energy needed to cool or heat drinking water
SUBMITTED BY	Municipality of Zwolle
PARTNERS	Drinking-water company (WMO), Essent energy company
DURATION	November 1999 - November 2002
PROJECT NUMBER	LIFE99 ENV/NL/000258
CONTACT PERSON	Mr. H.J. Boesenkool, +31 (0)38 498 26 99, wb.meijerman@zwolle.nl
WEB LINK	<a href="http://www.zwolle.nl">www.zwolle.nl</a>
KEYWORDS	Integral management, industrial area, water supply, energy supply



**MAASTRICHT CLUSTER PROJECT: INTEGRAL WATER MANAGEMENT FOR EIGHT INDUSTRIAL COMPANIES WITH CENTRAL SUPPLY AND SEMI-COLLECTIVE WASTEWATER PROCESSING**

<b>SPECIAL</b>	Cross-company collaboration awarded with the Responsible Care Award 2002
<b>BRIEF SUMMARY</b>	Integral water management is used to reduce emissions into water and reduce the total quantity of wastewater from eight industries in South Limburg. The central location for water supply and treatment is paper factory Sappi. The Meuse river water treatment and wastewater treatment is used for its own purposes and for surrounding companies. One of the companies processes its nitrogenous wastewater at Sappi, resulting in cost savings and environmental advantages for both. The nitrate replaces the addition of oxygen, which had been vital until recently. In this way, one company's wastewater becomes another company's raw material. Groundwater consumption decreases as a result.
<b>OF INTEREST TO</b>	Industries located close to each other, in an area where good quality groundwater is scarce and sufficient surface water is available
<b>ENVIRONMENTAL IMPACT</b>	Reduction in groundwater consumption, process water use, nitrate emission into surface water, CO <sub>2</sub> emission, energy consumption and use of chemicals. Replacement of O <sub>2</sub> by nitrate. The ultimate objective (the total elimination of groundwater consumption) was not achieved.
<b>SUBMITTED BY</b>	e-Water Group
<b>PARTNERS</b>	Ciba Chemicals Maastricht, Sappi Maastricht, Meerssen Papier Meerssen, Sphinx Sanitair Maastricht, Trega Maastricht, Vereenigde Glas Maastricht, Sappi Lanaken (BE)
<b>DURATION</b>	January 2001 - December 2003
<b>PROJECT NUMBER</b>	LIFE00 ENV/NL/000790
<b>CONTACT PERSON</b>	Mr. J.J.C. Geurts, +31 (0)475 63 00 00, j.geurts@ewatergroup.nl
<b>WEB LINK</b>	<a href="http://www.ewatergroup.nl">www.ewatergroup.nl</a>
<b>KEYWORDS</b>	Integral management, industrial wastewater, water management



**DECONTAMINATION OF POLLUTED GROUNDWATER BY IN-SITU INJECTION OF MOLASSES**

<b>SPECIAL</b>	Particularly suitable in the case of contamination with heavy metals
<b>BRIEF SUMMARY</b>	Many industries use VOCs (Volatile Organic Chlorohydrocarbons) or VOCIs (Volatile Chlorinated Organic Compounds). In many cases, this leads to soil and possibly also to groundwater contamination. This was the case at the Philips factory in Rambouillet. The objective of the project is complete in-situ decontamination of groundwater by injecting a viscous liquid (molasses). The injection of this liquid is claimed to generate a physical-chemical reaction that promotes the biodegradation of VOCs by micro-organisms.
<b>OF INTEREST TO</b>	Suitable for many locations in Europe, particularly those where groundwater has been contaminated by heavy metals. However, only if biological activity and the organic material are normal.
<b>ENVIRONMENTAL IMPACT</b>	Limited: project only partly removed the VOCs from the groundwater using the in-situ technology.
<b>SUBMITTED BY</b>	Nederlandse Philips Bedrijven
<b>DURATION</b>	November 1999 - October 2003
<b>PROJECT NUMBER</b>	LIFE99 ENV/NL/000230
<b>CONTACT PERSON</b>	Mr. J. Schreurs, +31 (0)40 273 24 63, jack.schreurs@philips.com
<b>WEB LINK</b>	<a href="http://www.arcadis.nl">www.arcadis.nl</a>
<b>KEYWORDS</b>	Volatile organic matter, removal of contaminant, disinfection, groundwater





**Gerko van IJsselmuiden:**

***'We are trying to lead the way in Europe, from an environmental point of view'***

**Charles Ruffolo:**

***'By demonstrating these possibilities we want to achieve stricter environmental legislation'***

# Valuable waste

## Ecodock in Eemshaven

The Eemshaven is situated close to the outer border of the Netherlands, in the very north-eastern part of Groningen. It's a modern and well-equipped shipping port in a good location for conducting business with Scandinavia and the emerging EU Member States. There is plenty of space and all activities within the port are based on environmentally friendly principles. This makes the Eemshaven the ideal location for Ecodock, part of the Idea-Ecoline Group®: a concept designed to ensure that ships, when at the end of their life span, are dismantled in a way that is environmentally friendly and economically profitable.



In the Netherlands, it all started with Jan Pronk, then Minister of Housing, Spatial Planning and the Environment. In 2002, he had the vessel Sandrien anchored in Amsterdam. It had been en route to India but was detained under the ban against the transportation of hazardous chemical waste. Doebren Mulder from the Tanker and Platform Dismantling Foundation [Stichting Tanker Ontmanteling Platform (S.T.O.P.)] wanted to remove the vessel in a responsible manner. This failed - the vessel is still there - but the need for a dismantling location remained. Eyes fell on the Eemshaven. Shipowners and experts in the field of

steel and asbestos joined as 'preferred suppliers'. The project has now reached the permit stage; in several years, a 28-hectare yard will have been constructed. Originally, in the 1970s, the Eemshaven was a petrochemical port. Now it is blossoming again, with a number of 'green' projects. 'We are trying to develop our port in a way that is as environment-friendly as possible', says Gerko van IJsselmuiden from Groningen Seaports. 'This is one of the reasons why we are Ecoport certified.' In addition to Ecodock, the package will soon include a biomass plant, liquefied natural gas and a biodiesel factory.

### Zero pollution

In the current system, an old ship yields one million euro in scrap revenues. Due to the costs involved in Ecodock, the remaining value will be lower – several hundred thousand euros – but will still be lucrative for a leading international trade position. Charles Ruffolo, 'professional networker' and spokesman for the project, explains. 'Compare it with computer parts: that's trade too. A ship is made up of several kilometres of copper wire, 50,000 tons of steel, wood... All of this can be reused. Shipowners are dumping their waste like tins on the beach. And why do drifters collect tin cans? Because they're worth money!' Besides economic value, 'zero pollution' is the key word: no waste flow will remain unutilised. The LIFE subsidy supports the innovative techniques being used, such as water-jet cutting using high pressure, but also flame cutting and welding without emissions. Waste materials such as asbestos, rubber, wood and oil are being converted into energy, electricity and basalt – even the final percentages of residuals are processed.

### BEACHING

*Old ships are often dismantled on the beaches of India, Bangladesh, China and Turkey: so-called 'beaching'. Ships are steered onto the beach, where they are scrapped under atrocious conditions. This leads to a high level of fatalities and enormous damage to the environment, due to the release of substances such as asbestos and oil. Shipowners are often impossible to trace. The countries themselves would like the situation to be different, but this would mean many jobs would be lost. Ecodock wants to tackle this social problem using this concept of environment-friendly, humane and economically profitable dismantling.*



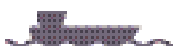
### America

The potential is enormous: worldwide, thousands of ships are waiting. However, Ecodock's capacity is limited; it can cope with 24 to 36 ships a year. In order to spread its knowledge, Ecodock is training people, who are then certified. In this way, Ecodock is setting the European standard for the dismantling and recycling of ships, in line with the guidelines laid down by the International Maritime Organisation. Moreover, movement of hazardous material is avoided by spreading the knowledge of this new working method. 'This is Ecodock's showcase, together with the Ecological Learning Centre and other companies within the Idea-Ecoline Group®. But it won't stop here', says Ruffolo. Countries abroad are interested too: 'In America,

General Clark, a good friend, is turning this idea into a realisation. There are shipyards there, and a ghost fleet of 750 marine vessels are waiting to be dismantled.'

### Brent Spar

Why is this concept only now finding a platform, when there is obviously so much need for it? 'You have to have the guts to try this: even though millions have been invested, the outcome is still very risky. It's not financially feasible by definition. What counts is the philosophy, from people with vision', says Ruffolo. Idea-Ecoline is also developing various other projects having to do with alternative energies. 'Ever since we have been able to produce plastic, our waste has no longer been biodegradable. Climate change is impacting the entire ecosystem. If emissions of CO<sub>2</sub> do not decrease and the world collapses, you are left standing there with your business. That's why sustainability is key', says Ruffolo. Whether shipowners will opt for this innovative method? 'This change in mentality will happen', Van IJsselmuiden believes. 'Just look at the dismantling of the Brent Spar: if it's possible to do it in a way that's environmentally friendly, it's socially irresponsible to do it any other way.'



## ECODOCK: RECYCLING OF SINGLE-HULL TANKERS AND DISCARDED SHIPS WITH HAZARDOUS WASTE

<b>SPECIAL</b>	Development for worldwide application
<b>BRIEF SUMMARY</b>	Currently, many discarded ships are being dismantled on the beaches of India, Bangladesh and China ('beaching'). This is dangerous work, resulting in a large number of deaths and injuries, as well as environmental pollution. Ecodock wants to have dry-cargo ships, tankers and work platforms dismantled in an ecologically responsible way, under humane working conditions. In this project, a dismantling location is being built, in which innovative cutting techniques for steel will be introduced that will facilitate and thus increase recycling. A cleaning and recycling system for hazardous waste will also be introduced. The dismantling yard in the Eemshaven will be used as a pilot to optimise the techniques and processes, with the objective of further building thirty to forty shipyards worldwide.
<b>OF INTEREST TO</b>	Ship owners
<b>ENVIRONMENTAL IMPACT</b>	Reduction of waste, less damage to the environment in developing countries
<b>SUBMITTED BY</b>	Tanker and Platform Dismantling Foundation [Stichting Tanker Ontmanteling Platform (S.T.O.P.)]
<b>PARTNERS</b>	Idea-Ecoline®
<b>DURATION</b>	March 2004 - December 2006
<b>PROJECT NUMBER</b>	LIFE04 ENV/NL/000653
<b>CONTACT PERSON</b>	Mr. C.D.A. Ruffolo, +31 (0)6 50 28 76 82, pr@idea-ecoline.com
<b>WEB LINK</b>	www.ecodock.info; www.idea-ecoline.com
<b>KEYWORDS</b>	Waste processing, hazardous waste, shipbuilding



## IMPLEMENTATION OF A 'SMART' PUMP-AND-TREAT SYSTEM BY INFLUENCING NATURAL GROUNDWATER FLOW

SPECIAL	Regulations found to impede realisation
BRIEF SUMMARY	To be able to produce high-quality groundwater, it is vital to protect groundwater quality. The soil and groundwater are polluted in many places in the Netherlands. Soil decontamination at so-called 'hot spots' is expensive. The objective of this project was to protect groundwater and prevent groundwater pollution by slowing down existing soil contamination. This can be achieved through the implementation of a new innovative technique, in which the circulation of groundwater is regulated with a pump. In the 'hot spots', the groundwater flow would be restricted.
OF INTEREST TO	Project not realised, since a new polluted location was discovered in the vicinity shortly before implementation. This hampered the decision-making process. In addition, it was found to be impossible to obtain the permits required, due to the land-use plan and new nature legislation and regulations.
ENVIRONMENTAL IMPACT	Delaying groundwater pollution caused by existing soil contamination
SUBMITTED BY	Akzo Nobel Base Chemicals
DURATION	Project not started
PROJECT NUMBER	LIFE00 ENV/NL/000789
CONTACT PERSON	Mr. R. Saal, +31 (0)20 419 61 63, rsaal@wxs.nl
KEYWORDS	Soil contamination, groundwater, management of contamination, water contamination



## DECISION-SUPPORT SYSTEM FOR ENVIRONMENTALLY FRIENDLY AND COST-EFFECTIVE WEED CONTROL ON PAVED SURFACES

SPECIAL	Suitable for public <i>and</i> private parties
BRIEF SUMMARY	The object of this project is to reduce herbicide emissions from paved surfaces as a result of chemical weed control, to levels acceptable for stakeholders (drinking-water companies, for example). Especially, the run-off of herbicides into surface water under the current practice of weed control causes problems for drinking-water production. A new decision-support system is being developed under the name SWEEP (sustainable weed control on pavements: DOB in Dutch), to be implemented by potential users, such as managers, urban planners and weed-control contractors, all working with paved surfaces. Five large organisations (municipalities or industrial sites) will apply the concept.
OF INTEREST TO	Municipalities, provinces and industries with agricultural activities
ENVIRONMENTAL IMPACT	Less emission of pesticides on paved surfaces and, therefore, also less pollution of (surface) water
SUBMITTED BY	Plant Research International
PARTNERS	Hollandse Delta Water Board (previously HEW), VEWIN, Monsanto Europe, municipalities of Hendrik-Ido-Ambacht, Alblasterdam, Papendrecht, Dordrecht and Leiden
DURATION	January 2004 - December 2006
PROJECT NUMBER	LIFE04 ENV/NL/000663
CONTACT PERSON	Mr. C. Kempenaar, +31 (0)31 747 58 30, corne.kempenaar@wur.nl
WEB LINK	<a href="http://www.dob-verhardingen.nl">www.dob-verhardingen.nl</a> ; <a href="http://www.dtb-registratie.nl">www.dtb-registratie.nl</a> ; <a href="http://www.pri.wur.nl">www.pri.wur.nl</a>
KEYWORDS	Decision-support, environmental management, diffuse contamination, integral management, water conservation, pest control





## WASTEWATER MANAGEMENT SAVES NATURAL ECOSYSTEMS

<b>SPECIAL</b>	Standing strong together for nature <i>and</i> industry
<b>BRIEF SUMMARY</b>	The Tilburg region has a water problem: the west of the region is drying out, causing problems for nature and agriculture. Large quantities of groundwater are still being used. By contrast, the east of the city has too much water: a nature conservation area suffers from flooding. The objective of the project is to demonstrate that treated municipal wastewater can be used in industry: as process water, cooling water, fire-extinguishing water and irrigation water. To do this, a treatment plant and a transport and distribution network will be built. The expectation is that this will result in a groundwater saving of 1.7 million m <sup>3</sup> , which may even increase to 8 million m <sup>3</sup> in the future. The results of the project will be disseminated throughout Europe.
<b>OF INTEREST TO</b>	Applicable throughout Europe
<b>ENVIRONMENTAL IMPACT</b>	Not yet completed
<b>SUBMITTED BY</b>	Tilburgsche Waterleiding-Maatschappij
<b>PARTNERS</b>	Municipality of Tilburg, De Dommel Water Board
<b>DURATION</b>	July 2002 - July 2006
<b>PROJECT NUMBER</b>	LIFE02 ENV/NL/000116
<b>CONTACT PERSON</b>	Mr. J. Maas, +31 (0)13 584 04 00, joost.maas@twm.nl
<b>WEB LINK</b>	<a href="http://www.samenstromen.nl">www.samenstromen.nl</a> ; <a href="http://www.twm.nl">www.twm.nl</a>
<b>KEYWORDS</b>	Wastewater treatment, water reuse, groundwater



## CAMPAIGN TO DEMONSTRATE THE ADVERSE EFFECTS OF TRIBUTYL TIN (TBT) TO RESEARCHERS AND POLICYMAKERS

<b>SPECIAL</b>	Project leads to shared petition to the International Maritime Organisation
<b>BRIEF SUMMARY</b>	Ships are treated with paint containing biocides in order to prevent organisms from attaching. One of the substances used for this is TBT. However, TBT leaks away into the sea environment and, as such, is extremely harmful. One indicator of TBT contamination in the sea environment is the masculinisation of female sea slugs. In Southern Europe, knowledge about the environmental damage caused by TBT is limited. Therefore, in this project, expertise is transferred to Italy, Spain and Portugal. By demonstrating the adverse effects of TBT, the project led to a shared petition from the countries in question to the Marine Environment Protection Committee of the International Maritime Organisation (IMO), amongst other things. Therefore, the project has contributed to the development of preventive environmental policy.
<b>OF INTEREST TO</b>	Easily transferable to other policy fields and other governments
<b>ENVIRONMENTAL IMPACT</b>	Greater awareness and shift in use of materials
<b>SUBMITTED BY</b>	NIOZ (Royal Netherlands Institute for Sea Research [Nederlands Instituut voor Onderzoek der Zee])
<b>PARTNERS</b>	CaTo Marine Ecosystems, IVM, Vrije Universiteit (VU) Amsterdam, Department of Chemistry and Material Sciences, University of Huelva (ES), Italian National Agency for New Technologies, Energy and the Environment (IT), University of Porto, Department of Zoology and Anthropology (PT)
<b>DURATION</b>	December 1998 - February 2001
<b>PROJECT NUMBER</b>	LIFE98 ENV/NL/000199
<b>CONTACT PERSON</b>	Mr. J.P. Boon, +31 (0)222 36 94 66, boon@nioz.nl
<b>WEB LINK</b>	<a href="http://www.nioz.nl/projects/tbt">www.nioz.nl/projects/tbt</a>
<b>KEYWORDS</b>	Environmental awareness, pollution of marine waters, prevention of contamination, paint, information system



## DEMONSTRATION OF AN UNDERWATER ROBOT FOR SALVAGING OF HAZARDOUS SUBSTANCES FROM SHIPWRECKS

<b>SPECIAL</b>	Promising idea: ought to be tested further
<b>BRIEF SUMMARY</b>	<p>Oil and chemicals in sunken ships form a major hazard for the environment, both below and above sea level. In order to salvage these hazardous substances from wrecks, salvage company Smit Internationale has developed the ROMAN (Remote Operated Manipulator) underwater robot. This 16-ton robot, which looks like a big crab, can be operated remotely and has good stability on the sea-floor. It has a ten-metre long arm, which can be used to drill holes in a fuel reservoir or cargo area without releasing oil or chemicals. This makes it possible to remove substances from wrecks. After initial tests, the ROMAN was modified and now works even better. However, poor weather conditions were one of the reasons why there was no room for any further tests. As a result, there has been no further publicity or developments.</p>
<b>OF INTEREST TO</b>	Technology not tested in real conditions, so not entirely clear whether it works properly and can be used by others. It does have potential.
<b>ENVIRONMENTAL IMPACT</b>	Tests only performed in shallow water, not at sites under realistic conditions. Potential effect: less pollution of the ocean water through less oil and hazardous substances left in shipwrecks.
<b>SUBMITTED BY</b>	Smit Internationale
<b>DURATION</b>	May 1999 - April 2002
<b>PROJECT NUMBER</b>	LIFE99 ENV/NL/000242
<b>CONTACT PERSON</b>	Mr. M. Hetterscheid, +31 (0)10 454 99 11, m.hetterscheid@smit.com
<b>WEB LINK</b>	<a href="http://www.smit.com">www.smit.com</a>
<b>KEYWORDS</b>	Pollution of marine waters, oil pollution, hazardous substance



## INFILTRATION MAASKANT: DRINKING WATER FROM INFILTRATED SURFACE WATER AS AN ALTERNATIVE TO GROUNDWATER

<b>SPECIAL</b>	Combination of peat and clay makes the application innovative
<b>BRIEF SUMMARY</b>	<p>Waterleidingmaatschappij Oost-Brabant is demonstrating the use of surface water infiltration in a river landscape as an alternative source for drinking-water generation. Total capacity has been planned at 50 million m<sup>3</sup> per year. The use of this technology is innovative due to the different geohydrological compositions (peat and clay) and the shallow groundwater levels present in the river landscape. An important part of the system is the isolation of the underground from the underlying earth bodies and the river Meuse. The advantages of the system are the reduction of the conventional pre-treatment, the reduction of energy, waste and costs, natural disinfection, minimal use of space and active development of nature and landscape.</p>
<b>OF INTEREST TO</b>	Authorities with river-flow areas
<b>ENVIRONMENTAL IMPACT</b>	Less energy and waste, natural disinfection instead of chemical disinfection, less use of space and active nature and landscape development
<b>SUBMITTED BY</b>	Waterleidingmaatschappij Oost-Brabant
<b>DURATION</b>	April 1994 - December 1997
<b>PROJECT NUMBER</b>	LIFE94 ENV/NL/001046
<b>CONTACT PERSON</b>	Mr. J.G.H. Philips, +31 (0)73 683 78 02, sef.philips@brabantwater.nl
<b>WEB LINK</b>	<a href="http://www.brabantwater.nl">www.brabantwater.nl</a>
<b>KEYWORDS</b>	Water supply



**Jan Smorenburg:**

***'Clear water paves the way for a good experience'***



# A coffee filter of six hectares

## Clean surface water in Leidsche Rijn

Leidsche Rijn will get a special water system. For the municipality of Utrecht and water control board De Stichtse Rijnlanden, this has been the objective since the first plans were developed in 1997. The water board even has its own space in the municipality's site office, making optimal contact possible. Added to this, the province is actively involved and engineering consultancies are being brought in. 'Within the space of twenty years, a city the size of Leeuwarden is being built (approximately 100,000 inhabitants): this will need to be supervised carefully', says Jan Smorenburg from the water board.



The core of the project is the closed circulation system. Barely any water comes into or leaves the Leidsche Rijn area. As a part of this system, rainwater, which is relatively clean, is not discharged unnecessarily into the sewage treatment plant. A sewer will only be constructed for domestic wastewater. In the residential area, rainwater will simply soak away into the soil, via swales – shallow trenches alongside the road, that filter the water before it soaks further into the ground – or it ends up straight in the drainage ditches. *The Haarrijnse Plassen*, the drainage ditches and the pumping stations provide for water storage and water flow. However, because the surface water is slightly

contaminated by phosphate and, as such, is subject to algal growth, extra treatment is necessary. An innovative approach is applicable: water treatment using vertical-flow reed beds. 'This is very similar to a coffee filter', says Smorenburg. 'Only, we'll be using it again and again. The principle is based on a natural chemical reaction, without the addition of any substances. The water will be pumped up from the drainage ditches and then led through the filter from the top. A large one-metre deep sandpit, filled with iron and calcium, under which a drainage system is installed. The metallic iron shavings will form a compound with the phosphate and this 'coffee' will be left behind.' Reeds serve to safeguard the appearance of the landscape, but also promote better vertical permeability, and they have their own treatment qualities too. However, reeds alone would not be sufficient: 'With horizontal reed beds, we would need four times as much space, and you will never be able to achieve such low phosphate levels. Reeds are unable to continuously absorb substances and grow less in the winter.'

### Pilot reed beds

The type of reed most appropriate for this location is still to be established, just as the quality of sand required. The ideal combination of substances in the sandpit will also be determined at the same time. At set times, samples will be taken from twelve pilot reed beds, each with a different composition. Two years have been allotted for this: we are now halfway through the experiment. The composition with the highest treatment return will be scaled up to the actual quantity required. The pilot area covers one hectare, but later the site could become six times larger, depending on the outcome of this pilot. Smorenburg is enthusiastic

### LEIDSCHER RIJN

*Leidsche Rijn, the new housing area enlarging the city of Utrecht, has been under development since 1998. It is a VINEX district: designed within the framework of the Fourth Policy Document on Spatial Strategy Extra [Vierde Nota Ruimtelijke Ordening Extra (VINEX)]. Since then, 10,000 houses have already been built, and in twenty years another 30,000 new houses will be added. A total of 100,000 inhabitants will reside here, including the villages of Vleuten and De Meern. The area was previously agricultural land.*





### Pioneering role

The project in Leidsche Rijn is dependent on a wide collaborative relationship between different authorities: this is quite exceptional amongst organisations applying for a LIFE subsidy. 'The system was devised by the water board, the municipality and the province,' says Smorenburg. 'A subsidy adds just that little extra push for further innovation. We do not just want to comply with the statutory norm, but also go one step further. We could adopt the traditional approach, but would then be tied down to this system for years to come. The commercial sector looks at the costs for one aspect; the government takes an overall view. We are playing a pioneering role. A sewerless system for draining rainwater – until fifteen years ago, this really wasn't imaginable.' Is clear surface water appreciated? 'Well, some people never look in the ditches. But if you live there, you soon see that it works.' If results are positive in Leidsche Rijn, Smorenburg hopes the system will be applied to other places in the Netherlands. 'There are still a number of large housing construction plans in the pipeline. This should become the standard.'

about the preliminary results: 'The filter requires little maintenance and operating costs are limited. The water is continually cleaned and is clearer than required by law. The target is one-metre visibility. We will achieve this with 0.05 mg of phosphate per litre, which represents a gain of 80% in comparison with the present value and is far below the maximum admissible value.' The fill-and-draw system also works well in combination with vertical flow. In the Netherlands, four vertical filters are in use, one of which by the Efteling amusement park. A special aspect of Leidsche Rijn is the long-term experiment to achieve increasingly lower levels of phosphate under different conditions. Another special aspect is the fact that it is the surface water that is treated, not water originating from a sewage treatment plant.



#### LEIDSCHER RIJN TREATMENT FILTER: A NATURAL WAY TO TREAT URBAN WATER

<b>SPECIAL</b>	Unique: large-scale treatment of surface water
<b>BRIEF SUMMARY</b>	In Leidsche Rijn, a vertical flow reed bed is being installed in order to improve the quality of lightly polluted surface water. This is special since this technology has never been used on this scale before and because it is generally used for the treatment of water from sewage treatment plants. Water from the Leidsche Rijn water system is pumped up slightly and then released above the filter. The water sinks through the filter and is allowed back into the water system via a number of pipes. The most important object of the filter is phosphate removal. This limits algal growth, which is better for the plant and fish population. The filter also removes coarser substances, bacteria and heavy metals.
<b>OF INTEREST TO</b>	Water boards, surface-water managers
<b>ENVIRONMENTAL IMPACT</b>	Improvement of the quality of surface water: removal of pathogenic bacteria and phosphorus from the water
<b>SUBMITTED BY</b>	De Stichtse Rijnlanden water control board
<b>PARTNERS</b>	Municipality of Utrecht, province of Utrecht, Foundation for Applied Water Research [Stichting Toegepast Onderzoek Waterbeheer], Centre for Urban Water (UK)
<b>DURATION</b>	January 2003 - December 2006
<b>PROJECT NUMBER</b>	LIFE03 ENV/NL/000467
<b>CONTACT PERSON</b>	Mr. M. De Burger, +31 (0)30 634 58 49, burger.mbmm@hdsr.nl
<b>WEB LINK</b>	<a href="http://www.zuiveringsfilter.nl">www.zuiveringsfilter.nl</a>
<b>KEYWORDS</b>	Decontamination, environmental impact of agriculture



## DEVELOPMENT OF A GENERAL METHOD FOR THE MONITORING OF ATMOSPHERIC DEPOSITION

<b>SPECIAL</b>	Factor 3 to 4 cost reductions achieved
<b>BRIEF SUMMARY</b>	This is a follow-up to a project that was implemented for the monitoring of atmospheric deposition using three intensive monitoring stations in Europe from 1991 to 1993. The objective of this project is to develop a simple low-cost monitoring method, for application throughout Europe on a large scale. A validation is carried out using high-precision measurements, through the use of instruments from the first project. The project was largely successful. The cost reductions envisaged were achieved. Development of the monitoring and test techniques proved to be more difficult than expected. The techniques available had too many limitations to be able to use them in the whole network.
<b>OF INTEREST TO</b>	Limited
<b>ENVIRONMENTAL IMPACT</b>	Economic advantages in particular. Better protection of ecosystems by better measurement of acid deposition and improvement in the determination of critical quantities.
<b>SUBMITTED BY</b>	Energy Research Centre of the Netherlands [Energieonderzoek Centrum Nederland (ECN)]
<b>PARTNERS</b>	TNO, ITE (UK), IFT (DE), RIVM, KEMA
<b>DURATION</b>	January 1997 - January 1999
<b>PROJECT NUMBER</b>	LIFE96 ENV/NL/000215
<b>CONTACT PERSON</b>	Mr. A. Hensen, +31 (0)224 56 42 03, hensen@ecn.nl
<b>WEB LINK</b>	<a href="http://www.ecn.nl/_files/sf/life_poster.pdf">www.ecn.nl/_files/sf/life_poster.pdf</a>
<b>KEYWORDS</b>	Air pollution, monitoring of contaminated substances



## DEVELOPMENT OF A GENERAL METHOD FOR QUALITY DETERMINATION AND MANAGEMENT OF CONTAMINATED RIVER BASINS

<b>SPECIAL</b>	Cross-border collaboration
<b>BRIEF SUMMARY</b>	In this project, a general method was developed for monitoring contaminated river basins. The project looked at the issue of cost optimisation and at the appropriate indicators for ecotoxicological effects. Researchers from different countries worked on a joint approach. This is important for the ability to describe and prepare an inventory of the 'good ecological status' required by the European Water Framework Directive. Triad approach is being used, in which physical and chemical parameters and bioassays are studied. One difficulty encountered was the differing legislation and regulations and sampling methods used in each country. This method was applied at four sites in the River Meuse and the River Scheldt.
<b>OF INTEREST TO</b>	Authorities with contaminated river waters
<b>ENVIRONMENTAL IMPACT</b>	Standard monitoring system instead of individual systems contributes to a better quality of fluvial mud
<b>SUBMITTED BY</b>	Aquatic Sediment Expert Centre (AKWA), Institute for Inland Water Management and Wastewater Treatment (RIZA), Directorate-General for Public Works and Water Management (RWS)
<b>PARTNERS</b>	Animal, Ministry of Environment of the Flemish region (BE), Water agency of the Picardie-Artois region (FR), Walloon Ministry of Transport (BE), metropolitan region of Brussels (BE)
<b>DURATION</b>	November 1999 - April 2002
<b>PROJECT NUMBER</b>	LIFE99 ENV/NL/000263
<b>CONTACT PERSON</b>	Mr. D. Clement, +31 (0)320 29 88 22, d.clement@riza.rws.minvenw.nl
<b>WEB LINK</b>	<a href="http://www.rws.nl/rws/projects/akwa/html/producten/index_producten.html">http://www.rws.nl/rws/projects/akwa/html/producten/index_producten.html</a>
<b>KEYWORDS</b>	Decision-support, monitoring system, evaluation method, river, hydrographic basin, environmental assessment, toxicological assessment



## BIOCONTROL FOR SUSTAINABLE GREENHOUSE HORTICULTURE

<b>SPECIAL</b>	75% reduction in pesticide use in greenhouse horticulture
<b>BRIEF SUMMARY</b>	The greenhouse horticulture and floriculture sectors are still using high levels of chemicals. Where garden soil is used instead of artificial substrate, large quantities of methyl bromide are utilised to disinfect the soil. This demonstration project shows that the yield achieved in greenhouse horticulture can be improved by using certain strains of the bacterium <i>Pseudomonas</i> when cultivating on substrate. This gives plants better resistance to disease. The project focusses on tomatoes. This approach results in a strong reduction in the use of pesticides: expectations are that a reduction of up to 75% will be achieved. For the Netherlands, this could mean an annual reduction of 32,250 kg for the greenhouse horticultural sector and 105,225 kg for floriculture. The advantages arising from this are a better image for the sector, improved food safety and greater consumer confidence.
<b>OF INTEREST TO</b>	Greenhouse horticulture (including flowers)
<b>ENVIRONMENTAL IMPACT</b>	Less water pollution, reduced energy consumption, improved production
<b>SUBMITTED BY</b>	Rockwool Grodan
<b>PARTNERS</b>	Delft Research Group
<b>DURATION</b>	July 2002 – July 2005
<b>PROJECT NUMBER</b>	LIFE02 ENV/NL/000118
<b>CONTACT PERSON</b>	Mr. J. Cuypers, +31 (0)475 35 35 18, jean.cuypers@grodan.nl
<b>WEB LINK</b>	<a href="http://www.life-biocontrol.com">www.life-biocontrol.com</a>
<b>KEYWORDS</b>	Greenhouse horticulture, alternative technology, damage to the ozone layer, pest control



## REDUCTION OF PESTICIDES IN HORTICULTURE THROUGH THE CONSTANT MONITORING AND EARLY TREATMENT OF DISEASES

<b>SPECIAL</b>	Plant diseases: prevention is better than cure
<b>BRIEF SUMMARY</b>	The use of pesticides in horticulture is still widespread. The use of these pesticides is generally based on visible signs of disease. This is an unrefined method, which also means that action is taken too late: when disease has already reached an advanced stage. This project looks at how to determine diseases at a far earlier stage, and the best way to combat them, using a combination of techniques and knowledge. Existing DNA techniques are used to study the ten most frequent diseases in plant roots and water. If this is done regularly, diseases can be caught at an early stage, resulting in a far less need for chemicals. A rapid-diagnosis and advice database is being set up for growers.
<b>OF INTEREST TO</b>	Greenhouse horticulture
<b>ENVIRONMENTAL IMPACT</b>	Reduced use of pesticides
<b>SUBMITTED BY</b>	Applied Plant Research [Praktijkonderzoek Plant en Omgeving]
<b>PARTNERS</b>	BLGG Oosterbeek, Delft Research Group, Central Science Laboratory (UK), Lucel
<b>DURATION</b>	October 2005 – September 2007
<b>PROJECT NUMBER</b>	LIFE05 ENV/NL/000021
<b>CONTACT PERSON</b>	Mr. J. Wubben, +31 (0)297 35 23 03, jos.wubben@wur.nl
<b>WEB LINK</b>	<a href="http://www.ppo.dlo.nl">www.ppo.dlo.nl</a>
<b>KEYWORDS</b>	Agricultural method, environmental impact of agriculture, groundwater, horticulture, pest control



## INTEGRAL MANAGEMENT PLANS FOR CATCHMENT AREAS OF TRANS-BORDER RIVERS: THE RIVER DOMMEL

SPECIAL	Linking of ecology and human activity in water management plan
BRIEF SUMMARY	The water quality of many trans-border rivers in Belgium, Germany and the Netherlands do not comply with the standards determined by the European Union. In order to find sustainable solutions for shared environmental problems, land and water management plans must be put in place at catchment area level. In this project, a decision-support model is developed for land and water management for the catchment of the River Dommel. Ecological and hydrological simulation models were integrated in the Regional Landscape Ecological Model (Relem). Socio-economic data are linked to this, making this model useful for the assessment of the consequences of policy scenarios and of human activity in the region.
OF INTEREST TO	Authorities with trans-border problems in relation to water pollution
ENVIRONMENTAL IMPACT	Improvement of water quality and water quantity
SUBMITTED BY	Province of North Brabant
PARTNERS	De Dommel Water Board, Utrecht University, Flemish Environment Agency (BE) [Vlaamse Milieumaatschappij (VMM)], AMINAL (BE)
DURATION	January 1994 - November 1998
PROJECT NUMBER	LIFE93 ENV/NL/003543
CONTACT PERSON	Mr. A.S.W. Span, +31 (0)73 680 81 08
KEYWORDS	Hydrographic basin, integral management, modelling, border area, river management



## DEVELOPMENT OF THE OUDE DIEP THROUGH INTEGRAL LAND DEVELOPMENT

SPECIAL	Learning points for trans-border collaboration
BRIEF SUMMARY	Spatial planning, the environment and water are often separate departments within municipalities. This does not help with the coherence and effectiveness of planning. Within this project, collaboration occurs with different departments and interest groups in order to achieve integral planning. This started with the creation of a non-hierarchical organisational structure. Subsequently, a development plan was produced for the 'Oude Diep' catchment area, together with a number of detailed project proposals (including funding and environmental innovation) and an implementation plan. This plan was compared with a similar project in Rheiderland, Germany. On the basis of both plans, a pilot project was implemented. Collaboration with German partners also resulted in a large number of learning points for trans-border contacts. These have been included in a separate report.
OF INTEREST TO	Any party involved in landscape management and planning
ENVIRONMENTAL IMPACT	Environmental monitoring was set up: better control and an integral approach to the problem
SUBMITTED BY	Province of Drenthe
PARTNERS	Grontmij Advies en Techniek
DURATION	April 1995 - January 2000
PROJECT NUMBER	LIFE95 ENV/NL/001216
CONTACT PERSON	Mr. E.P.H. Bregman, +31 (0)592 36 55 55, e.bregman@drenthe.nl
WEB LINK	<a href="http://www.plattelandsontwikkeling.drenthe.nl/oudediep.htm">www.plattelandsontwikkeling.drenthe.nl/oudediep.htm</a>
KEYWORDS	Policy integration, land-use planning





**Jan Berend Zeevaart:**

***'We brainstormed intensively'***

# Savings, thanks to a 'smart drain'

## Smart Flow in Reiderland

In sparsely populated areas, municipal costs soon rise. Particularly in relation to large jobs such as the collection and transportation of sewage water. This fact prompted the Dutch municipality of Reiderland in Oost-Groningen to consider a cost-saving and smart solution for the long-term. Now, a 'smart drain' has been installed almost throughout the entire municipality, in virtually every home. In this way, the villages of Finsterwolde, Drieborg and Nieuweschans can be guaranteed a future with clean and sustainable water.



'The sewage world is a conservative one', says Jan Berend Zeevaart, deputy director at the municipality of Reiderland and responsible for Public Works. 'Large amounts of money are involved and therefore opting for something new is not quickly considered. If you reckon just for how many billions of euros worth of pipes and tubes we have laying underneath the ground in the Netherlands... You're not going to start experimenting with it.' The necessary revision of the sewage system in Reiderland, as determined in the municipal sewer plan for 1997 [Gemeentelijk RioleringsPlan van 1997], had to be low-

maintenance, cost-saving and a guaranteed success. But how could that be realised? 'Not everyone was connected to the sewer system. Nieuweschans, for example, drained everything into the Westerwolde Aa stream', says Zeevaart. 'There was the issue of leakage in the pipes and contamination in the form of waste remaining in the sewer, because the sewer wasn't emptying properly. Large parts of the sewer would have to be replaced which would have increased sewerage charges to an unacceptably high level. And this is not the most prosperous of areas as it is. A maximum increase of 6% was admissible. So we started to look for an innovative solution.'

### Smart Drain

The engineers at Arcadis were asked to come up with an alternative plan. In addition to the financial conditions, the new system would need to have a two-way drainage, have an 80-year guarantee, and reflect current requirements. After extensive brainstorming – about reed beds amongst other things – the outcome was a system with a smart drain that separates the water flows. A drain of one metre for each home, with a half-metre fall and a plastic ball that closes off the inlet when one of the drainpipes is full. The present, mixed sewage system will remain in place, but will function as a rainwater discharge, directly into the surface water. Leakage and run-off will no longer be a problem, as this will be clean water. Large quantities of rainwater will no longer have to undergo unnecessary treatment. A newly constructed sewer, with a small diameter, will collect the dry-weather flow and can also collect the first flow of contaminated rainwater. This will then all be drained into the sewage treatment plant. The

### MIXED SEWERS

*Sewers normally consist of a mixed system, with a combination of wet-weather flow (rain) and dry-weather flow, such as wastewater from showers and washing machines. These two flows are not contaminated equally: rainwater could be drained directly into the surface water. Therefore, separate drains are increasingly being fitted in sewerage systems. This entails major reconstruction work, including the breaking open of roads and homes. In Reiderland, a relatively inexpensive and simple method has been developed for a system that is virtually completely separate.*



placing of the smart drain at the estate boundary will reduce nuisance for private individuals and eliminate the risk of faulty connections. After several years of small-scale testing in Drieborg, 800 drains have now been installed in 11 kilometres of sewer. The system functions to everyone's satisfaction: 'It's a robust and sustainable system, with little cost going toward management and maintenance. We have tested it with various things that don't belong in it, such as fat, underwear, sanitary towels, tennis balls... It needs to be able to function under all circumstances.'

### Mentality

The object was to make sure that the local economy profited too, by bringing in people who had been unemployed for some time, and by using

subcontractors from the region for the project. This was only partly successful. Zeevaart: 'Progress is slow. The sewer doesn't appeal to people; they think the work will be strenuous and dirty.' However, several people are now being trained for it. So, a sewer project can turn out to be considerably more advantageous than originally thought, via an intensive public-private partnership. 'New pipes have been laid and new rainwater outfalls installed, but the main point is still the smart drain, which will generate savings', Zeevaart says. Surrounding municipalities have opted for more traditional systems. Why did Reiderland have the guts to be different? 'Cost considerations played an important role, but also the employment project, environmental aspects and the need for innovation.' The system could also be used in Germany, England and Denmark – in flat areas – but this hasn't happened yet. 'Much still needs to be done before the mentality in the sewerage world changes and people become more open to smart innovations like this one', Zeevaart believes.



## SMART FLOW IN REIDERLAND

### SPECIAL

Disconnection in existing buildings is possible after all

### BRIEF SUMMARY

The municipality of Reiderland was having problems with the sewers: there was leakage and too many overflows, resulting in pollution of the groundwater and surface water. The municipality wanted to convert the sewerage system from a combined to a separated system. This resulted in the development of a Smart Flow system: a new pipe was installed for dry-weather flow, the current sewer was left in place and is used for rainwater collection. The first rainfall, which is the most polluted, is carried off to the sewerage treatment plant. Although there were additional costs as house connections had to be modified, a cost reduction of 15% was generally achieved in comparison with the costs applicable to a conventional system.

### OF INTEREST TO

Applicable to other municipalities or countries, bearing in mind any limitations of the sewerage system.

### ENVIRONMENTAL IMPACT

In the first instance, the rainwater was still too heavily polluted. This was resolved by allowing the 'first flow', the polluted first rainwater from roofs, etc., to flow into the new system. In addition to the environmental advantages, the system is 15% cheaper than a traditional solution.

### SUBMITTED BY

Municipality of Reiderland

### PARTNERS

Wavin, Arcadis

### DURATION

December 2000 - November 2003

### PROJECT NUMBER

LIFE00 ENV/NL/000791

### CONTACT PERSON

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### WEB LINK

[www.arcadis.nl/service+types/environment/afval+en+afvalwater/projects/](http://www.arcadis.nl/service+types/environment/afval+en+afvalwater/projects/)

### KEYWORDS

Wastewater treatment, urban area, prevention of pollution, sewers





## SUSTAINABLE URBAN TECHNOLOGY IN SCHOONEBEEK

SPECIAL	Implementation halted due to a number of problems
BRIEF SUMMARY	A new district was built in Schoonebeek. The objective of this project was to introduce various ways of sustainable urban planning. For example, a cycle-path system was provided in order to reduce the number of short car journeys. A domestic-water system should have generated a 50% saving in terms of drinking water. Wastewater would be treated in the district. Passive solar energy would be used. Knowledge and experiences would be shared. Several of the problems that arose were: the merger between the municipalities of Schoonebeek and Emmen hampered plans; the role of the parties concerned was not established clearly and the number of houses to be built was reduced. Moreover, the budget required was underestimated and no additional funding was available for the final section. Attempts to adjust the plans were unsuccessful: the project was not implemented.
OF INTEREST TO	Not implemented
ENVIRONMENTAL IMPACT	Ultimately, a number of different problems meant that the project was not implemented
SUBMITTED BY	Municipality of Emmen
PARTNERS	The Fife Council of Scotland (UK), Municipality of Georgsmarienhutte (DE)
DURATION	Project not implemented
PROJECT NUMBER	LIFE97 ENV/NL/000128
CONTACT PERSON	+31 (0)591 68 52 89
KEYWORDS	Urban development, sustainable development, human settlement



## THE BLUE TRANSFORMATION: TOWARDS A WATER-FRIENDLY CITY

SPECIAL	Integral water management for better water quality <i>and</i> quantity
BRIEF SUMMARY	The municipality of Eindhoven has devised the concept of 'the Blue Transformation' to improve integral water management. One of the characteristics of the concept is an at-the-source approach, according to which clean and polluted water streams are kept separate. The concept also establishes links with other processes that occur in an urban area (in relation to traffic, urban development and park management, for example). Implementation of the concept has resulted in experience with techniques for resolving problems at the source and in communication with other parties involved. In conclusion of the project, a handbook was issued, with the object of making it simpler to unlink street drainage from the sewer system on a large scale.
OF INTEREST TO	All municipalities
ENVIRONMENTAL IMPACT	Improved quality of surface water and sediment due to reduction of floods during storms, less peak load into the rivers, less soil influence
SUBMITTED BY	The Municipal Executive for Eindhoven
PARTNERS	Municipality of Copenhagen (DK)
DURATION	February 1997 - April 2000
PROJECT NUMBER	LIFE97 ENV/NL/000137
CONTACT PERSON	+31 (0)40 238 61 02
WEB LINK	<a href="http://www.eindhoven.nl">www.eindhoven.nl</a>
KEYWORDS	Rain water, water management, urban wastewater





## INTEGRAL SUSTAINABLE URBAN DRAINAGE AND CORE APPROACH TO RAINWATER FILTRATION

SPECIAL	Feasible ideas for an urban area
BRIEF SUMMARY	Just like many other cities in the European Union, the Dutch city of Dordrecht is facing problems in the field of water management. These problems relate to the collection, transport and treatment of wastewater, groundwater and surface water. For this reason, the municipality of Dordrecht has developed a concept that is suitable for use in urban areas. Activities implemented include application of a special coating in zinc gutters and setting up infiltration systems and measurement points for excess rainwater. This project certainly has potential, both from a purely technical and a planning point of view.
OF INTEREST TO	Municipalities with water problems in urban/developed areas
ENVIRONMENTAL IMPACT	Monitoring of groundwater level, resolution of problems with sewer capacity; as a result, there is less overflow during storms and rain and, as such, less surface-water pollution
SUBMITTED BY	Municipality of Dordrecht, public works department [Stadswerken]
PARTNERS	TU Delft
DURATION	February 1998 - February 2001
PROJECT NUMBER	LIFE98 ENV/NL/000195
CONTACT PERSON	+31 (0)78 639 60 08
WEB LINK	<a href="http://www.dordrechtwerktaanwater.nl">www.dordrechtwerktaanwater.nl</a>
KEYWORDS	Rainwater, sewers, drainage system



## USE OF LOCAL SURFACE WATER AS DOMESTIC AND INDUSTRIAL WATER

SPECIAL	Low-quality water found to be too expensive after all
BRIEF SUMMARY	Waterleidingmaatschappij Oost-Brabant wants to provide a new residential and industrial area with water of a lower quality for flushing toilets, washing clothes and industrial use. The concept is attractive from the point of view of public health, the environment, the cost-benefit ratio and acceptance by consumers. The project comprises the construction of a treatment plant, the installation of a distribution network for the non-drinkable water and the installation of specific systems in houses, offices and factories. Realisation of the above will reduce drinking-water use by 50%. The expectation is that the project will also provide an insight into aspects relating to public health, which may then lead to standardisation.
OF INTEREST TO	Regions where groundwater is scarce; however, transferability is limited by the extra investments necessary to connect up households or industries
ENVIRONMENTAL IMPACT	The treatment plant's energy consumption was found to be too high and did not weigh up against the cost of groundwater use and the environmental disadvantages it causes. The households were disconnected again from the supply of lower-quality water.
SUBMITTED BY	Waterleidingmaatschappij Oost-Brabant
DURATION	August 1998 – December 2001
PROJECT NUMBER	LIFE98 ENV/NL/000197
CONTACT PERSON	Mr. R.G.A. Broeks, +31 (0)73 683 75 51, <a href="mailto:richard.broeks@brabantwater.nl">richard.broeks@brabantwater.nl</a>
WEB LINK	<a href="http://www.brabantwater.nl">www.brabantwater.nl</a>
KEYWORDS	Water supply, end-of-pipe technology, groundwater



## SMART DRAIN: DISCONNECTION OF ROOFS AND STREETS IN THE CITY CENTRE

<b>SPECIAL</b>	Less pollution, without additional costs in situations where road constructions are taking place
<b>BRIEF SUMMARY</b>	This project demonstrates that the disconnection of rainwater from roofs and paved surfaces is also possible in inner cities. When renovating the centre, the Dutch municipality of Stadskanaal opted for the Smart Drain technology. This involves collecting the first flow, which is the most polluted, while the rest is discharged into the surface water. In addition, heavily used roads are disconnected from the sewers. This is the first time that Smart Drain technology has been used on this scale and on roads with heavier traffic intensity. Surface-water pollution is being limited. The new system is no more expensive than a conventional system in situations where road surfaces have to be removed for reconstruction and the combined sewage system remains in place.
<b>OF INTEREST TO</b>	Applicable in other municipalities in the Netherlands. It is also applicable outside Europe, bearing in mind any limitations of the sewerage system. A great deal of interest has been shown in this project.
<b>ENVIRONMENTAL IMPACT</b>	Less overflow from the sewer to the water system, so less water pollution. Measurements showed an improvement in water quality as a whole. Measurements per Smart Drain well should proof that this is due to the Smart Drain system.
<b>SUBMITTED BY</b>	Municipality of Stadskanaal
<b>PARTNERS</b>	Hunze and Aa's water board, Wavin (plastic-pipe systems)
<b>DURATION</b>	January 2001- December 2003
<b>PROJECT NUMBER</b>	LIFE00 ENV/NL/000787
<b>CONTACT PERSON</b>	Mr. H. Ensing, +31 (0)59 963 14 21, h.ensing@stadskanaal.nl
<b>WEB LINK</b>	<a href="http://www.stadskanaal.nl">www.stadskanaal.nl</a>
<b>KEYWORDS</b>	Integral management, urban area, water management



## GROUNDWATER SUPPLETION THROUGH RAINWATER AND TREATMENT OF OVERFLOW WATER BY A HELOPHYTE FILTER

<b>SPECIAL</b>	Households involved in integral water management
<b>BRIEF SUMMARY</b>	Winterswijk is suffering from drying out and the disruption of the water balance in built-up areas. In this project, a network is being formed to collect surface water and infiltrate it into dry built-up areas. Retention and infiltration facilities are being put in place for the collection of excess water. This can be infiltrated in a sand aquifer. The project looked at the treatment of sewage water in a helophyte filter, but that was found not to be economically feasible. The project is also working with households to establish possibilities for separately collecting rainwater.
<b>OF INTEREST TO</b>	Applicable to other municipalities in the Netherlands. It is also applicable in other countries, bearing in mind any limitations of the sewerage system.
<b>ENVIRONMENTAL IMPACT</b>	Reduction of the pollution effect on ecology and water system; reduction of water disruption in built-up areas; improved quality of the wastewater
<b>SUBMITTED BY</b>	Municipality of Winterswijk
<b>PARTNERS</b>	Waterschap Rijn and IJssel, province of Gelderland
<b>DURATION</b>	December 2001 - December 2004
<b>PROJECT NUMBER</b>	LIFE02 ENV/NL/000120
<b>CONTACT PERSON</b>	Mr. A.J. Timpert, +31 (0)543 54 55 55, btimpert@winterswijk.nl
<b>WEB LINK</b>	<a href="http://www.winterswijk.nl">www.winterswijk.nl</a>
<b>KEYWORDS</b>	Water management



*SenterNovem • which was formed by the merger of the two Dutch government agencies Senter and Novem • implements government policy in the areas of innovation, energy and climate, and environment and spatial planning, and as such contributes to innovation and sustainability • More information is available at [www.senternovem.org](http://www.senternovem.org)*



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