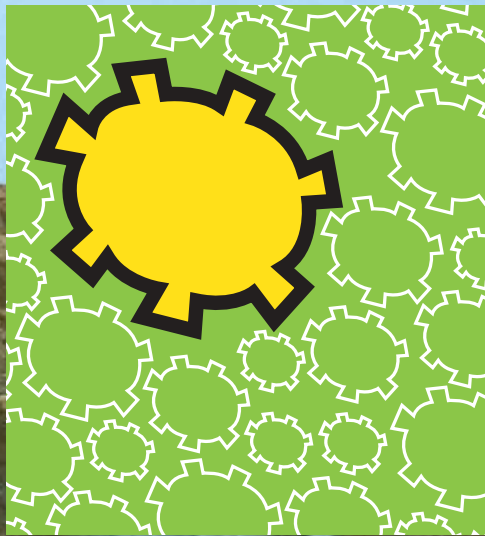


# *Winning ideas*



**The Best Ideas  
Environmental  
Innovation 2001**

# Environmental inventions lead to financial gains



*Hans Leghammar, Project Leader for the Environmental Innovation Competition 2001.*

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The field of environmental inventions has developed rapidly in recent years.

In the past many of the inventions involved considerably higher investments than conventional technology. Today, however, an investment in innovative environmental technology can also give significant financial gains!

Thus the economic motivation for investing in environmental technology is becoming increasingly important. I am convinced that, in the near future, those who fail to invest in the best environmental expertise in their research and development will find themselves outclassed in the market.

This year's collection of "Winning Ideas" illustrates the rapid development of environmental inventions. Use it as a source of inspiration to develop your own new ideas for environmental inventions and help us to inform others who might be able to take advantage of the inventions presented by this year's finalists.

Next year's competition will be presented in the spring of 2002. You can find more information about it on our homepage: [www.miljoforum.n.se](http://www.miljoforum.n.se)

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Sten Liljedahl, the Chairman of Halland Environmental Forum (Miljöforum, Halland) introduces the inauguration ceremony.



Karin Starrin, the County Governor of Halland, inaugurates this year's finals.



The popular seminar on successful aspects of Swedish environmental inventions. From the left: Ola Lauritzon, MD of the Swedish Invention Centre Foundation (Stiftelsen Innovationscentrum), Thomas Korsfeldt, Director-General of the Swedish Energy Agency (Energi-Myndigheten), Göran Wetterlundh, Presiding Officer of Halland Environmental Forum (Miljöforum, Halland), Per-Eriksson, Director-General of the Swedish Agency for Innovation Systems (VINNOVA) and Per-Ola Eriksson, Director-General of the Swedish Board for Industrial and Technical Development (NUTEK).

## Photographs from the Environmental Innovation competition 2001

Photographs courtesy of Magnus Karlsson, Göte Karlsson Foto AB



The King shows interest in Stig Karlsson's invention, "the Swedish Sandwich element"...



...and in Erik Svedberg's innovative sorting plant.

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# Check the tension to cut consumption

*John Elvesjö and Mårten Skogö have constructed a system that makes it possible to optimise the dosage of detergents by measuring surface tension.*

*Calculations show that the industrial consumption of detergents could in many cases be reduced by half if this new system was brought into regular use.*

Degreasing and scouring processes are a common component of many industries. Sometimes the dosage of tensides (detergents) added to the washing water is too low, which results in an unsatisfactory cleansing process. More often, however, the dosage is unnecessarily high – to be on the safe side. An excess dosage not only gives a negative environmental impact, but also involves considerable, and quite unnecessary, increased costs.

“Cleansing processes comprise a significant proportion of the total costs of industry today,” declare John Elvesjö and Mårten Skogö. “Enormous financial and environmental gains can be achieved by optimising the dosage of detergents.”

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## **The Jury's assessment:**

An extremely innovative instrument and a unique method for continuous on-line measurement of surface tension in processes such as industrial cleansing. An optimised dosage of surfactants leads to significant gains for the user and the environment, through greatly reducing the use of chemicals. The product, that ensures improved quality and great savings for the user, has a great potential in various sectors of industry on the global market.

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Their innovative technology makes it possible to measure surface tension “on line” and thus estimate precisely the correct dosage of detergent. Previously continuous measurement of surface tension could only be carried out in a laboratory, but was not feasible in the production process. Now that information about the surface tension of the washing liquid is available continuously the optimal concentration of detergent can be estimated exactly and controlled throughout the process.

Calculations show that the industrial consumption of detergents could in many cases be reduced by half if this new system was brought into regular use. The necessary equipment is comprised of a closed system in which the liquid is sucked through a hose into a measuring instrument and is then pumped back into the system again. Measurement takes place every second.

The measuring instrument is specially designed to withstand the stresses and strains of the corrosive industrial process, and is maintenance-free.

The system can be used in all processes in





*Mårten Skogö on the left and John Elvesjö have developed the method that won this year's Environmental Innovation Competition.*

which surface tension needs to be measured. Even parameters such as pH, conductivity and the rate of ultra-violet absorption can be estimated by the instrument that Jenser Technology AB have constructed for this process.

Most tenside-based cleansing systems achieve optimal efficiency at a certain pH level. It is thus important to assess the degree of acidity in the water.

Measurements of conductivity give information about the salt content in the process liquid, while the rate of ultra-violet absorption gives an assessment of the oil content of the liquid.

“There are many diverse sectors in which the technology can be used. Suitable processes include, apart from de-greasing, the removal of ink from recycled newspaper pulp, the extraction of ore, the production of ink etc.

The invention originated in a request made by a group of Sweden's most renowned industrial companies in 1996 to the Institute for Surface Chemistry (Ytkemiska Institutet). They requested help to develop a process whereby surface tension could be measured with precision continuously, so that the optimal dosage of detergent could be assessed in industrial de-greasing systems.

In 1997 a research project was initiated by the

Institute for Surface Chemistry which resulted in the development of a theoretical solution to the problem. The project was then handed over to John Elvesjö, the project leader, Mårten Skogö and three others, who started a company to develop the results of the research project.

In October 2001 Jenser Technology AB could present the measurement instrument that they had developed from the original ideas developed at the Institute for Surface Chemistry. John Elvesjö and Mårten Skogö, both engineers in Engineering Physics from the Royal Institute of Technology (KTH), are the MD and Technical Manager of Jenser Technology AB, respectively. The companies that lay behind the initiation of the project were, naturally, their first customers. Many more have shown interest. External investors, such as the Swedish Industrial Development Fund (Industrifonden), have bought shares in the company. “This has strengthened our position from the start. It gives us the necessary resources to penetrate the market and also allows us to concentrate on research and development in related areas.”

The technique is patented.

“As we are the first to develop this technique, and there is clearly a demand for the product, we have a large potential market both in Sweden and abroad.”



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# Opposite poles gives heat on the production line



*In-line hardening is a totally new method of hardening steel products, based on a development of induction hardening.*

*The method has various advantages for industrial production. It enables the hardening process to take place on the production line (in-line) and therefore leads to great financial and environmental gains.*



– Many companies today have a modern in-line industrial process right up to the hardening process... but there the production line stops,” says Ulf Thelander, the

man behind this new technique for hardening.

In contrast to the traditional methods of hardening, Inline-hardening takes place in a process that is integrated into the production line flow system.

## **The Jury's assessment:**

A very innovative way of applying existing technology to a totally new area. This invention enables the hardening process to take place directly on the production line by heating the components to the hardening temperature using a magnetic-field-heating process, and then cooling it to achieve the desired temper. This invention vastly reduces the consumption of energy per item, as the heating process is concentrated exclusively to the object to be treated, not to the surrounding air mass. The environmental impact of transportation is also reduced, as the process takes place on the production line, and the use of oil for cooling and detergents for cleansing are also eliminated. As the invention gives great financial gains to the user, it has an enormous potential on the global market.

Heating takes place via coils that create a magnetic field and produce current that can give a suitable hardening temperature of up to 1050 0 C.

Inline-hardening has been developed principally for hardening spherical components, such as ball bearings, but the technique can no doubt also be adapted for use in other processes. It therefore has great potential. Compared with traditional hardening processes it involves an energy saving of 66%. The hardening is of a high quality with reliable, even results and each of the components treated can be controlled individually throughout the process. The process time can also be shortened considerably as the hardening takes place without the use of oil. Transport to and from the hardening plant is also eliminated.

“In some cases components are transported up to 800 kilometres for hardening by traditional methods. Using our technique we can do the same job within a stretch of 15 metres,” says Ulf Thelander.

Inline-hardening clearly has a vast potential on the market. Ovako Steel has put in an order for the first machine. Several other companies have also shown great interest in the technique.

“The combination of the great advantages offered by this method and the interest shown in it, has given us great optimism for the future,” says Ulf Thelander.

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# Small-scale furnaces that produce electricity on the side

*Oilbox is a new method to provide a combined power and heating plant. It enables the production of both heating and electricity on a small-scale (2-15 MW) in an environmentally friendly but still economically viable way. This combination has not been possible in the past.*

“This invention has a number of environmental advantages,” says Anders Kullendorff. “It uses energy efficiently and minimises the consumption of resources, and is based on biofuel, a renewable resource, as its source of energy.”

He and his colleagues at SEP (Scandinavian Energy Project) in Gothenburg have developed this idea over the past few years. It is based on components that are already available on the market. From these they have constructed their newly patented invention, which they call Oilbox.

Oilbox is based on a normal hot water furnace, but the closed system is filled with oil instead of water. The oil is heated to 3200, which can take place at atmospheric pressure. A heat exchange then takes place between the oil and water in a heat exchanger that is external to the furnace. This produces overheated steam, which can be used to drive a steam turbine to produce electricity.

“Oilbox not only makes use of the heat produced, but also converts the heat into electricity using a small-scale furnace. This has not been seen as economically viable before. The system has a coefficient of efficiency of 15-12 percent, which is high for a plant of this size. With this system both electricity and warmth can be produced at a low price from a relatively small heat source. The technique can be further refined to give even greater efficiency.

The first plant of this sort is under construction in Vetlanda and will involve a total investment of approx. SEK18M.

“There are always financial and environmental benefits to be gained by making use of the electricity produced, even if only to meet internal needs. There are many municipal heating works of this size in this country. There is therefore a large potential market for this technique, both at home and abroad. Electricity is considerably more expensive abroad,” says Anders Kullendorff.



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### **The Jury's assessment:**

An innovative new system, created by applying existing technology to create an economically viable method to produce electricity from small amounts of biofuel. Usually small and medium sized biofuel plants are only used to produce heat. By replacing the hot water in the furnace with oil, steam can be produced, which gives an economically viable means of creating electricity in small and medium sized furnaces, which will reduce the environmental impact of producing electricity elsewhere from non-renewable resources.

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# IT concept tops up the loads

*Delego is a new IT system that can optimise the transport of goods on our road network. This system can give great environmental gains, as more than 30% of the haulage capacity of the vehicles on the roads of Sweden and the EU is totally unused, for various reasons.*

Delego is a completely integrated system that allows customers and haulage contractors to make easy contact with one another via the Internet. Via the homepage the demand and supply for haulage are matched together.

“This system enables the customers to contact the haulage contractor in a way that was not possible before. Moreover, contact will only be made with the vehicle that has the most suitable run and needs to go the least out of its way to take the goods,” say Tomas Nilsson and Patrick Nordin.

Their interest for this problem arose towards the end of the eighties when they ran a small haulage company in Halmstad. As the size of the loads on different runs – and accordingly the profitability – often varied widely, they began to think about how they could devise a system that would increase haulage efficiency. They were finally able to put their idea into practice at the end of 1999.

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### **The Jury's assessment:**

An invention based on IT technology and practical experience of the haulage branch that enables the exploitation of excess capacity in lorries that are already on the road. The new matching system means that it is possible to find goods vehicles travelling on a suitable route and make use of their excess capacity. The system provides great opportunities to reduce the costs and the environmental impact of haulage, which means that it could also become an attractive export product.

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*Thomas Nilsson, on the left, and Patrick Nordin are the brains behind the logistics system called Delego.*

Delego, which operates across the entire country, has awoken great interest in the period since September 2000 when it first became fully accessible on the Internet. There has been a 25% increase in the amount of goods transported per month. In December 2001 approximately 900 customers were using the service regularly. Serious efforts are being made to increase the number of users. If enough people make use of the system great financial and environmental gains are possible. For example, haulage capacity will be used more efficiently, and fuel consumption and emissions of carbon dioxide and nitrogen oxide will be reduced. Moreover, in the long run it will be possible to measure the environmental impact of each individual vehicle that is connected to the system. Ultimately the greatest benefits would be achieved if the system was also applied to international road transport haulage, for example between the different EU countries.

“Delego already has the capacity for this – we are hoping to be able to sell licences to companies in other European countries, and thus develop the system into a Pan-European network. This would greatly increase haulage capacity and give enormous environmental benefits,” say the two ex-haulage contractors.



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# A leak-free system

*Hydraulic hoses can be exchanged for stainless steel pipes that have automatic greasing and are free from leakage, so that the oil can be replaced by ordinary water.*

*Thore Wiklund, from Piteå, is the designer of this environmental hydraulic system.*

The hydraulic systems used today constitute an environmental hazard. Hoses break and hydraulic oil seeps out. Used oil is not always disposed of as it should be and can therefore pose a threat to the environment. "A hydraulic cylinder in a machine always leaks lubricating oil," says Thore Wiklund.

His new system greatly improves environmental security. The hoses, which are often responsible for leaks, are replaced by stainless steel pipes and the internal lubrication of the hydraulic cylinder takes place in an automatic, sealed, leak-free process. The hydraulic cylinder is free to move up to 70 laterally and 1800 longitudinally, which allows a great deal of variation. It is equipped with a special back plate and a special cylindrical central axle. This design gives it the same degree of efficiency as a conventional cylinder. As the inside of the cylinder is lined with stainless steel, it is possible to use water instead of hydraulic oil. "I hope that we can eventually replace hydraulic oil with ordinary water. The same pressure can



be achieved using water instead of oil, and water is also a good lubricator." In Sweden alone, it is estimated that huge amounts of hydraulic oil seep out into the ground, groundwater and other receiving bodies of water. Thore Wiklund's new system can help to minimise this environmental impact, as well as leading to significant financial gains.

"Running costs can be cut by up to 30% through less broken hoses, production stops and environmental control charges." The system has been tested by SSAB in Luleå with good results and other industries have shown interest.

"This shows that there is a significant industrial potential for this technique."

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# Blocks made of tyres block out sound

*Berne Geéwe has invented a product made out of worn-out tyres that absorbs sound. The 91 cm high blocks do not spoil the appearance of the countryside and are easy to handle. They could be used in many cases instead of high noise barrier fences.*

Berne Geéwe has developed a method by which rubber granules, made from worn-out tyres, are combined with an environmentally friendly binding agent to make blocks that



absorb sound by breaking up the sound waves. Normal sound barrier fences made of wood or cement are often a few meters high, and do not in fact absorb the sound, but make it 'bounce off' in another direction, which

can often mean that the sound is intensified somewhere else.

In this new technique the sound is actually removed at ground level where it is produced. It could therefore be used instead of high sound barrier fences in many places, for example along railway lines and roads where the sound waves are produced close to the ground.

"The rubber particles are bound together asymmetrically, with facets, angles and cavities



in all directions," explains Berne Geéwe. "That is what creates such a unique effect."

The effects have been confirmed in experiments at the Marcus Wallenberg laboratory at the Royal Institute of Technology, in which sound measurements were taken. The Swedish National Rail Administration has made tests that show that noise from trains can be reduced by 14,7 decibels, which is considerably higher than the minimum demand of 12 decibels. Moreover, the blocks also reduce vibrations.

The specially developed polymer-based binding agent is environmentally friendly and can withstand UV rays. This means that the rubber blocks do not deteriorate in sunlight. The binding agent also prevents chemicals in the rubber from escaping into the environment.

The blocks are easy to place out and to remove and can be re-used. Examples of places where they can be used include alongside railway lines and roads, on bridges and in industry.

"We already have a number of major customers and an increasing amount of inquiries about our product are coming in. After just a few months of production our turnover has reached several million Swedish crowns. Great interest in the product has also been shown on the export market.

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## Plastic in the right place

*More than ten percent of the material used in the production of plastic bags is waste. Today there is no cheap, rational method available for taking care of this material on the spot.*

*However, Erling Svensson is working on an invention named Polyconvert which will solve this problem.*

Today the waste material is usually recycled in a large scale plant somewhere else. The costs of transport and handling are relatively high. For example, the plastic has to be stored until a sufficient quantity has been amassed, then it must be transported from the factory to one of the few large-scale plants that recycles this type of material.

“As the quality of the recycled plastic is rather unreliable, it is generally made into low-price, relatively unprofitable products, such as rubbish-bin liners,” explains Erling Svensson. But Polyconvert can offer a solution to the problem.



“It is a small, inexpensive machine with simple technology that makes it possible to recycle the waste material directly in the production process.”

The machine converts the waste, which has a low bulk density, to granules with a high bulk density. It can then be mixed with new material directly in the extruder without any reduction in the quality of the product.

There is a large potential market for Polyconvert. There are a large number of extruders all over the world that are used in the production of plastic bags.

“By recycling the waste as an integrated part of the production process large financial and environmental gains can be made,” says Erling Svensson.



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## Green horse power

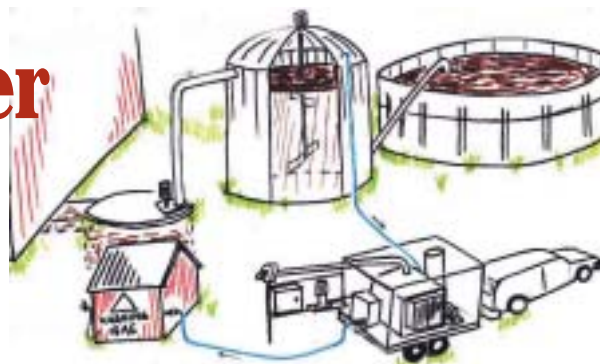
*A broad interest in environmental questions inspired two development engineers, Peter Karlsson and Mattias Prytz, to investigate the possibilities of inventing a small-scale purification plant for biogas. Their invention, BIOREGATM, enables biogas to be used as fuel for motor vehicles.*

Recently there has been a lot of discussion about the environmental problems associated with methane gas. Methane gas is produced during the natural decomposition process that takes place in oxygen-free manure pits containing manure from cattle or pigs. As methane gas contributes to the greenhouse effect it is important to minimise its production.

However, by purifying the biogas using BIOREGATM it can be used as fuel for motor vehicles, which is also in line with the policy of the Delegation for Alternative Fuels and the Environmental Department. Moreover, after combustion the only waste products emitted are carbon dioxide and water.



*Mattias Prytz, standing, and Peter Karlsson believe that their invention, BIOREGA™, has great potential.*



“If the gas is also made use of, the environmental gain will be doubled. Firstly, there is no leakage into the atmosphere, and secondly, some of the consumption of petrol, diesel or ethanol can be replaced by biogas,” explain the two inventors.

The BIOREGATM project is still in the development phase, but a prototype of the invention with a capacity of approx. 240 cubic meters crude gas per day, the equivalent of about 170 litres of petrol, has been produced. This demonstrates that the technique is viable and works well.

The final purification plant is estimated to cost between SEK400 000 and 700 000, depending on the specifications demanded by the customer.

The aim is that the finished product will enable medium to large-scale farmers to become self-sufficient in fuel production. This demands, however, that more private farmers invest in small-scale digester tanks on their farms.

Given this development the production of biogas poses no problems. It is estimated that in southern Sweden alone biogas to the equivalent of 400 000 cubic meters of petrol could be produced per year by decomposing organic material including waste products and other crops. This would provide enough fuel to run 200 000 to 300 000 cars.

“We estimate that this product has a very great potential. Even with today’s fuel prices we estimate that the technique is financially viable. If fuel prices rise, an investment in biogas will become even more profitable.

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## Software for optimal driving

*Mattias Hedlund, Magnus Gunnergård and Martin Lackéus at Chalmers School of Entrepreneurship in Gothenburg have constructed a system for collecting data on run statistics in order to be able to optimise the way in which lorries are driven.*

*This system will allow a significant reduction of fuel consumption and exhaust emission.*

The system enables a constant monitoring of run statistics from lorries. This information is then transmitted via a radio link to the haulage contractor's computer system. The only equipment needed is a normal hand-held computer and the specially designed software.

Fuel consumption, the varying stresses and strains on the engine, and run statistics are all recorded, and from this data optimal patterns for driving can be calculated.



*Mattias Hedlund, on the left, and Martin Lackéus in co-operation with Magnus Gunnergård, have developed a system for optimising lorry driving, irrespective of the make of lorry involved.*

“The aim is to achieve maximum efficiency through minimising fuel consumption and optimising the stresses and strains on the engine,” explains Mattias Hedlund.

“By optimising the way in which vehicles are driven, this system can result in a 15% reduction in fuel consumption and exhaust emission.”

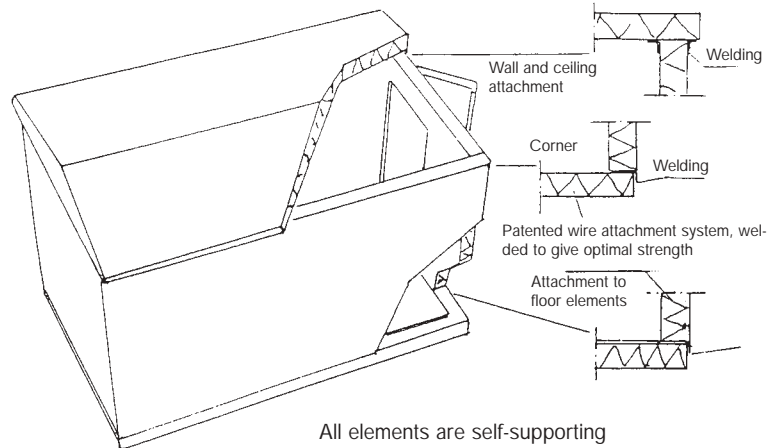
“There are 56 000 heavy vehicles in Sweden. If they represent a total fuel consumption of 3 billion litres of diesel per year, then a 15 percent reduction in consumption would mean a saving of 4.5 million litres of diesel. It would also mean an equivalent reduction in exhaust emission.

A report from Skogsfors (the Swedish Forestry Research Organisation) claims that if the fuel consumption of timber lorries was reduced by five percent, it would mean a saving for the forestry industry of up to SEK60 M per year.

This system can be used with all makes of lorry and is very cost-effective.

“These two factors together make it of great market value, both at home and abroad.”

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## Light-weight building elements

*Stig Karlsson has designed a new type of light-weight building element which he has called Sverigesandwichelemnet (Swedish sandwich elements). The construction, which can be made of steel, aluminium or stainless steel, has many advantages that make it interesting from both a financial and environmental point of view.*

“One of the greatest problems associated with conventional glued sandwich prefabricated constructions is that the material in between the sandwich layers eventually splits apart when it is put under strain,” says Stig Karlsson, who has been working with this type of light-weight building element since the 1980s.

His Swedish sandwich element construction, however, solves this problem. It is a self-supporting light-weight construction element that makes use of a latticework framework of steel, but that can also be made of stainless steel or aluminium. From an environmental point of view this is a great advantage as the material of which the elements are constructed can be recycled. The elements are also simple to produce, maintain and repair.

An important aspect of the construction is a system of wires with which the panels are welded

together. This gives the construction mechanical properties that can withstand extensive pressure of pushing, pulling and twisting. It is also heat-resistant, as cooling ducts can be built into the elements, and these can even be used for vacuum to reduce the fire risks.

“The construction is very flexible and takes full advantage of the properties of steel. The weight of the constructions in which these elements are used can also be optimised. This gives both technical and financial gains. The elements can be used in constructions such as houses, office blocks and factories as well as for other purposes, such as the reconstruction of motor vehicles, trains, boats etc.

The Swedish sandwich element construction is in many cases a cheaper alternative than conventional sandwich elements. The total market for sandwich elements of different sorts in Europe amounts to over 80 million square metres per year. Bearing in mind the technical advantages of the Swedish sandwich elements and the fact that they are recyclable, they clearly have a large market potential.

“I am already in contact with a number of companies that have shown interest in the elements. My goal is to employ 50 – 100 people in this business in the near future.”

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## Think globally produce locally

*Jan Anjou has designed a mobile plant for the small-scale production of pellets for heating purposes. This equipment enables carpentry and wood-working industries to convert their waste products into combustible fuel.*

Today there are many waste products made of renewable materials that represent an untapped energy source. The waste from carpentry workshops and other wood-working industries could be converted into environmentally friendly pellets for heating purposes.

“The problem has been that pellets have only been produced on a large-scale in capital intensive plants. Therefore many small-scale local factories and workshops have been unable to make use of their waste,” says Jan Anjou.

“There is plenty of raw material available in the wood-working industry that could be converted to pellets, but it is not utilised because there are only large-scale plants on the market.” Jan Anjou has designed a system that can produce pellets locally, on the spot and on a small-scale from the waste products of carpentry workshops e.g. scraps of wood, off-cuts, wood shavings etc.

The system is composed of a mobile chipping machine and a mobile pelleting machine. The chipping machine, which has its own engine, weighs



250 kilos, and the pelleting machine 200 kilos. They can be transported together on a normal car-trailer. The pelleting machine converts the finely shredded chips into 8mm pellets. Similar plants can be adapted to process other organic waste, such as straw. This mobile small-scale plant makes it viable to produce pellets for heating private houses, as an alternative to oil, electricity or firewood, which can reduce the transportation of fuel over long distances.

“For instance, local sawmills can convert their own waste products into fuel and thus increase their range of products,” says Jan Anjou. Pellets made from forestry waste are one of the most environmentally friendly types of fuel. The carbon dioxide released under combustion is equal to the amount that is bound up in the growing process in the forest. Other advantages include the high heat value of the product and its clean combustion. Jan Anjou has already sold several hundred of these machines in just a few months. Moreover, he has been approached by several international contacts who are interested in constructing the machines abroad under licence. “Great interest has been shown in this product, which is very promising,” he says.



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## Budge that sludge

*A new invention called the Aqua Recipro process has been constructed through combining old and a new technology.*

*The idea behind it is that organic material is burnt to give off energy. It also enables the recovery of phosphorus and the other chemical precipitates from the sludge that is produced in the process of purifying drinking water and wastewater.*

Farmers discovered long ago that sludge could be used as a fertiliser, and have spread it on their fields, which has also solved the problem of how the sewage works should dispose of a bulky waste product.

However, as it has now been shown that sludge also contains other more hazardous substances, this practice has been called into question. It has now been decided that the deposition of organic waste, such as sludge from water works and sewage plants, will be forbidden from 2005.

AquaReci is therefore a process that could provide a solution to this problem.

“We have combined two ideas to make a new invention. Firstly, the organic material is burnt through a process known as supercritical water oxidation.

Phosphorus and other chemical precipitates are then recovered in the second step of the process. All that remains at the end of the process is inorganic waste, such as sand and gravel,” says Kjell Stendahl.

A company called Chematur Engineering AB in Karlskoga has constructed a pilot plant to test the method, which has given positive results.

In a test run at this plant 10 000 tons of sludge from a waterworks, which would normally simply have been dumped, was processed, leaving no other waste products than 10 tons of sand and gravel. Besides this 100 percent of the chemical precipitates could be recovered and energy was produced worth an estimated SEK 1M. This energy is suitable for distribution in a municipal heating network.

The process therefore offers an overall solution to the disposal of sludge, that has many interesting aspects, not least its potential environmental gains. A number of municipalities have shown interest in the method.

“We are now planning to construct a show plant where we can demonstrate the many advantages offered by the method,” says Kjell Stendahl.



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# Rubber protection

*New interior fittings for cow-sheds can prevent injuries to cows' hoofs, udders and teats. The new system is based on rubber-clad surfaces and a specially designed gutter for urine and manure that minimises ammonia evaporation and nitrogen emissions. It can therefore offer great environmental improvements.*

Even though Swedish dairy cows are not generally ill-treated, there is still much that can be improved, in the interests of both the animals and the environment. The concrete floors of the cow-sheds are hard and the stalls are often poorly designed. A study made by the Swedish University of Agricultural Studies (SLU) in Skara showed that nine out of ten cows in traditional loose housing suffer injuries to their hoofs at some stage. The combination of urine and manure leads to high levels of ammonia evaporation.

Gunnar Fritz has designed a system whereby the stalls and surrounding surface areas are clad with protective rubber mats. Moreover the stall can be lengthened with a rubber-clad extension,



which makes it easier to ensure hygienic and effective cleaning procedures.

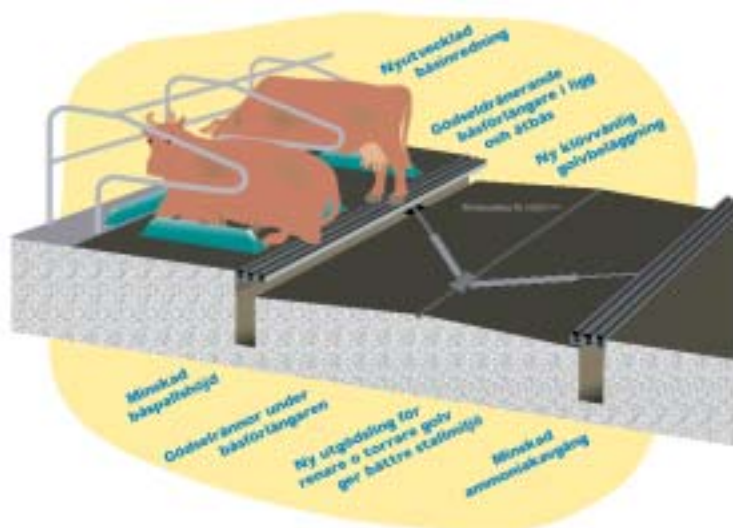
The stall extension also allows large cows to lie down comfortably in the normal way, without their legs or other parts of their body extending beyond the limits of the stall. Any manure in the stall is automatically drained off.

When the cow is lying down its body is supported by a stall divider. These dividers also prevent the cows from lying diagonally in the stalls and depositing manure in the adjacent stalls. The risk of them damaging their teats by stepping on them is also reduced.

Moulded rubber mats to line manure gutters, collecting troughs, and as flooring in resting stalls and fodder stalls give a soft surface that protects the animals from hoof injuries etc.

The design of the manure gutters also greatly reduces ammonia evaporation and nitrogen emissions.

“We have designed a complete loose housing system that optimises performance, profits, environmental factors and healthy conditions for the livestock,” says Gunnar Fritz. “Furthermore it provides significantly improved ergonomic working conditions for the farmer. Those that have tried the system so far have found that it has given great environmental benefits.”

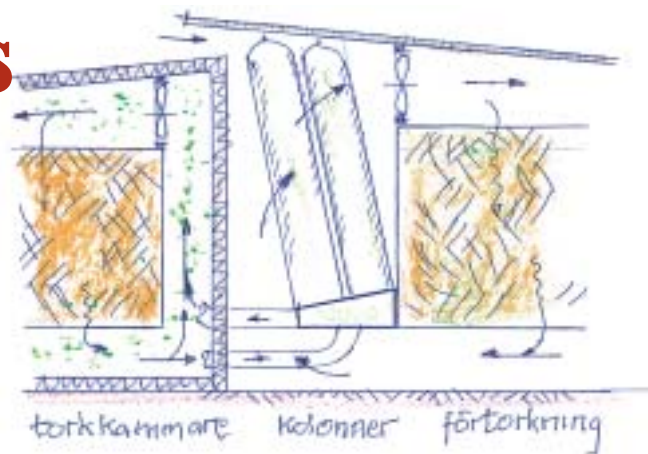


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## Recycled heat gives the best warmth

*Kiln drying wood or other materials is an energy consuming process. A new method, based on a "column technique" can reduce the energy consumption in the process by up to two-thirds. Furthermore, it gives a higher quality product.*

Kiln drying wood, or other material, is both tricky and energy consuming. The current technique used is that the drying process takes place in an insulated kiln with internal air-circulation. Cold air is taken in, and steam and warm air, representing a significant source of energy, are expelled. Moreover, the percentage of extracted warm air increases greatly as the degree of moisture in the material being dried decreases. Sten Zeilon has designed a method to increase the efficiency of the drying process and make it considerably more energy-saving at the same time as the quality of the end product is improved.



In his method the air circulates within a closed system in the kiln, and only the steam is extracted. This takes place without cooling the air, by using a technique based on special membranes in column-shaped formations that are attached externally to the kiln. The steam condenses and the reduced warmth from the kiln is then heat exchanged via the columns, and can be re-used in a second step of the drying process, for instance for pre-drying wet material.

This technique can reduce the total energy consumption needed for the drying process by up to two thirds.

The method also automatically produces the optimal humidity in the kiln in relation to the material to be dried. This minimises the risk for drying damage and cracks.

Through simple technology, the "column dryer" gives high quality drying, with few cracks in the wood and greatly reduced energy consumption. The system can also be used for drying biofuel and grain.

"The method can replace the expensive, high-tech systems that are used today to control the drying conditions in kilns," says Sten Zeilon. The system is also cost-effective and can be used on a small-scale to increase the added value of products from small industries, such as local sawmills.

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# Heaps of material to be gained

*Erik Svedberg's new mobile screening plant enables the recovery and re-cycling of ballast material, gravel and sand. Spoilt particles are screened out using a mechanical process.*

Erik Svedberg has invented a method for mechanical screening using a high-pressure washing appliance to separate small particles from larger ones in earth, gravel, sand or other such material.

Environmentally hazardous pollutants tend to stick far more easily to small particles of gravel than to large ones. If the small particles are removed, the major bulk of the material can be recycled immediately. The small particles can also be recycled, but they must be washed clean first.

“My method enables the recycling of about 90 percent of the material,” says Erik Svedberg. This means that the exploitation of natural sand, gravel and earth can be reduced by an equivalent amount, and also that transportation is also reduced. This means great environmental gains. Far less material will need to be deposited as landfill and the charges for depositing contaminated material will be avoided.

“It also means great savings in the process of dealing with sanitary landfill,” says Erik Svedberg.

The sorting system includes the washing of the material with a high-pressure washing appliance and the recycling of the washing water.



This saves enormous amounts of water.

The method is mainly designed for sorting ballast material, road sand and gravel. However, large volumes of contaminated material can be decontaminated and recycled using the same method. It can also be used in the decontamination of industrial sites.

In 2008 Sweden will introduce laws against depositing untreated contaminated waste. “We plan to gradually expand our production, so that we can eventually establish this mobile sorting plant firmly on the market,” says Erik Svedberg.



## The Jury of the Environmental Innovation Competition 2001:

Göran Värmbj, Chaiman of the Jury, Business Region Göteborg AB

Britt-Marie Bertilsson, MISTRA

Gudrun Bågstam, the Swedish Metalworking Industries' Association

Åsa Domeij, the Swedish University of Agricultural Science

Hans-Erik Eldemark, University College of Halmstad

Hans-Olof Franzén, ALMI Företagspartner AB

Lars Hallén, Life Academy

Ola Lauritzson, the Swedish Invention Centre Foundation (Stiftelsen Innovationscentrum)

Carl Naumburg, the Swedish Agency for Innovation Systems VINNOVA

Göran Uebel, The Swedish Board for Industrial and Technical Development NUTEK

Hans Zetterling, The County Administration Board of Halland

The criteria on which the Environmental Innovation Competition 2001 has based its adjudication include consideration of the uniqueness of the invention, and the financial and environmental benefits it can offer.

### Further questions regarding the Environmental Innovation Competition:

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### The municipality arranging the finals of the competition



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