



EUROPEAN
COMMISSION

Community research

Co-operative Research projects for SMEs – Volume 1



“We can develop a new technique and new, European-made products offering industry great advantages.”

Tougher laws on food and drug safety have forced small and medium-size enterprises (SMEs) in the European food, pharmaceutical and agriculture industries to seek out better ways to clean their processing plants. A major source of food contamination is high-pressure water cleaning which can generate aerosol mists that spread impurities throughout plant working areas. With nine partners in four countries, the Co-operative Research Aerosol Reduction project is developing a vacuum-based cleaning system that reduces aerosol mists while using far less water and energy than current spray systems. The resulting technology should give European SMEs access to modern cleaning systems, while opening new markets and revenues for European products.

In response to several recent outbreaks of food poisoning, the European Union has begun introducing tougher regulations, inspections and enforcement to ensure a safer supply of food and drugs. High-pressure cleaning systems, a known cause of contamination in food-processing plants, create aerosol mists that can spread impurities on to clean equipment and food. European SMEs in the sector have asked for high-tech cleaning systems to solve this problem, but the research costs involved are beyond most of them. Consequently, the Co-operative Research project Aerosol Reduction (Nex Hygienic Cleaning Technique – for food production – reducing aerosol problems and water consumption) is working on a high-tech, vacuum-based system aimed at reducing the spread of aerosols in processing plants while significantly cutting water and energy use.

Mobile mists

Research indicates that the main entry point of food contaminants during production is via the air. High-pressure water sprays are used worldwide in many types of cleaning systems used regularly in processing plants in the food, pharmaceutical and agricultural industries. These sprays can often end up doing more harm than good because the impact of a high-pressure stream through a small-diameter nozzle creates aerosols – i.e. mists of fine water droplets that travel naturally through a manufacturing plant’s atmosphere and are able to transport particles and dangerous micro-organisms such as *Listeria monocytogenes*. The aerosols can re-contaminate already cleaned equipment, food and other products, while sprayed equipment is often not sufficiently dry before being used again. In addition, high-pressure water cleaning uses vast quantities of water and electricity.

Aerosol-borne contamination problems are especially acute in the preparation of such ready-to-eat (RTE) foods as hot dogs and processed meats, cheeses, and smoked fish, which the consumer may not cook enough (or at all) to kill micro-organisms. Aerosols can carry contaminants from plant areas where raw food is processed to the sections where RTE foods are handled and packaged. The bacteria *Listeria monocytogenes*, particularly dangerous to pregnant women and people with weakened immune systems, can cause fever, meningitis, encephalitis and prenatal septicaemia. In 2002, a listeria outbreak linked to RTE turkey slices caused at least seven

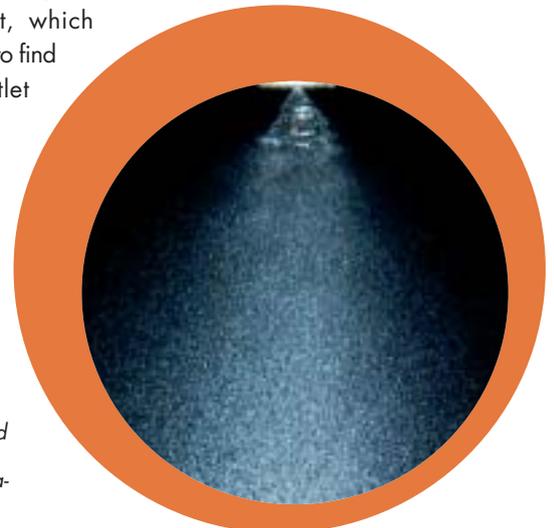
deaths, three miscarriages and 46 illnesses in the United States. Listeria-tainted potted meat killed seven people in France in 2000.

The Co-operative Research Aerosol Reduction project has gathered nine partners from four Member States working to develop a vacuum-based cleaning system that will control the spread of aerosols as well as use 40% less water and energy than current high-pressure spray systems. The project is being coordinated by Lagafors Fabriks AB, of Laholm, Sweden, an SME manufacturer of custom cleaning and hygiene systems for the food-chain industry. The Norwegian company Matsforsk will contribute auditing and testing; Chalmers Industriteknik, an operating foundation of Chalmers University of Technology in Sweden, will design filters, and the Danish Institute for Product Development will develop ergonomics technology. The Norwegian Food Research Institute will also participate. The European Union is contributing slightly more than half of the project’s overall budget over two years, helping to place this new technology within reach of SMEs with modest revenues.

Safer food, stronger market

The Aerosol project’s new cleaning technique will produce a dryer, cleaner working environment, which in turn should result in longer shelf life for food and pharmaceutical products. The partners expect the system to generate substantial economic benefits and stronger market positions for the European companies that become involved in producing the resulting equipment, which would be likely to find a robust outlet worldwide.

High-pressure water sprays used for cleaning can generate bacteria-laden aerosols.



"We could never do this kind of innovation without economic support."

The Co-operative Research project team will concentrate on solving the technical problems of a vacuum-based cleaning system, including how to measure and collect the aerosols to reduce spreading and contamination, as well as finding a way to substantially decrease the vast amounts of water and power needed to clean the processing areas of large plants.

As from 2006, the SME partners plan to sell the new system to food and pharmaceutical industries in northern Europe and the United Kingdom. SMEs in other countries will be able to buy production and sales licences. Because the potential market for such an advanced system is very large, the project partners expect this co-operative research to boost their competitiveness and revenues substantially.

Project title

Nex Hygienic Cleaning Technique – for food production – reducing aerosol problems and water consumption (AEROSOL)

Contract number

CT-2004-508490

Duration

24 months

Global project cost

€ 879 000

EC contribution

€ 454 000

Contact person

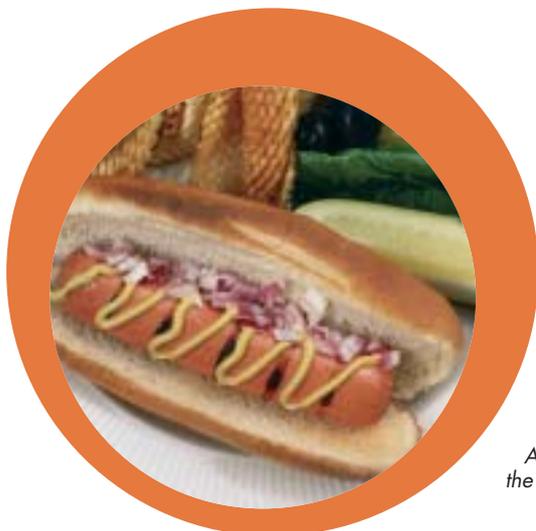
Pär-Magnus Elmblad
Lagafors Fabriks AB
Industrigatan 22
312 21 Laholm
Sweden
Tel: +46 430 78110
Fax: +46 430 78119
magnus.elmblad@lagfors.se

Project website

www.lagafors.se

Participants

- 1 Lagafors Fabriks AB (SE)
- 2 Faitech OY (FI)
- 3 Hygienteknikk A/S (NO)
- 4 Innovationteam AB (SE)
- 5 Instituttet for Produktudvikling (DK)
- 6 Norwegian Food Research Institute (NO)
- 7 Procordia Food AB (SE)
- 8 Stiftelsen Chalmers Industriteknik (SE)
- 9 Vald Nielsen Maskinfabrik AS (DK)



Aerosols are a particular danger in the preparation of ready-to-eat foods.



"This is one of the first-ever applications of hollow-fibre membranes for the absorption of pollutants from gases."

Ammonia gas is a by-product of many industrial processes and agricultural activity. However, it is a serious atmospheric pollutant and emission levels have to be controlled. The Agate project is developing a new system – based on hollow-fibre membranes – that not only removes ammonia from waste gases, but also recovers it, thus closing the industrial ammonia cycle and conserving valuable raw materials. The aim of the Co-operative Research is to build a unit that is 99% efficient, and cheaper and easier to run than existing scrubber systems. The sustainable technology promises to compete well with scrubbers: the Agate SMEs hope to capture at least 10% of the €4 billion EU ammonia abatement market within a decade.

Ammonia released into the atmosphere is a serious source of environmental pollution. It is known to damage sensitive habitats and cause problems for vegetation, soil and water. It is also one of the causes of acid rain, which can have devastating environmental effects miles away from sources of ammonia emissions.

Ammonia is a by-product of many industrial processes, including oil refining, fertiliser production, and food processing. It is usually released into the atmosphere through chimneys with other waste gases. In agriculture, it is produced during manure and slurry processing.

The EU National Emission Ceilings Directive includes ammonia in its target emission levels for Member States. These overall levels are translated into national legislation which sets limits on the amount of ammonia individual factories or industrial plants can release with their off-gases. Any site – including large, intensive, cattle, pig and poultry farms – producing ammonia above these limits is compelled to install scrubbers and to reduce the amount of ammonia in emission gases to acceptable levels.

However, scrubbers are large and heavy, difficult to scale, and installation is far from straightforward. Operation is also difficult: scrubbers do not cope with large fluctuations in ammonia concentrations, they are sensitive to changes in flow conditions, and require regular cleaning and maintenance.

Furthermore, scrubbers are not a sustainable solution to ammonia emissions. By producing a dilute solution that can be flushed into the sewer, they merely transfer the ammonia to the waste-water stream. Such disposal is far from ideal – while huge quantities of ammonia are washed away, thousands of tonnes are produced each day from non-renewable resources.

Absorbing research

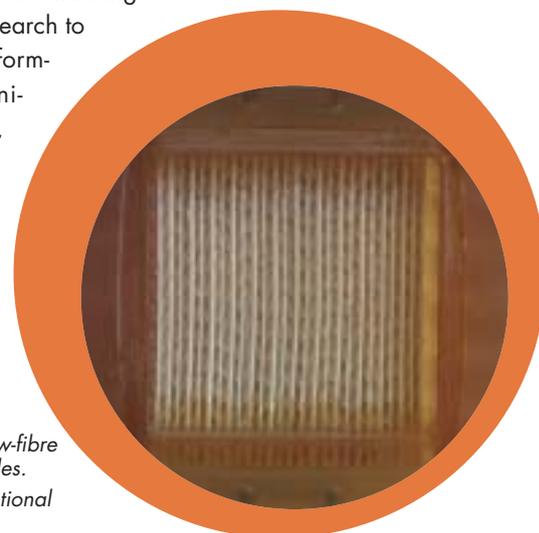
A group of European SMEs has finally decided to close the industrial and agricultural ammonia cycle. Working together within the Agate Co-operative Research project, they want to develop a technology that will both absorb and recover ammonia from waste gas flows.

This new technology will be based on hollow-fibre membranes which are already widely used for effluent treatment. Porous membranes are wrapped into a module through which an absorbing agent flows. As the waste gas passes over the membranes, pollutants move through the membrane pores and are carried away by the absorbing solvent on the inside. The low volume of solvent means that high concentrations of pollutants are absorbed, making their recovery possible both technically and financially.

The membrane gas absorption (MGA) system will be compact and modular, 98-99% efficient, and will enable the recovery of the absorbed ammonia for conversion into chemicals such as ammonium nitrate and ammonium sulphate for use as fertiliser. To compete with the well-established scrubber market, the Agate partners aim to produce MGA systems that will be 50% cheaper to run and more reliable than existing equipment.

Eight SMEs (small and medium-sized enterprises) from the Netherlands, Belgium, Germany and the Czech Republic are involved in developing different components (membranes, sensors, filters) and designing the overall MGA unit. They are joined by Acheson Produktie BV, a large chemical company which will field test the prototype end product in its manufacturing plant in the Netherlands.

The SMEs are contracting some of the research to three RTD performers. The University of Brno, in the Czech Republic, is involved in membrane



Example of hollow-fibre membrane modules.

© Cirmac International Apeldoorn

development, supported by the Dutch Organisation for Applied Scientific Research (TNO). TNO is also helping with MGA module design and in modelling the dynamics of ammonia transfer across the novel membranes. Finally, Promikron – a Dutch SME – will conduct field tests and technical and economic evaluations of prototype systems.

Anticipated demand

If the technology proves to be successful, the eight Agate SMEs will form a consortium to market MGA ammonia-recovery systems throughout Europe. Some of the SMEs will manufacture and supply components, while others will produce the end product or sell it within specific industry sectors. German and Dutch SMEs expect to act as a 'buyers' for the recovered ammonia compounds which they will collect, store and sell to fertiliser manufacturers.

The project partners anticipate a large demand for the Agate system – a demand that is likely to outstrip their own production capacities. However, by licensing the technology to other manufacturers they expect to build a 10% share of the European ammonia abatement market within ten years. With annual sales potentially worth around € 400 million, this new technology offers an exciting business opportunity. And it will help Europe meets its sustainability targets and international commitments to reducing atmospheric pollution.

Project title

Ammonia Gas Absorption Technology (AGATE)

Contract number

CT-2004-508178

Duration

24 months

Global project cost

€ 1 467 764

EC contribution

€ 758 998

"This will be a sustainable solution to ammonia emissions and will close the loop in industrial ammonia usage."

Contact person

Mr Ron Keulen

Gemini Enterprises

Ank van der moerdreef 13

6836 MP Arnhem

The Netherlands

Tel: +31262360670

Fax: +31263271900

environ@wxs.nl

www.gemini-enterprises.org

Participants

- 1 Cirmac International BV (NL)
- 2 Acheson Produktie BV (NL)
- 3 Aura Metallurgie GmbH (DE)
- 4 Carltech BV (NL)
- 5 Constructie en Lasbedrijf Besarlis BV (NL)
- 6 Eidos Spolecnost Rucenim Omzenym SRO (CZ)
- 7 Gemini Enterprises (NL)
- 8 Innovative Membrane Technology BV (NL)
- 9 Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek – TNO (NL)
- 10 Promikron BV (NL)
- 11 Vysoke Uceni Technicke V Brne (Brno University of Technology) (CZ)
- 12 Waterleau Global Water Technology (BE)



Example of prototype hollow-fibre membranes.

© Eidos SRO



More reliable net products will help hundreds of thousands of European farmers cut the costs of low-input agriculture."

Specialist nets produced especially for horticulture can help farmers to protect their crops against a range of natural hazards. Already widely used, the right net supported on the right structure can provide shelter against extreme weather conditions or pests such as birds and insects. But while several commercial nets are available, integrated 'permeable protecting structures' (PPS) – net/frame products designed to suit specific tasks – are difficult to find. The Agronets Co-operative Research project combines research experience from six universities and technical specialists across Italy, Greece and the Netherlands to develop and test a range of PPS. The aim is to help thousands of small and medium-sized enterprises (SMEs) across Europe – including hundreds producing PPS and vast numbers of growers.

European fruit, vegetable and flower producers are constantly faced with the unpredictable hazards that nature throws at them. A Mediterranean summer can bring high temperatures, sun damage and drought, while a northern winter can produce high winds and hail. On top of that there is additional damage from birds, insects and other pests – including those that spread diseases which can ruin valuable fruits and flowers. Yet, at the same time, farmers are facing increasing demand for more organic foods, which means using fewer chemicals to protect plants from pests and to promote growth.

One solution lies in specialist nets that can help farmers to protect their crops against pests and natural hazards. They can also help to support plants such as grapes, strawberries, blueberries, peas and beans, which need some horizontal structure to grow properly. Agricultural nets can also limit weeds, improve micro-climates to allow early flowering or fruiting, and enhance efficiency through reducing the amount of energy or water used to grow the crops.

But different nets, supported on different types of structure, will perform very differently – at the moment, the main problem for farmers is actually getting hold of reliable products designed for a particular use. The Agronets consortium has identified a critical need to improve product information, design and development so that European growers can choose reliable PPS to suit their specific needs.

A systematic approach

Agricultural nets are made from various substances and exhibit a range of physical characteristics. Usually made from some type of plastic – polyethylene (HDPE) and polypropylene are common – the nets are produced with a range of technical specifications. Flexibility and stability against UV light are important in determining how easy they are to work with and how long they will last. Other qualities such as light, air and water permeability, together with the design of the supporting frame, all influence the net's suitability for different functions, such as shading, ventilation or use as ground cover.

In practice, SMEs can only really build up an understanding of how different nets and structures perform through a process of trial and

error – a procedure which can prove costly for smaller companies. Agronets, on the other hand, brings together a range of experience and expertise to look at the issue systematically. Coordinated by the Agricultural University of Athens, this Co-operative Research project combines the agricultural know-how of three universities with the expertise of net and greenhouse specialists to address the problem. The project aims to develop reliable evaluation schemes to assess the critical mechanical and physical properties of PPS that ensure maximum stability and predictable performance under a range of climatic conditions. The project will also look at the costs and benefits of the nets compared to conventional technologies such as chemical additives.

The partners anticipate that the research will help to develop better-designed net/frame products which are widely acceptable to low-input farmers. They also hope that this work could eventually lead to the development of a European standard for both agricultural nets and integrated PPS, along with a code of practice for their design and installation.

Better yields cost less

The Agronets project offers the possibility for thousands of European SMEs to produce higher quality fruit and vegetables at a significantly lower price, without using high levels of chemical additives.



Anti-hail nets protect delicate vines in Korinthos, Greece.

© Agricultural University of Athens

“The European consumer can expect better quality products, fewer chemicals and a cleaner environment.”

Well-designed net products will protect plants against pests and disease, reduce production losses and prevent product contamination. By optimising design, new products will also allow the manipulation of climatic conditions within the nets to increase yields, reduce energy consumption and allow early season flower and fruit production.

There are also additional benefits for both producers and consumers. Improved PPS designs will perform more reliably, allowing farmers – and their insurance companies – to rely on nets with greater confidence, thereby increasing demand for new net products. Reduced chemical applications will lead to direct environmental and health benefits, while replacing greenhouses with nets will significantly reduce agricultural plastic waste. And, with specific input into developing products which are as attractive as they are effective, the new Agronets should do all this without spoiling Europe’s stunning landscape.

Project title

Development of protective structures covered with permeable materials for agricultural use (AGRONETS)

Contract number

CT-2004-507865

Duration

24 months

Global project cost

€ 1 247 336

EC contribution

€ 824 710

Contact person

Prof Demetrios Briassoulis
Agricultural University of Athens
Iera Odos 75
11855 Athens
Greece
Tel: +30 210 529 4011
Fax: +30 210 529 4023
briassou@aua.gr
www.aua.gr

Participants

- 1 Agricultural University of Athens (EL)
- 2 Agrek C. Samantouros S.A. (EL)
- 3 Agrotechnology and Food Innovations (NL)
- 4 Arrigoni SpA (IT)
- 5 Howitec Trading B.V. (NL)
- 6 Università Degli Studi di Bari (IT)



Reliable, well-designed PPS can improve the quality of fruits such as pears without the need for high levels of chemicals.
© Agricultural University of Athens



"Success will reduce development time by an order of magnitude."

Reactors are the core elements of chemical process plants. Some commercial software packages are available for the design and sizing of the process components, but this is not the case for reaction vessels. Accurate design of such vessels depends on the complexity of the chemical reactions involved, and analysis can be a highly skilled, time-consuming and expensive task.

The Aitekin Co-operative Research project is using a novel experimental technique combined with expert systems and artificial intelligence to automate analysis and sizing. The resulting system will make a major impact on the participating companies' ability to respond to business opportunities and will significantly reduce the design cost of new chemical plant.

Optimising the size and configuration of a reaction vessel in an industrial chemical process is an extremely complex task. It requires a profound understanding of the reaction kinetics of the often multiple and parallel reactions that will take place inside it. A number of advanced process software packages can analyse and optimise process plant components (pipes, holding and mixing tanks, valves, etc.) under steady and transient conditions, but most of these simulators do not attempt to model the reaction vessel itself. The description of the heart of the chemical system is left to the design team and plant user.

To analyse the kinetics of a complex chemical reaction accurately requires a large number of laboratory experiments and the skill of highly qualified theoretical chemists. It is a process that is both time-consuming and expensive.

Kinetic software tools

However, the costs could be reduced by using software tools capable of identifying arbitrarily complex kinetics and able to exploit this information to design the full-scale reactor and control systems needed. The Aitekin project is aiming to produce just such a tool. The team will use a prototype plug flow reactor interfaced with the necessary hardware to carry out temperature scanning kinetic experiments. These fast experiments will be able to generate reaction schemes automatically. Artificial Intelligence (AI) based software will use graph theory to identify the kinetic mechanisms involved in the reaction sequence. The software employs symbolic processing rather than heavy number crunching to obtain the kinetic results. The suggested scheme can be modified to test sensitivity.

The AI or expert system has a number of novel aspects: it incorporates a symbolic translator which converts the chemical kinetic results into the algebraic language that computing systems can analyse, and it can perform rigorous regression analysis of the temperature scanning experimental results based on sensitivity equations and model discrimination to unravel systems where more than one kinetic mechanism is discovered.

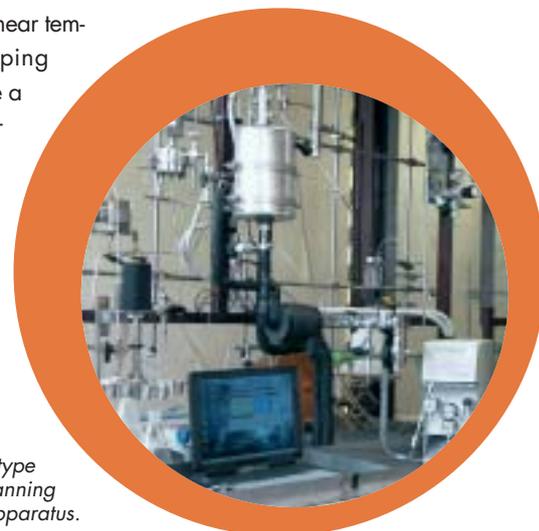
Black box chemistry

The system can be treated also most like a 'black box' as the reacting chemical system is fed in one end and the system can generate the kinetics, design the industrial-scale reactor and its optimal control system with little human involvement. It will even generate the necessary code to feed into process simulation software to complete the modelling of the whole plant process.

To achieve this outcome will involve the successful co-operation of scientists from distinctly different backgrounds – theoretical chemists, artificial intelligence specialists, software developers, system control engineers, etc. The project has been structured to ensure that its methodology guarantees good collaboration.

The project is coordinated by Technosind srl of Italy which was responsible for the initial project concept. Heavyweight chemical companies are represented by UOP Limited and Polimeri Europa, whilst the University of Manchester Institute of Science and Technology in the UK and Biuro Usług Technicznych I Handlu of Poland are chemical research institutions. Technical, software and expert consulting services are provided by the Czech SME Eveco Brno sro, Firth Executive Ltd of the UK, and Nova Systems Roma srl in Italy.

The prototype reactor has been set up at Polimeri Europa's research facility at Istituto Donegani where it will be fine-tuned. Accurate data input from the linear temperature ramping experiments are a critical point for the project.



The prototype temperature scanning apparatus.

"The companies will be able to offer better and faster services to chemical enterprises."

Once the hardware is in place the expert system will be developed using two industrially relevant reactions (phenol production and its oxidation to cumene) where kinetic results can be validated against existing data obtained with traditional techniques. Following successful determination of the kinetic mechanisms, the system interfaces will be developed that can supply computer code for two commercially available process simulation packages.

Time is money

The new system has the potential to dramatically reduce the time needed to analyse and develop new chemical processes. It will elaborate the kinetic model for a particular chemical system in a very efficient way and provide seamless input to flow sheet designs. For the SMEs it will significantly reduce the costs of undertaking development and allow them to offer better and more flexible services to the chemical industry in a timely manner. The equipment should be applicable to all sizes and types of chemical processes, but may make a big impact on speciality chemicals production where more accurate reactor sizing could improve process yields and reduce overall costs.

Project title

Combination of AI techniques and software with advanced reactor equipment for efficient kinetics analysis in the chemical industry (AITEKIN)

Contract number

CT-2004-506667

Duration

24 months

Global project cost

€ 1 350 000

EC contribution

€ 795 000

Contact person

Mr Eugenio Pelosio
Technosind S.R.L.
Viale Cortina D'Ampezzo 156
00135 Rome
Italy
Fax: +39 06 3365 2324
ammi@technosind.it
www.technosind.it

Project website

www.cpi.umist.ac.uk/aitekin

Participants

- 1 Technosind srl (IT)
- 2 Biuro Usług Technicznych I Handlu (PL)
- 3 Eveco Brno sro (CZ)
- 4 Firth Executive Ltd (UK)
- 5 Nova Systems Roma srl (IT)
- 6 Polimeri Europa SpA (IT)
- 7 University of Manchester Institute of Science and Technology (UK)
- 8 UOP Ltd (UK)



Aitekin will ease the design of complex chemical plant.
© Courtesy of UOP LLC



"The project will produce winners all around."

The use of aluminium tools is helping manufacturers of plastic components across Europe to reduce costs and lower their energy consumption. However, the tools have certain limitations compared to conventional steel ones, which restrict their greater uptake in the industry. The novel surface treatments being developed in this Co-operative Research project will vastly increase the range of applications for aluminium moulds in the thermoplastic processing industry through the development of surfaces with exceptional hardness and thermal conductivity. This, in turn, will boost the competitiveness of European companies and make a notable contribution towards sustainable manufacturing.

The use of aluminium mould tools for thermoplastic processing is becoming increasingly popular. This is driven by issues such as cost reduction, improved process cycle times and the need to reduce energy costs. Total cost, in terms of construction and use, for an aluminium tool mould is slightly higher than for its steel equivalent, but machining and energy costs are considerably more for steel. In addition, the design and production lead times for aluminium mould tools are much shorter than for their steel equivalents. Aluminium tools can be made within 12 working days compared to several weeks for steel.

From a process point of view, the main advantage of aluminium is its high thermal conductivity – four times that of tool steel. This can lead to reduced cycle times for aluminium tools of a few seconds for each part produced when compared to the equivalent steel tool – a significant competitive edge. This is a major reason why growth rates for aluminium tools in the thermoplastic processing industry are expected to increase significantly. The lower density of aluminium also offers notable advantages over steel in terms of easier handling and lower energy consumption both during manufacture and in use.

Anodising advantage

However, aluminium moulds suffer from poor relative hardness, and wear and abrasion resistance that is preventing even greater uptake. Aluminium tools are currently limited to relatively low volume (totalling around 300 000) production runs before the quality of the product starts to degrade. They are also usually restricted to small to medium-sized mouldings.

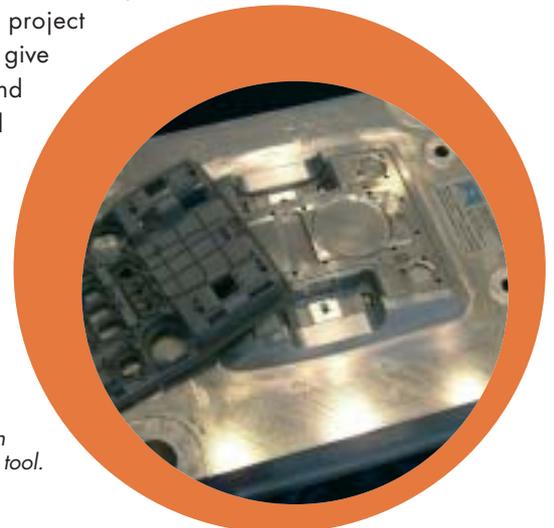
However, innovative technologies are being developed by two SME anodising companies, Brita Finish Limited and Heywood Metal Finishers based in the UK, which could enable the production of anodised surfaces with greater thermal stability. This could result in the production of aluminium tools with better wear resistance than that of steel and with cyclic heat resistance up to 300°C. These new treatments will also provide a very high thermal emissivity surface – a feature that is critical for improving cycle times further.

Competitive edge

The Alamo project, coordinated by RAPRA Technology Limited – the UK Rubber and Plastics Research Association – combines the experience of the anodising innovators with other relevant European research organisations, mould toolmakers, aluminium suppliers and plastics manufacturers from across the continent. The array of companies involved in this Co-operative Research represents stakeholders from all parts of the supply chain from raw material suppliers to end-users. Together, they will fully develop the anodising technologies for the manufacture and use of advanced aluminium moulding tools. Alamo will optimise mechanical and thermal properties for thermoplastics processing applications and develop pre-competitive, innovative anodised aluminium mould tools for the main thermoplastic processes: injection moulding, blow moulding and rotational moulding.

Initially, small-scale experiments will be carried out to optimise the anodised coatings. These results will then be applied to complete test tools for both rotational and injection moulding applications. Finally, full validation in real manufacturing processes will be undertaken.

These new aluminium moulds will have surface mechanical and thermal properties exceeding those presently on the market in terms of wear resistance, thermal emissivity and corrosion resistance. Fully achieving the project objectives will give the small and medium-sized enterprises involved a technological



An example of an aluminium mould tool.
© Alcan 2005

"This will dramatically advance plastics moulding technology which will be of tremendous benefit to European industry."

edge leading to greater competitiveness. The anodisers will increase sales, as will the toolmakers and aluminium suppliers, whilst the plastic moulding companies will raise their flexibility to respond to orders and will benefit from the ability to apply aluminium tools to a much wider range of thermoplastic processes.

The advantages of aluminium are apparent all along the value chain. Benefits for the mould maker include faster machining, easier fitting and less monitoring of the machines. The improved thermal conductivity means that the placement of cooling channels is simpler and easier, whilst the lower density ensures simplified handling of parts in the plant. For the plastic processor, moulds are cheaper, available faster and will deliver higher productivity with higher quality and simpler process control. And finally, parts will be available faster and should be less expensive for the plastic component purchaser.

The wider manufacturing, employment and environmental scenarios will also benefit, as new plastic components can be made available more quickly and at a more competitive cost in Europe. Lower energy consumption has environmental and economic benefits and the products and processes developed will make a major contribution towards sustainable manufacturing.

Project title

Development of innovative high performance anodised aluminium moulding tools for the thermoplastic processing sector to achieve competitive advantage (ALAMO)

Contract number

CT-2004-512833

Duration

24 months

Global project cost

€ 1 401 049

EC contribution

€ 725 024

Contact person

Dr Gary Williams
Rapra Technology Ltd
Shawbury
Shrewsbury
SY4 4NR Shropshire
United Kingdom
Tel: +44 1939 252402
Fax: +44 1939 251118
gwilliams@rapra.net
www.rapra.net

Project website

www.rapra.net/projects/overview.asp

Participants

- 1 Rapra Technology Ltd (UK)
- 2 Andalplast S.L. (ES)
- 3 Association pour la Recherche et le Développement des Méthodes et Processus Industriels (FR)
- 4 Brita Finish Ltd (UK)
- 5 Fundacion Ascamm (ES)
- 6 Heywood Metal Finishers Ltd (UK)
- 7 Juan Carlos Marin Riquelme – SI2M (ES)
- 8 Alcan (Pechiney) (FR)
- 9 PPA TEO (IE)
- 10 Queens University, Belfast (UK)
- 11 Sigma Engineering GmbH (DE)



*SigmaSoft® simulation of the injection moulding process.
© Sigma Engineering GmbH 2005*



“Our project will provide European SMEs with practical help, allowing them to see how other markets work and to find the information they need to operate internationally.”

information before they commit themselves to selling their products or services to a new market in another country. Market analysis can cover a range of issues such as customer needs, potential competition, local laws and regulations, and details about patents. With good information to hand, SMEs can make informed choices about going into international markets, and improve their chances of devising successful marketing and selling strategies. A Co-operative Research project called AMI-SME intends to bring together useful data sources and create a web-based search tool to help these companies access the information they need to enter and operate in new markets successfully.

At the moment, the approach used by SMEs to collect and analyse market information can be rather ad hoc. Many firms simply rely on internet search engines to find out what they need to know. Sometimes business associations and consultants can help them with certain details but, more often than not, an SME's approach to intelligence gathering is not particularly comprehensive and may easily miss useful information. What is more, the average European SME simply cannot afford to conduct continuous and extensive market research.

To address these issues, AMI-SME (Analysis of Marketing Information for Small and Medium-Sized Enterprises) will gather, analyse and process vital information for firms that want to break into international markets.

New tools

AMI-SME, which brings together 13 partners from five European countries, aims to produce an organisational toolbox and a web-based information retrieval system. The tool kit will describe the steps and methods required for information gathering during internationalisation. It will help SMEs understand the type of information they need to make informed decisions about entering new markets. AMI-SME will also produce guidelines to help firms analyse and interpret the information they receive – this will be particularly useful to companies before they use the project's information retrieval system.

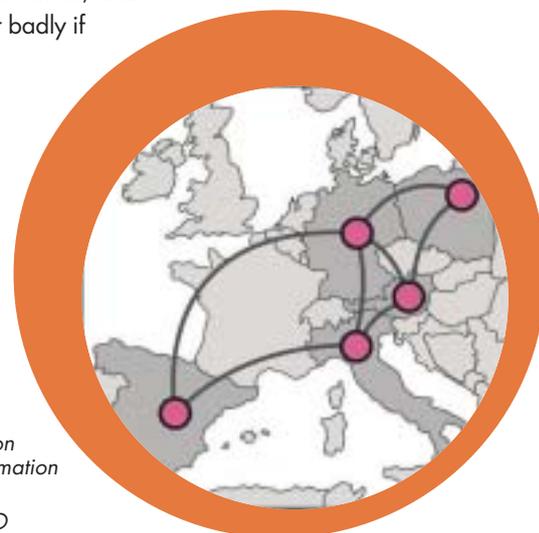
Essentially, this search tool will allow trained users from any SME or business association to gather intelligence about a particular market. Search parameters and even business ontologies can be entered allowing the user to tailor results to individual company needs. The data that can be accessed by the search tool will be drawn from a variety of sources including professional databases, company websites and government institutions.

Searching for success

While the user interface of AMI-SME's search tool is designed for ease of use, it actually masks complex functionality that brings together a great deal of information culled from many sources. This reflects the challenges SMEs face as they struggle to make the right choices about going into new markets. The AMI-SME search tool will be suitable for all SMEs, whatever business they are pursuing. More industry-specific versions will be developed for biotechnology and simulation software, as and when such SME partners join the project. Business associations are invited to specify the search facilities for the benefit of the SMEs they work with. A number of consulting partners in the consortium are offering consultancy services for internationalising SMEs, which will be extended on the back of AMI-SME.

Clearer thinking

AMI-SME should provide some transparency to the process of gathering and analysing information, allowing European companies to see how other markets work and what it will take to operate successfully in another economy. SMEs will be able to use the AMI-SME tools to make an informed choice about going into a market in the first place, as well as to plan their strategy if they do take the decision to move forward with international operations. Some firms still go into new markets on the strength of a hunch or a handshake with a contact. But that is not the best way to plan a business, and SMEs can suffer badly if



Internationalisation is based on information and networks.

© Fraunhofer IAO

a new venture abroad does not work out. AMI-SME's outputs will reduce the risk of failure and boost the chances of SMEs forging lasting success, which should have positive benefits for the European economy in terms of creating exports and jobs.

Project title

Analysis of Marketing Information for Small- and Medium-sized Enterprises (AMI-SME)

Contract number

CT-2004-5875

Duration

24 months

Global project cost

€ 1 463 202

EC contribution

€ 864 262

Contact person

Dr Wolf Engelbach
Fraunhofer Institut für Arbeitswirtschaft und Organisation
Nobelstr. 12
70569 Stuttgart
Germany
Tel: +49 711 970 2128
Fax: +49 711 970 2401
wolf.engelbach@iao.fhg.de
www.iao.fraunhofer.de

Project website

www.ami-sme.org

Participants

- 1 Fraunhofer Gesellschaft zur Förderung der angewandten Forschung e.V. (DE)
- 2 Biozoon GmbH (DE)
- 3 Centro Internacional de Métodos Numéricos en Ingeniería (ES)
- 4 CiaoTech SRL. (IT)
- 5 FHS Kufstein-Tirol Bildungs-GmbH (AT)
- 6 Fondazione Graphitech (IT)
- 7 Instytut Inżynierii Informatycznej SP. Z O.O. (Institute for Computer and Information Engineering, LTD) (PL)
- 8 InTraCoM GmbH (DE)
- 9 KMA Knowledge Management Associates GmbH (AT)
- 10 Politechnika Warszawska (Warsaw University of Technology) (PL)
- 11 Prof. Dr. Gerhard Heyer (DE)
- 12 Quantech ATZ S.A. (ES)
- 13 Semtation GmbH (DE)



"The agent-based system can introduce innovation in a systematic way."

For many SMEs in manufacturing and other sectors the capacity to provide fast, flexible and effective design services could add considerable value to their business. Retaining and managing design know-how is an issue for all manufacturing businesses. The Assist programme aims to harness the latest breakthroughs in artificial intelligence to provide cost-effective solutions to these and related problems. The Co-operative Research project will produce a common system that can hook up to company-specific databases to provide bespoke design solutions. The system should be affordable for SMEs but could also be made available as a leased design service over the internet.

Knowledge that could be useful to design engineers comes in many forms and from many sources both inside and outside SMEs (small and medium-sized enterprises). A common need amongst SMEs is to be able to acquire and process this knowledge so that a greater, richer and centralised source of knowledge or information is available throughout the enterprise. The ultimate goal for the business is to produce better designs, faster with greater innovation and with less 'reinventing of the wheel'.

In many SMEs, a large amount of company know-how resides in the heads of one or two key personnel. It is vital for the continuity of the company that this knowledge asset is captured and made available to the business going forward. The most important requirement for SMEs, with regard to design, is to get good products to the market place quicker, and to reduce costs and overheads related to design.

Finding an agent

The Assist project is aimed at achieving a breakthrough in the use of advanced agent-based knowledge management techniques in real industrial situations. The main business focus of the project is to produce a leap forward in industrial design performance in SMEs, using an innovative ICT solution that is affordable for small to medium-sized companies.

Agent-based approaches to data management have grown out of the increasing use of distributed computing systems operating over largely autonomous networks. Agents – a term used to cover a wide family of information technology techniques – were devised as a method of dealing with data complexities. They are mechanisms for finding, fusing, using, managing and updating information within complex networks, and are effectively manipulators of data and useful tools for knowledge-management applications.

Assist will employ a unique agent-based knowledge-management approach to meet SME requirements. Knowledge is the key to this, as the right knowledge and ideas presented in a well-structured environment will help designers to improve their design performance. The wide diversity of knowledge to be acquired managed and processed demands research into the latest thinking in terms of semantic and context sensitive knowledge. It requires an investiga-

tion of various agent-based knowledge-management systems that can understand the knowledge and the environment it comes from. In essence, the system will be able to take information 'particles' from diverse parts of a company's design database and compare and contrast their properties against one another and against design criteria established for a specific design task to provide the designer with appropriate decision support.

Common need for action

The Assist project will develop an approach to understanding the semantics of the knowledge that it acquires to be able to manage it effectively for the designers. This will enable the Co-operative Research team to process context-specific knowledge, which exists in the industrial design domain, to process it into useful forms and present it to designers in a structured manner. The results will be the Assist methodology, and prototype systems will be implemented in seven demonstration applications at SME companies.

The developed system will be common to all the companies but will only access knowledge from company-specific databases. This protects an individual company's intellectual property and also means the Assist system will be a generic tool that could be used by any SME with such a design or knowledge management requirement. This 'off-the-shelf' approach, together with the continuing and rapid increase in power-to-cost ratio in modern computing hardware, means that a very affordable but extremely powerful system should be assembled.



Assist can speed design of packaging tools.

"Knowledge is key to business survival."

The project is coordinated by Fundación Labein of Spain which will undertake part of the research and development in conjunction with two other research organisations: Institut für angewandte Systemtechnik Bremen GmbH of Germany and Integrated Information Systems of Greece. The seven SMEs that will get to use the system first range across the engineering sector from machine toolmakers, automation systems and robotics to car customisers and air-conditioning systems and are based in Germany, Greece, Spain and the United Kingdom. Although all the SMEs have differing design requirements, they have a common need to improve their design process and retain the knowledge and design experience they have built up over the years.

The system developers anticipate sales of the tool to a diverse range of businesses, but also envisage that it could be used in a design bureau situation with companies buying time from a design service provider for specific tasks or projects.

Project title

Knowledge-Based Intelligent Design Assistant (ASSIST)

Contract number

CT-2004-512841

Duration

18 months

Global project cost

€ 1 901 140

EC contribution

€ 984 704

Contact person

Dr Mikel Sorli
Fundación Labein/Tecnalia
Edificio 700
48160-Derio (Bizkaia)
Spain
Tel: +34 94 607 33 00
Fax: +34 94 607 33 49
sorli@labein.es
www.labein.es

Participants

- 1 Fundación Labein (ES)
- 2 Assanakis A&K Co. (EL)
- 3 Charles Robinson (Cutting Tools) (UK)
- 4 Institut für angewandte Systemtechnik Bremen GmbH (DE)
- 5 Integrated Information Systems SA (EL)
- 6 Norbert Binke und Partner Unternehmensberatung GmbH (DE)
- 7 Praesentis S.L. (ES)
- 8 Rodos Air Ltd (EL)
- 9 Técnicas de Calentamiento, S.L. (ES)
- 10 Thiele Spezial Karosseriebau GmbH (DE)



Underwater robot design will benefit from the system.
© Praesentis, S.L



“The big advantage for us is that we will have an anatomically correct model.”

For the first time, a seven-member consortium, including four small and medium-sized enterprises (SMEs), is developing a laser scanning system that can analyse movements of the lower back and legs using an anatomically correct model. The system is intended to support conventional diagnosis of back and knee problems. The device will be low cost and radiation-free. The Co-operative Research project team will work closely with clinical specialists to discover the best medical applications. One important use is likely to be the screening of children for posture abnormalities, including scoliosis and knee joint defects, although it is hoped to find a much broader base in hospital treatment rooms.

Back and lower body musculo-skeletal problems are among the most frequent reasons for visits to the doctor. For any abnormal changes to be identified, various movements of the back and lower body areas need to be studied, and X-rays are usually necessary. However, no equipment is currently available to analyse the dynamic functional parameters of the lower body. For this reason, the Aurora project aims to develop and produce a low-cost system to reconstruct musculo-skeletal movements based on scanned volumes of the lower back and legs. Structured around a computer, a camera and a large scanning laser, the system will carry out three-dimensional surface measurements over time to provide a full volumetric analysis of movements. The system does not rely on X-rays or other types of potentially harmful radiation.

There are four pieces of detecting equipment placed at different angles to define the scanning range, covering an overall distance of three to four metres. The person walks through the machine while it scans physical movements over a period of about 30 seconds. The device will support different means of clinical diagnosis, but will not replace them; it is intended rather to indicate where diagnosis is needed. Apart from the new laser, only standard components are used to ensure that the price is kept low.

Previous experience

Similar techniques were used by the Aurora team in a previous (Craft) project to scan the back of a moving person. An anatomically correct, dynamic model reconstructed mainly the back, pelvis and shoulder, with good results. This showed for the first time that it is possible to reconstruct a model of the inner skeleton in motion from surface information alone. This was pioneering work, although it had already been achieved with static models. There are systems that employ markers placed at various points on the body – they work well but do not reconstruct the whole surface of a particular area of the body. They simply reconstruct the movement of individual points because the skin moves in a slightly different way from the underlying bones, making the results with markers only approximate. Aurora makes use of the surface itself, without relying on markers, to give more comprehensive and reliable results.

This new Aurora project is more challenging than the previous one since new methodologies will be needed for the legs. A set of movements within a normal range for the lower body will be defined – for bending or twisting, for example. If body movements are found to lie outside of this range, abnormalities may be present. The project team will work closely with doctors to discover the best clinical applications for the model. One use could be the screening of schoolchildren for posture and movement defects, including scoliosis. It is hoped that one day it could become a standard device in hospital orthopaedic and physiotherapy units.

Many applications

The project consortium comprises four SMEs and three university research centres. A laser company in Lithuania is developing and building the scanning device, while a German company is synchronising the different components together with the transfer of data. Another SME in Poland is responsible for calibration, visualisation and animation. Diers International, a German manufacturer of orthopaedic medical equipment, is coordinating the project. The Polish university is handling the image analysis that will identify the features required for the biomechanical model. The German research centre provides a medical team responsible for defining the clinical parameters for the models that will be relevant and useful for doctors. The Belgian university has a fundamental role in defining and analysing biomechanical models.



The patient walks through the scanning equipment.
© Christian Lauer

“Once this equipment is on the market, others may be inspired to take the concept further.”

Diers, a medical equipment company, expects to add the device to its current range of products. At the end of the project, the next step for the company would be to set up clinical studies required to validate the equipment and have it accepted by the medical profession. The other SMEs, which are not active in the medical field, will have access to an innovative new product which they could market to other companies in other fields, such as robotics, sports or computer games.

There are many possible applications for the device. It could be used to evaluate the ergonomics of the workplace by scanning people going about their daily routine, to find the most suitable desks and chairs, for instance. It could also be employed for the early detection of asymmetry between the left and right parts of the body, which top athletes often develop. More general screening by the public in sports halls or fitness clubs is another possibility. However, much wider applications for these anatomically correct, dynamic models are possible, such as applications in the clothing and fashion industry.

Project title

Contact-free Dynamical Volumetric Measurements of Lower Body with Functional Clinical and Diagnostic Capacity (AURORA)

Contract number

CT-2004-508203

Duration

24 months

Global project cost

€ 1 938 100

EC contribution

€ 1 387 500

Contact person

Mr Kjell Roger Heitmann
Diers International GmbH
Dillenberweg 4
65388 Schlangenbad
Germany
Tel: +49 61294 8860
Fax: +49 61294 88650
heitmann@diers.de
www.diers.de

Participants

- 1 Diers International GmbH (DE)
- 2 Eberhard Karls-Universitaet Tuebingen (DE)
- 3 Katholieke Universiteit Leuven (BE)
- 4 Politechnika Warszawska (PL)
- 5 Rimkevicius and Gintautas Company (LT)
- 6 Smarttech Sp.ZO.O. (PL)
- 7 Velomat Messelektronik GmbH (DE)



"There is a huge market drive behind this project. Everyone recognises the real business opportunity."

Emissions of the poisonous and carcinogenic chemical benzene are estimated to cause over 10 000 deaths in Europe each year. Although legislation aims to protect workers and citizens, current monitoring technologies can only measure cumulative benzene levels over a period of time. The BEN-DET project is now developing a portable detector capable of measuring benzene concentrations in real time. This breakthrough technology could be used in industry as a 'benzene alarm' and by regulators for more accurate benzene analyses. The Co-operative Research project team could make a valuable contribution to the improvement of public and occupational health and enable effective enforcement of existing legislation.

Benzene is a widely used in industry. It is a common organic solvent and a precursor in the production of many products, ranging from drugs and dyes to plastics and petrol. However, it is also a known carcinogen and its use is highly regulated. Emissions levels have to be tightly controlled as specified in European legislation.

Directive 2000/69/EC states that the "method for the measurement of benzene will be the pumped sampling method on a sorbent cartridge followed by gas chromatographic determination". Air is pumped through a cartridge and benzene effectively 'sticks' to the walls. The cartridge is then collected and analysed for benzene in a laboratory.

However, there are many problems with this technique, which make it inadequate in numerous circumstances. The collection, transportation and laboratory analysis of the cartridge is a costly and time-consuming process. It runs the risk of sample degradation and only measures the total exposure to benzene during the sampling time. Furthermore, the delay between sample collection and availability of results offers no protection from exposure – people really need to know they are being exposed to benzene when it happens, not that they received a dangerous dose weeks previously.

Component parts

Recognising the market need for real-time benzene detectors, Ion Science, a small UK manufacturer of photoionisation detectors, has teamed up with several other European SMEs (small and medium-sized enterprises) to develop such an innovative device. They have formed the EU-funded BEN-DET Co-operative Research project and have asked Pera in the UK and the Fraunhofer Gesellschaft in Germany to help them with their research.

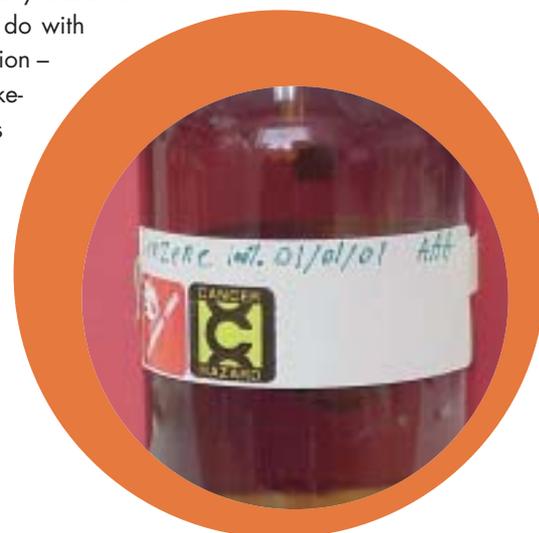
The detector will contain a number of different components including an adsorbent chamber to capture the benzene, housings for sampling and chemical reagents, a photoionising device, gas chromatography, and a radio transmission device to pinpoint the location of the detector in the field. These different technologies will be supplied and developed by the various project participants.

Ion Science has a great deal of expertise in photoionisation technology. It already makes devices that use photoionisation to detect gases and volatile organic compounds (VOC) and will implement its detector technology in this benzene detector.

SRA Instruments is the project team's expert in gas chromatography. It is working on the problem of 'cleaning up' samples before they are passed to the photoionising detector. Unfortunately, benzene is not the only VOC that will be adsorbed in the device – the photoionising detection will only be accurate if the benzene is separated from other chemical contaminants. SRA will look at a combination of separation and preconditioning techniques, including filtering and heating followed by gas chromatography to enrich the benzene as much as possible. Towards the end of the project, the German SME Vipem may be involved in producing miniaturised heaters and gas chromatography columns which will be important to turn the benzene detector technology into a portable device.

The Germany SME Braun Formenbau also focuses on miniaturisation. As a specialist in plastic injection moulding, it will work closely with Pera to make the capillaries and small storage compartments for chemical reagents that will be required to move and mix samples. The Fraunhofer Gesellschaft will develop the necessary valves and micro-pumps.

The UK company Sarantel has nothing to do with benzene detection – you are more likely to find its products inside your mobile



"The device will help to make the environment and the workplace safer for European citizens."

phone! This company makes innovative radio-transmission antennae. Its task within the BEN-DET project is to integrate a global positioning system into the portable device to allow users to map benzene levels geographically and locate 'hot spots' or sources of pollution.

Rapid growth

By the end of the three-year project, the participants hope to have a working, prototype product ready for full commercialisation. The input of the oil giant Shell will be invaluable in this respect. As a potential end-user, it will give advice on specifications for the product and field test a prototype device. Ultimately, its feedback will help BEN-DET to develop a well-designed, well-priced product that will be readily accepted in the VOC detector market.

The partners anticipate that sales would increase quickly – industry and regulators have been calling for such a device for decades. The BEN-DET project could rapidly turn into a successful business venture for the SMEs involved, while the successful commercialisation of the end product could create hundreds of new jobs, save hundreds of lives, and help the environment, all at the same time.

Project title

Improved air pollution and worker exposure monitoring and control through the development of a near real time benzene specific gas analysis & measurement instrument (BEN-DET)

Contract number

CT-2004-508107

Duration

24 months

Global project cost

€ 1 578 779

EC contribution

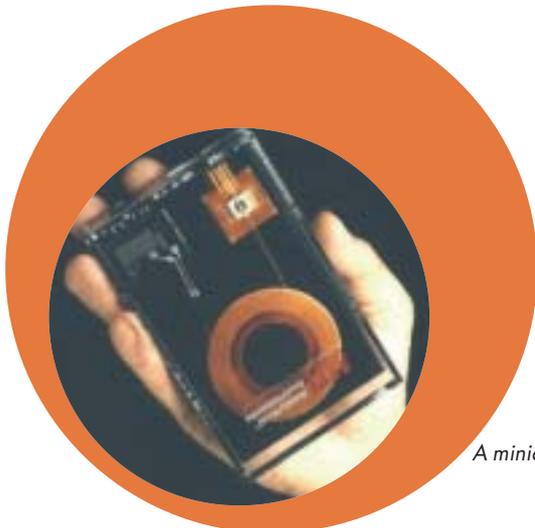
€ 773 947

Contact person

Mr Duncan Johns
Ion Science Ltd
The Way
Fowlmere
Herts SG8 7UJ
United Kingdom
Tel: +44 1763 208503
Fax: +44 1763 208814
duncan.johns@ionscience.com
www.ionscience.com

Participants

- 1 Ion Science Ltd (UK)
- 2 Braun Formenbau GmbH (DE)
- 3 Fraunhofer Gesellschaft zur Foerderung der Angewandten Forschung E.V. (DE)
- 4 Pera Innovation Ltd (UK)
- 5 Sarantel Ltd (UK)
- 6 Shell International BV (NL)
- 7 SRA Instruments (FR)
- 8 Vipem Hackert GmbH (DE)



A miniaturised chromatography column.



“More reliable products will help to open up the market for BFPs.”

Across Europe, campaigns on healthy eating are driving consumer demand for high-quality fruit and vegetables, while environmental and health concerns are encouraging more and more people to go organic. But with growers still heavily dependent on chemical inputs, the horticultural industry is facing increasing pressure to come up with new ways to ensure healthy crops and high yields. The Biological Food for Plants Co-operative Research project brings together four European research institutes with six BFP producers and crop growers to develop new organic additives for horticultural plants. With an estimated world market of €3.2 billion in 2010, the project hopes to dramatically increase the competitiveness of thousands of small and medium-sized agricultural enterprises across the European Union.

Organic farming is growing in popularity every year. Demand for organic food has increased by around 25% each year over the last five years, and is expected to get even bigger, with some experts predicting that the US market alone could expand to around €100 billion in the next five years.

Yet, for Europe’s fruit, flower and vegetable growers, the move towards more organic products spells trouble. On the one hand, horticulture needs to use more chemicals – growth supplements and crop ‘protectants’ – than any other type of agriculture. On the other hand, there are relatively few chemicals which actually qualify as ‘organic’. Types of organic additive which do exist include dry and liquid manure and compost, animal feed and mined minerals. These all tend to be rather labour intensive to apply and often vary in their nutrient content – so their effects on crops may be unpredictable. What fruit and vegetable producers really need, in order to provide competitively priced organic products, are reliable, human and environmentally friendly crop additives which can be applied using irrigation.

Great potential for growth

Biological Foods for Plants (BFPs) are innovative soil or plant additives which are derived from biological resources. They are produced by extracting ‘active compounds’ – chemicals which improve growth or protect against pests and disease – from natural products like leather, seaweed, herbs and pine needles. BFPs reduce the need to use mineral fertilisers, improve crop health, plant disease resistance and soil quality, and can therefore decrease farmer dependency on harmful chemicals.

At the moment, there are only an estimated one or two hundred SMEs (small and medium-sized enterprises) across Europe which produce BFPs, most of them selling to national markets. Yet, although this remains a small and locally oriented industry, its potential for growth is enormous. For Europe alone, best estimates predict a possible tripling in demand for BFPs from €7 million in 2003 to €22 million in 2007. And that is just for organic horticulture; if this project is successful, then the industry could also benefit from new clients in conventional agriculture, thus leading to much higher demand.

Keen to help the European BFP producers to realise this potential – and the growers to achieve high-quality organic crops – the BFPs project aims to address a number of key problems. The project’s overall goals are to improve product performance and reliability, to facilitate transnational trade, and increase global BFP demand.

Digging deep

Because BFPs are extracted from natural sources, and because the industry is still in its infancy, industrial expansion is being hampered by a number of important issues. Non-standardised manufacturing processes and lack of scientific information about the nature, benefits and potential impacts of BFPs have influenced product perception and often limited demand. With its diverse expertise and international reach, the Co-operative Research project – with participants from Italy, Latvia and Poland, Spain, Germany and the Netherlands – can work together to overcome these problems, which the SMEs are unable to tackle alone.

Adopting a totally integrated approach, the BFPs project will investigate problems arising throughout the whole production chain. Technical research will look at issues such as how uniform the BFPs are and how efficient they are to produce, while laboratory research and field trials will determine their effect on horticultural plants, establish how they work and how reliable they are. Additional research will consider environmental issues such as how BFPs affect ground-water and soils, as well



Blackcurrants in Poland – researchers harvest fruits treated with BFPs in Skierniewice.

as food quality issues including storing and the vitamin content of fruits and vegetables produced using BFP additives.

The potential benefits of the BFPs project are quite considerable. Until now, lack of scientific information, combined with stringent regulatory systems, has limited product development and transnational trade within this sector. But improved knowledge based on rigorous testing will make products more reliable – and make it easier to trace their origins.

The project consortium anticipates that these improvements will make it much easier for producers to get permission to export their products to other countries within Europe. The team also expects that the involvement of farmers in the project's field trials will bring BFP producers and farmers closer together. It predicts that this, together with improved marketing techniques, should eventually lead to increased international demand for BFPs – and a brighter future for organic horticulture.

Project title

Ensuring the quality of innovative crop growth inputs derived from biological raw materials (biological food for plants) (BFPS)

Contract number

CT-2004-508458

Duration

24 months

Global project cost

€ 1 033 329

EC contribution

€ 558 201

“BFPs can improve plant health and soil quality and decrease the need to use harmful chemicals.”

Contact person

Professor Edward Zurawicz
Institute of Pomology and Floriculture
96-100 Skierniewice
ul. Pomologiczna 18
Poland
Tel: +48 46 833 2021
Fax: +48 46 833 3228
ezuraw@insad.pl
www.insad.pl

Project website

www.craft.insad.pl

Participants

- 1 Institute of Pomology and Floriculture (PL)
- 2 Agrobio Products B.V. (NL)
- 3 Ceresco Sociedad Cooperativa Limida (ES)
- 4 Gospodarstwo Rolno-Ogrodnicze Sadpol (PL)
- 5 Industria Lavorazione Sottoprodotti Animali (IT)
- 6 Istituto Sperimentale per la Nutrizione delle Piante (IT)
- 7 Joint Stock Company “Biolat” (LV)
- 8 Szkółka Markiewicz Agnieszka Markiewicz-Januszewska (PL)
- 9 Universitaet Kassel (DE)
- 10 Universitas Miguel Hernández (ES)



Working together will bring greater understanding between researchers, BFP producers and growers.



“Everyone has a unique and important contribution to make. We really are a team of six and could achieve nothing without each other.”

Pancreatic cancer is an aggressive disease which kills around 60 000 people in the EU and US each year. Studies have shown that gastrin drives tumour growth, making this hormone a good treatment target. Three European SMEs and three academic laboratories have joined forces in a Co-operative Research project to develop an antibody mimic that tightly binds gastrin and stops it signalling to tumour cells. The partners are using their expertise in a number of disciplines that include antibody production, peptide synthesis and molecular modelling. By the end of the project they hope to have several mimics, the activity of which could be tested in specially developed cells and animal models.

Pancreatic cancer is a significant threat. Whilst the number of people diagnosed with the disease each year may be much smaller compared with figures for lung or colorectal cancer, the survival rates are extremely low. Even with treatment, few patients survive more than six months following the onset of the cancer.

Research has shown that the hormone gastrin plays a key role in tumour progression. Pancreatic tumour cells overproduce gastrin, which stimulates the tumour to grow and spread. Consequently, this hormone and its signalling pathways have become the focus of research into possible treatment for pancreatic cancer.

There are currently many different approaches to try to stop gastrin interacting with the hormone receptors on the tumour cells. One anti-gastrin vaccine stimulates the body's production of antibodies against the gastrin hormone. However, the vaccine does not elicit an immune response and is largely ineffective in around 50% of patients. Another approach is to inject monoclonal antibodies that either bind and immobilise the gastrin, or bind to and block the receptor. Whilst this technique is well established for several cancers, the development and production costs are high. Instead of using antibodies, it is also possible to use small molecules that compete with gastrin for receptor binding and limit the hormone's effects. However, such antagonists are very often toxic and have unpleasant side effects.

Mimicking nature's best

A consortium of European SMEs (small and medium-sized enterprises) and academic research laboratories has decided to take a slightly different approach. They are combining their expertise within the Binding Gastrin Co-operative Research project to develop antibody mimics that bind or 'mop up' the gastrin in pancreatic tumours. As these molecules do not rely on immune reactions they should be effective in all patients. Furthermore, they can be produced synthetically and should be cheaper and faster to manufacture.

The Spanish National Cancer Centre has already screened antibody libraries and identified around 30 antibodies that bind gastrin naturally. France's Louis Pasteur University (ULP) has measured the

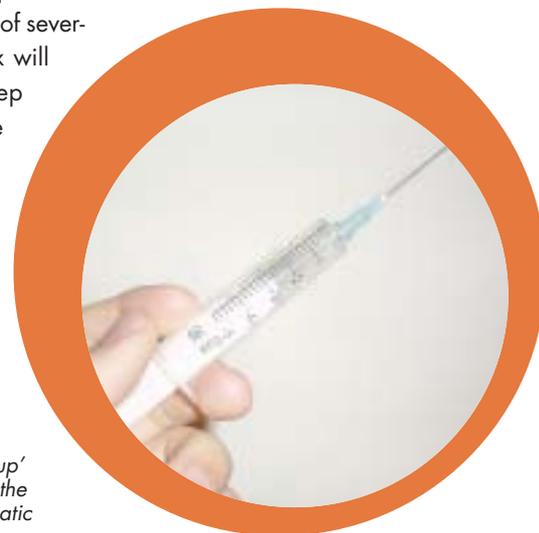
gastrin-binding affinity of each of these antibodies – some bind it extremely tightly and are the best models for the antibody mimics.

Human antibodies are large molecules and most of their structure plays no part in antigen binding. Antibody mimics are therefore produced by discarding most of the antibody molecule and only keeping those sections that are directly involved in binding. Such sections are known as CDR loops.

Pepscan, a small vaccine developer in the Netherlands and coordinator of the Binding Gastrin project, has taken the high-affinity antibodies identified by ULP and established the amino acid sequences of all the gastrin-binding CDR loops. Molecular simulations, being run by the Belgian project partner Algonomics, will look at how different loops may interact to give the best possible overall affinity for gastrin. This is an important project for Algonomics, which is hoping to adapt its software and expand its services for antibody design and vaccine development.

The preliminary work by Algonomics suggests that four CDR loops will provide binding affinities comparable with the best antigens. It is now down to Pepscan to synthesise these loops chemically and incorporate them into its proprietary structural scaffold, called CLIPS, that will hold them in the correct position. To date, the CLIPS technology has only been used with single CDR loops so the successful binding of several to the matrix will be a major step forward for the company.

Injections of the antibody mimic could be used in patients to 'mop up' gastrin and slow the growth of pancreatic tumours.



"All the SME partners have a great opportunity to develop their technological platforms as well as contribute to the development of a potentially important therapeutic."

High hopes

The two remaining partners will come into the project in its later stages. Once the four CDR loops have been attached to the CLIPS scaffold the project will have effectively generated a candidate therapeutic molecule. However, it will have to be tested for gastrin-binding affinity (again by ULP) and for clinical activity *in vitro* and *in vivo*. The Dutch University Medical Centre of Utrecht is developing cell lines and animal models in which the candidate antibody mimic will be tested. A small Spanish company, Proteomika, which currently makes DNA chips, will also work with Pepscan at this stage to develop a peptide microarray of the antibody mimic which could be used to measure gastrin binding, possibly in diagnostic applications.

The SME partners will all reap immediate benefits from this project. But whilst they have an opportunity to develop their technology platforms, they are also hopeful that their collaboration will eventually lead to the development of an effective treatment for pancreatic cancer, offering some solace to the tens of thousands of patients diagnosed with this aggressive disease each year.

Project title

Therapeutic synthetic antibodies – binding bodies – against gastrin to treat Pancreatic Cancer (BINDING GASTRIN)

Contract number

CT-2004-512691

Duration

24 months

Global project cost

€ 1 867 500

EC contribution

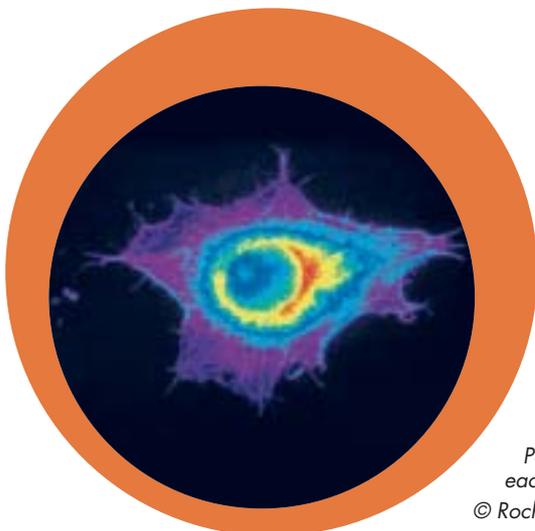
€ 1 133 750

Contact person

Dr Peter Timmerman
Pepscan Systems B.V.
Edelhertweg 15
8219 PH, Lelystad
The Netherlands
Tel: +31 320 237200
Fax: +31 320 238120
p.timmerman@pepscan.nl
www.pepscan.nl

Participants

- 1 Pepscan Systems B.V. (NL)
- 2 Algonomics NV (BE)
- 3 Fundación Centro Nacional de Investigaciones Oncológicas Carlos III (ES)
- 4 Proteomika S.L. (ES)
- 5 Universitair Medisch Centrum Utrecht (NL)
- 6 Université Louis Pasteur (FR)



Pancreatic cancer kills 60 000 people each year in Europe and the US.
© Roche, 2002-2005



"As SMEs, we find it hard to have large R&D programmes. This project is helping us to develop new technologies and applications."

Although many standard biochemical analyses use fluorescence, the technique tends to have problems with sensitivity, often caused by high levels of background noise. The Biotphex Co-operative Research project aims to improve assays using a phenomenon called two-photon excitation (TPX).

Two SMEs are developing infra-red laser technologies, while three others are applying TPX in a variety of systems with significant commercial opportunities, including small clinical diagnostic devices. They are aided by the expertise of three European universities, which are involved in improving the basic assaying system, developing the instrumentation, and testing and trialling prototype products and protocols.

The phenomenon of fluorescence – the emission of light from a substance when it is exposed to radiation – is commonly used in biochemical research. A scan of scientific journals quickly uncovers many images of cells glowing green, red or blue.

The basic technique is quite simple: you take antibodies specific to your molecule of interest, label them with a fluorescent dye, and add them to your sample. If your target molecule is present the antibodies 'stick'. When exposed to a radiation source, usually ultraviolet light, the marker molecules attach to the antibodies fluoresce. The coloured light tells you that your target molecule is present in the sample.

Although fluorescence-based techniques are a mainstay of biochemical research and clinical diagnosis, their lack of sensitivity is a particular problem. All biological material is naturally fluorescent to some extent, which creates high levels of background noise in these assays. Fluorescence from the sample container can also sometimes reduce sensitivity or produce other experimental artefacts.

Exciting partnership

A group of European SMEs (small and medium-sized enterprises) and universities are currently working together in a Co-operative Research project on an innovative method of fluorescence assaying that they claim will be 'background-free'. Instead of exposing samples to ultraviolet or visible light, the Biotphex project uses a phenomenon called two-photon excitation (TPX) to illuminate samples with infra-red radiation. Under normal circumstances, the wavelength of infra-red radiation is too long to be able to cause fluorescence. However, by using a laser in short pulses (less than 10 million millionths of a second) of infra-red light it is possible to deliver sufficient energy for marker molecules to fluoresce.

The basic TPX system is being supplied by Finland's Arctic Diagnostics, which is coordinating the project. This will be improved and developed for new applications with the assistance of the other project participants.

Two companies are developing the laser technology. Standa Optomechanical Products in Lithuania has produced a relatively cheap, finger-sized TPX laser that could be incorporated into small

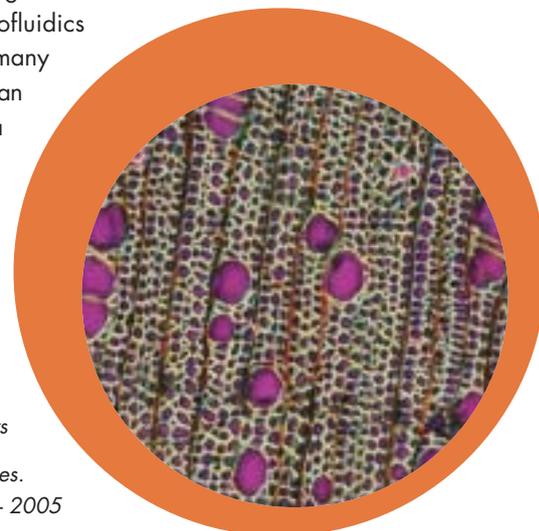
diagnostic equipment. Fianium in the UK is working on a high-performance fibre-optic-based laser system that could be used for research applications. Both companies will supply the laser components for any commercial products that result from the research project.

Another area of research in the project, being conducted by the University of Jyväskylä in Finland, is the development of binding proteins that can be used to coat microscopic latex beads with target-specific binding proteins (e.g. antibodies or DNA binding proteins) linked to fluorescent dyes. These beads move through the sample solution and 'mop up' target molecules. As the laser beam delivers its energy to just a minute volume of the sample – about the same volume as that of a bead – only single beads are excited at a time. The brightness of each bead's fluorescence indicates the concentration of target molecule in the sample.

University College Cork in Ireland is playing an important role in testing and trialling the Biotphex technique and prototype technologies, especially in DNA assays, and is helping to optimise assay procedures and protocols.

In collaboration with the University of Turku in Finland, three SMEs are focusing on new applications for TPX assaying. Luxcel Biosciences in Dublin, Ireland, is adapting the technology to count cells in samples by measuring oxygen uptake. German-based Merlin Technologies is working on a microfluidics 'chip' so that many parallel assays can be run from a single sample in a portable device.

Scientists frequently use fluorescent markers to identify target cells and molecules.
© Roche, 2002 – 2005



Diagnostics doctor

The Finnish SME Arctic Diagnostics, on the other hand, wants to make a small, cheap diagnostics device, which could be used in a doctor's surgery or clinic rather than samples being sent to a central laboratory. The aim is to cut costs, avoid long waits for results, and save time for both doctors and patients. On-site diagnoses would improve the quality of healthcare for Europe's citizens and make health services more accessible, particularly in remote regions where long distances make it difficult to send samples for laboratory analysis.

By the end of this project, the partners hope to have a range of sensitive biomolecular recognition assays, immunoanalyses and clinical diagnostic tools based on the TPX technology. And they are not destined just for academic biochemical research departments. Without doubt, the arrival of a 'black box' in the doctor's office – the partners estimate that the market for an in-house diagnostic device is thought to be 40 000 units in the EU alone – would lead to faster decisions on treatment and referrals. Biotphex certainly has some exciting potential.

Project title

Multiplex Bioassays using the Two-Photon Excitation Method (BIOTPHEX)

Contract number

CT-2004-508054

Duration

29 months

Global project cost

€ 1 499 876

EC contribution

€ 774 778

"TPX has been around in biochemical research for about ten years. This project will move the technology into a wider market place."

Contact person

Mr Erkki Soini
Arctic Diagnostics Oy
Tykistokatu 6
20520 Turku
Finland
Tel: +358 40 052 0643
Fax: +358 22 637 1250
erkki.soini@arcDia.com
www.arcDia.com

Participants

- 1 Arctic Diagnostics OY (FI)
- 2 Jyvaeskylaen Yliopisto (FI)
- 3 Luxcel Biosciences Ltd (IE)
- 4 Merlin Technologies GmbH (DE)
- 5 New Optics Ltd. (UK)
- 6 Standa Optomechanical Products (LT)
- 7 University College Cork, National University of Ireland, Cork (IE)
- 8 University of Turku (FI)



The optical unit of the ArcDia TPX-Plate Reader incorporates all necessary components for confocal and two-photon imaging.



“A vaccine against Lyme disease will help to reduce the large number of people who suffer from it in Europe.”

Lyme borreliosis is transmitted to humans by ticks carrying certain species of *Borrelia* bacteria. If untreated with antibiotics, the bacteria can cause a number of severe diseases, such as meningitis, arthritis and carditis. No vaccine exists for the European version of the disease. A small Austrian biotechnology company is applying its innovative technology, in co-operation with several other European SMEs and universities, to identify and isolate antigens common to all *Borrelia* species causing borreliosis. These could be used in a new vaccine against the disease to be marketed in both Europe and the US.

Lyme disease or *borreliosis* (LB) is the commonest tick-borne disease in Europe. It can be transmitted to humans when they are bitten by ticks carrying species of the *Borrelia* bacterium. Infection is often diagnosed by a rash (*Erythema migrans*) that spreads out from the site of the tick bite. If caught early, the disease can be prevented with oral antibiotics. However, if left untreated, the bacteria can spread through the bloodstream, access various tissues and cause severe diseases including meningitis, arthritis and carditis.

The reported incidence of the disease in European countries ranges from as few as 200 cases per year in the UK to over 20 000 in Germany. Official incidence rates range from 0.3 to 150 cases per year per 100 000 population. However, few countries have made LB a notifiable disease, so these rates are only an approximate estimation. Many experts believe that actual rates of LB infection could be up to seven times higher.

No vaccine currently exists against LB, despite the fact that in some countries the disease has had a significant socio-economic impact. But the market for an effective vaccine has already been proven: in the US, sales of the first and only human Lyme disease vaccine reached \$40 million in its first year, although the product has now been withdrawn.

Intercell, a small biotechnology company based in Austria, has spotted the market opportunity and brought together a number of European SMEs (small and medium-sized enterprises) and universities to collaborate on the very earliest stages of developing an LB vaccine. The Bovac project is being funded by the EU as one of its Co-operative Research projects.

Antigen attack

One of the problems with LB in Europe is that it is actually caused by three genospecies of *Borrelia*, namely *B. afzelii*, *B. garinii* and *B. burgdorferi*. An effective vaccine has to provide immunity to patients against all three genospecies. Intercell is applying its innovative Antigenome technology to screen all three *Borrelia* species for common proteins that could form the basis of a new LB vaccine.

The company is using state-of-the-art molecular biology techniques to identify and isolate prospective antigens. The Antigenome tech-

nology takes the genome of *Borrelia*, fragments the DNA into short lengths, then expresses the corresponding peptides on the surface of bacteria. These bacteria are treated with human sera containing anti-*Borrelia* antibodies to identify peptides that trigger immune responses in patients.

As a second approach, the genomes of the three genospecies are compared to identify common genes. The genes can be further investigated to discover those which encode immunoreactive vaccine candidates.

A Germany company, MWG Biotech, is carrying out the sequencing work and will determine the genomic sequence of *B. afzelii*, which is not publicly available. This could be particularly challenging as the *Borrelia* species contain many linear and circular sections of genomic DNA – called plasmids – that are difficult to isolate and sequence. However, the company hopes to develop new techniques for sequencing plasmids that it can use in other sequencing projects. It is also interested in developing diagnostic tools for LB.

A Czech SME called BioTest is providing the animal testing facilities for the project. It will work closely with the other project partners to develop an animal model for LB that can be used in antigen and vaccine testing. This project is an important step for the company, which is looking to expand its contacts and clients with the EU since the Czech Republic became a Member State in 2004.



The classical bulls-eye of *erythema migrans*.
© Dr. Gerold Stanek

"We have a strong partnership to find antigens that can be taken into commercial development."

The Bovac consortium also benefits from the expertise of three universities. The Sven Bergström research group at Umeå University in Sweden is a world authority on LB and Borrelia. The group is experienced in the manipulation of Borrelia bacteria, protein expression and engineering strains for testing candidate antigens.

Renowned units from the Medical University in Vienna and the National Institute of Public Health in Prague will supply the project with human sera and clinical isolates of Borrelia. During the Co-operative Research, they will also collect more accurate and localised data on the frequency and occurrence of LB in the European population.

Into the clinic

By the end of the two-year project, the partners hope to have identified and isolated a number of promising antigens that could progress to further testing and clinical trials for a LB vaccine. But although Europeans will still have to wait several years before any vaccine might reach the market, the project could have more immediate benefits. The parallel development of reliable diagnostic tools could help to set new standards for clinical diagnosis. Moreover, the earlier diagnosis of LB will enable more patients to receive effective treatment and greatly reduce the impact of this unpleasant disease.

Project title

Development of a prophylactic vaccine and diagnostic markers to prevent and diagnose Lyme Borreliosis specific to Europe and North America (BOVAC)

Contract number

CT-2004-512598

Duration

24 months

Global project cost

€ 1 817 686

EC contribution

€ 1 355 443

Contact person

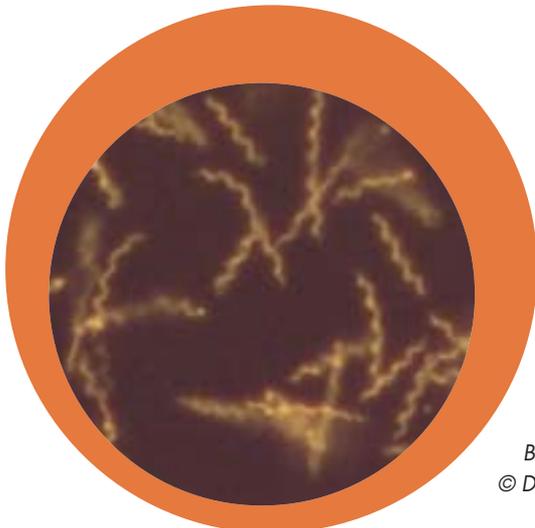
Mr Andreas Meinke
Intercell AG
Campus Vienna Biocenter 6
AT-1030 Vienna
Austria
Tel: +43 1 20620 210
Fax: +43 1 20620 805
ameinke@intercell.com
www.intercell.com

Project website

www.bovac.org

Participants

- 1 Intercell AG (AT)
- 2 BioTest S.R.O. (CZ)
- 3 Medical University Vienna (AT)
- 4 MWG Biotech AG (DE)
- 5 National Institute of Public Health (CZ)
- 6 Umeå University (SE)



Borrelia cells.
© Dr. Gerold Stanek



Diagnostic kit cheers up the wine industry

BRETT
MONITORING

"At €30 per litre a taste problem in 255-litre barrels adds up to a substantial loss."

Yeasts belonging to the genus *Brettanomyces* are responsible for serious spoilage problems in the European winemaking industry, destroying the product and reducing the revenues. The Co-operative Research project BRETT MONITORING brings together ten partners from three European countries to develop a diagnostic testing kit that will allow wineries to detect this type of yeast easily, thereby preventing the spread of infection to other batches. The resulting kit should have market potential in wine-producing countries worldwide.

Brettanomyces, a unicellular fungus, or yeast, is a major cause of spoilage in the European winemaking industry. A vintage wine can take ten years to mature in barrels containing 255 litres and worth an average €30 per litre at wholesale. That adds up to a substantial loss for a winery, in terms of revenues and jobs, and for the general economy of a winegrowing region where the problem is widespread.

The earlier that *Brettanomyces* yeasts are detected in wine, the better are the chances of preventing their spread to other batches. Currently, the main detection method is by outsourced diagnostic laboratory test, which is expensive and takes time. The Co-operative Research project Brett Monitoring – Development of Diagnosis Tools for *Brettanomyces* Monitoring – has gathered together ten partners from France, Spain and Germany to find a simple, fast and reproducible monitoring method to allow winemakers to test for *Brettanomyces* in-house. Led by the French industrial-filtration specialist Prédél, the partners include three small and medium-sized enterprises (SMES) and three winemakers. The Chambre d'Agriculture de la Gironde, from one of France's most prestigious winegrowing regions, will participate. The Centre Technique Interprofessionnel de la Vigne et du Vin, the Université de Montpellier, and Spain's Consejo Superior de Investigaciones Científicas will contribute technical expertise.

Leaving a bad taste

If you drink fine wine regularly, you will probably have had the deflating experience of opening a Brett-infected bottle. Diagnostic laboratories test for certain chemical by-products that are only produced by *Brettanomyces*. These are the volatile phenols – measured in nanograms per millilitre, just a few cells can affect a wine's aroma. The Brett-produced compound 4-ethyl phenol gives wine an aroma that has been described in various ways including 'barnyard,' 'leather,' 'barbeque,' 'mousey,' 'fishy,' 'dirty sock' and others – not exactly what you would expect when you open a bottle of Medoc.

Some yeasts are deliberately used to control fermentation in wine, but those belonging to the genus *Brettanomyces* grow wild. Some wine lovers claim that small amounts can actually add character to a vintage wine's aroma, but such a view remains controversial. The overwhelming majority of experts regard *Brettanomyces*, nicknamed 'Brett', as an expensive nuisance.

The genus includes about a half dozen species, of which the most problematic for wine is probably *B. bruxellensis*. Brett grows in both red and white wines, but is mainly a problem for the former as reds have a far higher polyphenol content and higher pH, both of which tend to foster Brett infections. Almost any barrel of red can become infected, and many theories exist as to how this actually happens. Some say the yeast simply comes in on the skin of the grapes themselves. Brett can spread through contaminated grape-crushing equipment, wooden cooperage, tanks, must and transfer lines. Some point to the use of wooden barrels, which are almost impossible to sterilise but crucial to the ageing process of fine wines. Brett produces an enzyme, B-glucosidase, which allows it to eat the wood sugar cellobiose, which is higher in used barrels than in new ones. Another theory holds that a recent trend toward 'natural' wines – using little or no sulphur dioxide at crushing – has led to more infections. Sulphites are effective at curtailing Brett.

Quick reaction

High-powered methods for eliminating Brett from wine, such as filtering, sterilising, and the use of sulphites, can all damage the quality. Steel barrels are less susceptible to infection, but are just not a palatable option for vintage winemakers. Since a sterile winery is not realistic, the viable solution is to make sure that equipment and batches do not spread the infection. That is where the Co-operative Research project Brett Monitoring begins. The overall objective is to increase knowledge about *Brettanomyces* and thus to develop a quick, easy-to-use detection kit. The team will conduct scientific experiments to determine exactly

If you drink wine regularly, you have probably had the deflating experience of opening a Brett-infected bottle.



"An outbreak of Brettanomyces can cause tremendous economic damage to a winery or winegrowing region."

how Brett spoils a wine's taste and aroma. One major objective is to determine whether flavour spoilage depends on a particular Brett species or strain.

After thorough testing of the kit, the project team will publish its results. The project's marketing specialists will formulate a strategy for selling the new tool. Since Brett is a highly prevalent problem for the winemaking industry worldwide, including those newer producers such as the United States and Australia, a successful detection kit is likely to have a wide market potential.

Project title

Development of Diagnosis Tools for Brettanomyces Monitoring (BRETT MONITORING)

Contract number

CT-2004-508445

Duration

24 months

Global project cost

€ 919 483

EC contribution

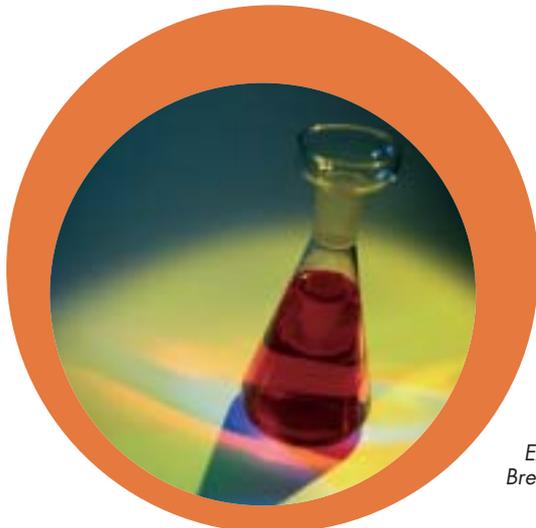
€ 539 427

Contact person

Mr Henry Roy
Prédel
14 rue de genêts
33450, Saint-Loubès
France
Tel: +33 5 56 38 93 93
Fax: +33 5 56 38 87 87
info@predel.com
www.predel.com

Participants

- 1 Prédel (FR)
- 2 Bionostra (ES)
- 3 Centre Technique Interprofessionnel de la Vigne et du Vin (FR)
- 4 Chambre d'Agriculture de la Gironde (FR)
- 5 Consejo Superior de Investigaciones Cientificas (ES)
- 6 Dr Moller Und Schmelz GmbH (DE)
- 7 Dsmz-Deutsche Sammlung Von Mikroorganismen und Zellkulturen GmbH (DE)
- 8 Productos Agrovín SA (ES)
- 9 Université de Montpellier I – Centre de Recherche et de Formation en Oenologie (FR)
- 10 Université Victor Segalen – Bordeaux II (FR)



Experiments will determine exactly how Brettanomyces spoil the taste and aroma of a wine.



"A machine that handles the materials without anybody touching them will reduce the possibility of recontamination."

European demand is rising rapidly for mycelium which is used in the production of mushrooms and other fungus products. One major problem faced by small and medium-sized enterprises (SMEs) in this industry is that unwanted fungi or insects can contaminate the substrate on which mycelium grow, resulting in lost products and revenue. With 13 partners from six European Union and two affiliated countries, the Co-operative Research BULK SUBSTRATES project aims to design an energy-saving machine that can produce and package sterilised substrate at low cost.

As European demand expands for mushrooms and other fungi used for food and feed, as well as pharmaceutical and biological control products, there is an increasing need for mycelium, the primary material used in fungus farming. Mycelium grows in substrate using solid-state fermentation (SSF), meaning that there is no free water. The substrate is made up of recycled agricultural wastes which tend to be susceptible to contamination. Inadequately sterilised substrate can result in poor product yield and quality and, hence, lost income as an overgrowth of unwanted fungi and insects chokes off the target product.

The Co-operative Research Bulk Substrates (Development of an energy-efficient bulk sterilisation technique for the production of mycelium) project includes 11 SME mushroom and mycelium growers with limited research budgets and a clear common need: a bulk production system for the safe, cost-effective and energy-efficient production of pure mycelium. Led by the Katholieke Hogeschool Sint-Lieven (KAHO) in Belgium, an industrial engineering university specialising in large-scale experiments in fermentation technology, and a second research and technology developer (RTD), WAM SPA of Italy, the project's 13 participants come from six EU countries, including Malta, and two affiliated countries.

Something in the air

Mycelia are masses of threadlike, networked filaments that make up the undifferentiated vegetative structure of a fungus. Mycelial biomass can be eaten, but is mainly used as an inoculum: for mushrooms for direct consumption or pharmaceutical use, fermented food products such as tempeh, for composting, and for biocontrol products.

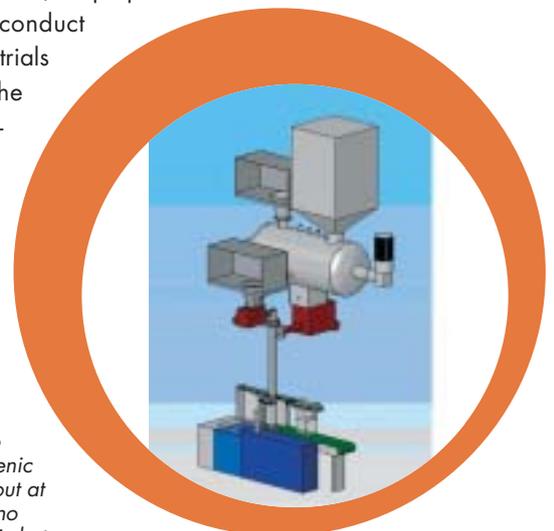
As the EU market for fungus products soars – for example, production of speciality mushrooms reached 44 megatonnes in 2002, worth €160 million – SME losses have grown too. Traditional sterilisation methods, using autoclaves, have resulted in 10-20% losses due to recontamination of substrata, mainly as the result of handling after sterilisation. Lost substrate means lost product, capacity and income, and some growers have gone bankrupt and workers have lost their jobs as a result.

A new tool from existing parts

The Co-operative Research project plans to create a machine that will handle substrate materials without human contact, reducing the possibility of recontamination. Since the device will have many applications, the design team is modifying existing equipment so as to satisfy all possible needs.

Each SME will produce its own inoculum in solid and liquid form. The substrates used for the production of inoculum of a specific fungus are principally grain-based (wheat, rye and rice). For mushroom growing, the substrates are usually wood-based since most mushrooms are wood-degrading species. All substrate components will be inventoried and analysed. WAM's main task is to engineer and construct the mixer and steriliser for raw materials. WAM and KAHO will also develop a dosing system that can work under aseptic conditions.

The next steps are to make systems for aseptic cooling, inoculation and portioning into pre-sterilised plastic bags under strictly hygienic conditions. Participating SMEs will contribute expertise in gas sterilisation in closed environments, clean room technology, and for filling pre-sterilised plastic bags with sterilised, inoculated material. One will make the sterilised bags. After fine-tuning a multifunctional prototype, with appendages for air removal, steam injection and cleaning, as well as sensors for temperature and pressure control, the project team will conduct semi-industrial trials to evaluate the uniformity, production rate and quality of the substrate product.



Raw materials go in on top and axenic substrate comes out at the bottom, with no human handling in-between.

The Bulk Substrates device should make work easier, particularly for smaller firms. Raw materials go in at the top; the machine sterilises the substrate, cools it, adds inoculum, and finally pours axenic substrate out of the bottom into sterilised bags, with no human handling in-between. Until now, it has been necessary to literally shake every bag very hard to distribute the inoculum evenly over the substrate's solid particles.

The new apparatus should enable the production of a regular supply of a standardised mycelium product, resulting in a more stable, prosperous fungi market. This, in turn, will provide a more stable income for mycelium producers, with ripple effects for the growers of mushrooms and other fungi, and other related businesses.

Project title

Development of an energy-efficient bulk sterilisation technique for the production of mycelium (BULK SUBSTRATES)

Contract number

CT-2004-508645

Duration

24 months

Global project cost

€ 1 945 520

EC contribution

€ 1 008 040

"Incorporating the different needs of 11 SME partners should improve the end result."

Contact person

Mr Joris Hoozee
Katholieke Hogeschool Sint-Lieven
Dept. Industrieel Ingenieur
Laboratorium voor Biotechnologie
Gebr. Desmetstraat, 1
9000 Gent
Belgium
Tel: +32 92 65 86 13
Fax: +32 92 25 62 69
joris.hoozee@kahosl.be
www.kahosl.be

Participants

- 1 Katholieke Hogeschool Sint-Lieven (BE)
- 2 Agrifutur SRL (IT)
- 3 Carlos Da Tarrago (ES)
- 4 Dingemans Mout NV (BE)
- 5 Forest Mushrooms (IE)
- 6 Nutrition Sciences (BE)
- 7 Greenview (Malta)
- 8 Mycelia BVBA (BE)
- 9 Myo AS (NO)
- 10 Pilzgarten GmbH (DE)
- 11 Sac02 NV (BE)
- 12 Tekoa Mushroom Farm LTD (IL)
- 13 WAM SPA (IT)



“Animated three-dimensional visualisation could have more applications but only if we convert CAD designs into a form that can be 3D rendered in real time more automatically.”

Animating three-dimensional models of objects enables designers to present their ideas compellingly to almost any sighted person, even those of us not trained to read traditional technical drawings. It has applications in engineering, architecture, computer-games programming and in the creation of special effects for cinema. Cost, however, is preventing its wider application. Transforming an arbitrary computer-aided design into a form suitable for fast three-dimensional rendering can, and frequently does, take a lot of expert manual work. The Cadpipe Co-operative Research project aims to free up the development cycle by producing a software tool with which to eliminate the need for most manual intervention.

In a single generation, a revolution virtually unnoticed by the outside world has transformed design offices. As recently as 25 years ago, the design of just about any kind of solid object began life on paper. Products were designed with pen and ink on drawing boards. Now, however, it is rare indeed for a product of any complexity to be designed without two-dimensional (2D) or three-dimensional (3D) computer-aided design (CAD).

The usefulness of 3D CAD is easy to appreciate. A design concept displayed as a photo-realistic 3D image on a screen is infinitely easier for an ordinary customer to make sense of than a set of technical plans on sheets of paper. In fact, the more advanced CAD environments enable designers to create models of objects that can be animated. So an architect who gets an urgent request to design new stairs for a house being refurbished might, in a matter of hours, for example, be in a position to ‘walk’ the client on-screen through 3D models of the interior of the house with the different alternatives in place.

Not surprisingly, 3D CAD animation has economically important applications. Best known by far is the use of 3D special effects for cinema and television. As spectacular as the effects created in these media are, though, there are even more demanding applications – real-time simulators, for instance. Airlines use them to train their pilots; NASA and ESA, to train their astronauts; and computer-game companies, to captivate their customers. Whereas special effects for the cinema can be created frame by frame at whatever rate is necessary to realise the producer’s vision within budget, real-time simulations of realistic objects requires rendering of each new ‘frame’ in real time.

Incompatible standards

CADPIPE is a Co-operative Research project aimed at lubricating the sticky production chain that all too often connects a 3D-CAD design to the 3D model into which it needs to be transformed for fast 3D-rendering. In an ideal world, the project would be unnecessary. When a designer designs an object which must be amenable to fast 3D rendering, he or she selects compatible 3D-CAD and 3D-modelling tools and there is no reason why the job should not proceed smoothly from concept to animation. But this is frequently not an option for the 3D-model designing SMEs (small and medium-sized

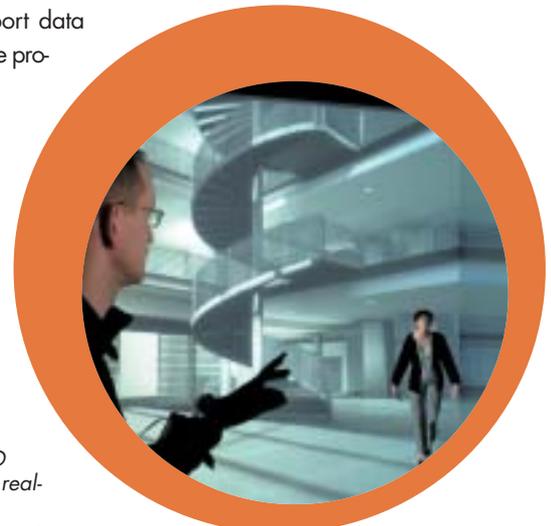
enterprises) at the centre of the CADPIPE consortium. Many of their clients – 3D end-user companies, also represented in the consortium – require fast 3D rendering of pre-existing 3D-CAD designs.

Both the list of CAD packages in which these designs have been created and the list of file formats in which they are stored are long. Young it may be, but in its short lifetime the CAD movement has spawned a plethora of file formats, each with its own peculiarities, many of them incapable at present of being easily converted for high-quality real-time 3D rendering. In these circumstances, transforming a design into the requisite 3D model is impossible without a lot of expert data manipulation by hand. That invariably makes it slow and expensive.

Unblocking the production pipeline

Now under way, the project’s technical development work lies in the capable hands of Cadpipe’s four international research institutes and RTD performers. Their plan is to produce software modules in the form of plug-ins that together will augment the performance of a 3D modelling tool. One will be an import plug-in to enable a modeller to import CAD data directly into a popular 3D modelling package. To make the problem more tractable, they will design the plug-in to import files in a limited number of standard CAD formats.

Other tools will be created to perform automatic data manipulation and to import and export data from the Cadpipe production line.



EVTT's Lumeporti, a virtual-reality system in which Cadpipe will be used to produce 3D content for 3D visualisation and real-time simulation.

This research project will give the modeller the ability to attach physical and interactive properties to the object being modelled. He or she will be able, for example, to add realistic textures to the object's surfaces or to open a door in the design to interactively, where the data for these attributes is absent or cannot be automatically retrieved from the CAD design itself.

The technical result will be a powerful software system controlled from a single unified user interface and built in modular fashion for easy future development. A user's guide for design, manufacturing and testing is planned, condensing the total know-how generated for all project partners. But the information flow will not stop there. Project progress will be accelerated and its results improved through a European CAD expert network to be initiated by the consortium. With representation from all interested industrial sectors, it will broaden the expertise on which Cadpipe partners can call and will be an ideal channel for dissemination of its findings far and wide.

Project title

Cad Production Pipeline (CADPIPE)

Contract number

CT-2004-512897

Duration

24 months

Global project cost

€ 1 615 496

EC contribution

€ 980 390

Contact person

Mr Hannu Kuukkanen

VTT Technical Research Centre of Finland

PO Box 1201

02044 VTT

Finland

Tel: +358 20 722 5948

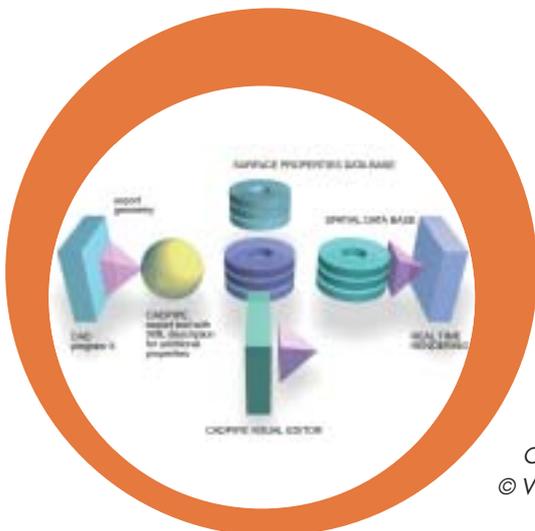
Fax: +358 20 722 7049

hannu.kuukkanen@vtt.fi

www.vtt.fi/indexe.htm

Participants

- 1 SenseTrix Oy (FI)
- 2 NIKI Information Technologies Ltd (EL)
- 3 DeltaCad (FR)
- 4 InfoTRON A.S. (TR)
- 5 DeskArtes OY (FI)
- 6 Ingeniería y Soluciones Informáticas del Sur S.L. (ES)
- 7 SienaBioGraFiX s.r.l. (IT)
- 8 Melon Technologies JSC (BG)
- 9 Nemetschek OOD (BG)
- 10 TESTALUNA srl (IT)
- 11 VTT Information Technology (Coordinator) (FI)
12. Fraunhofer Institute IFF, Fraunhofer-Gesellschaft Zur Foerderung Der Angewandten Forschung E.V. (DE)
- 13 ICI International Computer Institute (TR)
- 14 MIRALab, Université de Genève (CH)



Cadpipe system flowchart.
© VTT Information Technology

“Cannabis is more accepted as a potential medicine than it was a few years ago.”

Medicines derived from cannabis have been used throughout Europe and Asia since ancient times.

With the advent of modern medicine, the drug’s ability to ease pain and inflammation has been put rigorously to the test, with variable results. One of the problems is that as there is no procedure for producing standardised extracts of cannabis, the chemical composition of such extracts varies. The partners in the Co-operative Research project Cannabis aim to devise a procedure for standardising extracts. This, they hope, will generate preparations suitable for use in large-scale clinical trials and, ultimately, will help in the treatment of arthritis and migraine.

Cannabis has an image problem. Thanks to its psychoactive properties, it continues to be regarded in large swathes of the developed world first as a drug of abuse, and only second as a potential medicine. Yet indications that it can relieve pain associated with even the most debilitating of diseases are intriguing. The goal of the Cannabis project is to raise the drug’s status as a medicine by producing a procedure for extracting its painkilling constituents in a standardised way.

This project represents an entirely novel approach to the development of cannabis-based medicines. Until now, researchers have tended to home in on particular cultivars or strains of the plant, *Cannabis sativa*, from which they extract therapeutically promising compounds. But because they claim intellectual property rights on the cultivar rather than on the end product or the procedure by which it is derived, the chemical composition of that end product may vary. It can be affected by numerous factors, even the time of year when the plant is harvested.

This is not a new problem in the medicinal application of cannabis. Once widely prescribed as a herbal remedy, its unpredictable potency led to it being removed from the US Pharmacopeia and National Formulary in 1941, and the British National Formulary in 1971. Michael Heinrich, project coordinator of Cannabis, thinks it may also be a reason why the results of more recent clinical trials have been mixed.

The people’s choice

In 2003, the medical journal *The Lancet* reported equivocal results in a trial of one orally delivered cannabis-based product in 630 multiple sclerosis patients. While the product seemed to have no effect in relieving muscle spasm, as measured by a formal scoring system of muscle stiffness, the patients themselves felt that it helped them. There have been no controlled studies of the effects of cannabis preparations in arthritis and migraine patients, but surveys suggest that large numbers of people suffering from these conditions continue to risk prosecution and the dangers of obtaining their cannabis from street dealers, to self-medicate with the drug.

Indeed, it was the appearance of a number of MS patients in British courts in the mid- to late 1990s that encouraged the UK government

to cautiously consider legalising medicinal cannabis, as long as a pharmaceutical form of it could be found. Different countries take different positions on the issue, says Heinrich, and some are less open-minded. But in general, people are warming to the idea that complex plant-based preparations could have advantages over simpler, synthetic drugs when it comes to treating pain. And they are beginning to see cannabis as something more than a recreational drug.

Bottom-up approach

The partners in the Cannabis project hope to take advantage of this shift in attitudes. They want to eliminate the problem of variable potency by devising a procedure for producing standardised cannabis extracts which can be delivered orally and are suitable for clinical use. Preferably, these extracts should also be low in tetrahydrocannabinol (THC), the drug’s psychoactive component. The team will then claim the procedure, rather than the starting material, as its intellectual property. This is a recognised approach to IP that has been applied, for instance, to the production of extracts of St John’s Wort and Ginkgo biloba, now widely sold as herbal remedies.

And the group is well equipped to succeed, Heinrich says. The three SMEs (small and medium-sized enterprises) involved bring expertise in phytopharmaceuticals or plant-based drugs, biochemistry and animal models of human neurological disease. But because they lack the in-house research capacity to perfect the extraction procedure

Female Cannabis sativa plant from which the resin is derived for pharmacological testing.
© University of London School of Pharmacy



"The concept of one compound hitting one target is showing its limitations – people are realising that more complex, plant-based medicines have untapped therapeutic potential."

on their own, they have chosen to collaborate with six major research centres with expertise in the area. Most of the work will involve looking for anti-inflammatory and analgesic effects in cell culture. But at the end of two years, the group hopes to have one or more extracts for which they will have demonstrated useful pharmacological effects, both *in vitro* and in animal models, of arthritis and migraine. The intellectual property on the extraction procedure will then be shared equally between the SMEs.

Heinrich says it is unrealistic to think that those extracts will be licensed as drugs immediately. But they will be available to other groups of researchers who can then use them in large-scale clinical trials involving arthritis and migraine sufferers. With a standardised product, the hope is that the outcomes of such trials will be more clear-cut than in the past, and may ultimately lead to the approval of a new generation of cannabis-based drugs. Then, and only then, will cannabis come to be seen as a medicine first, and a drug of abuse second.

Project title

Standardised extracts of Cannabis for use in the treatment of migraine and rheumatoid arthritis (CANNABIS)

Contract number

CT-2004-512696

Duration

24 months

Global project cost

€ 1 883 100

EC contribution

€ 1 344 350

Contact person

Prof. Michael Heinrich
School of Pharmacy, University of London
29-39 Brunswick Square
London WC1N 1AX
United Kingdom
Tel: +44 2077 535844
Fax: +44 2077 535909
phyto@ulsop.ac.uk

Participants

- 1 School of Pharmacy, University of London (UK)
- 2 Cerebricon Ltd (FI)
- 3 Netherlands Organisation for Applied Scientific Research, Tno Pharma (NL)
- 4 Universidad de Córdoba (ES)
- 5 Università del Piemonte Orientale (IT)
- 6 Universitaet Bern (CH)
- 7 Universitätsklinikum Freiburg (DE)
- 8 Vivacell Biotechnology GmbH (DE)
- 9 William Ransom and Son PLC (UK)



"We want to make a product that is both environmentally friendly and does not hurt or damage the skin."

The Cleanhand project is developing a solution to one of the major problems facing the healthcare sector – one that, in principle, is very easy to solve. It is being targeted at hospital-acquired infections which kill thousands of patients across Europe each year, and complicate the treatment of many more. The incidence of infections which patients acquire in hospital could be drastically reduced if medical staff were more rigorous in ensuring their hands were disinfected efficiently and more regularly. Partners in the Cleanhand Co-operative Research project are developing an automated system to achieve this aim. In so doing, they should capture a significant share of a large global market.

Each year, 2.8 million patients are infected while receiving treatment in European hospitals. In some cases the infections can involve micro-organisms that have acquired resistance to the drugs that might otherwise defeat them. At least 10 000 people die from hospital-acquired infections in the EU each year. Many more patients recover from their infections, but only after having endured greater suffering and a longer stay in hospital. Treating the hospital-acquired infections is both time-consuming and expensive, yet many of them could be avoided simply by ensuring that medical staff and visitors are able to disinfect their hands efficiently.

This is a huge global problem. In the USA, for example, it causes 90 000 deaths per year, which is more than those caused by car accidents and homicides together. The figures in less-developed regions of the world will be much greater.

At present, medical staff do not use the existing sanitising creams and sprays effectively for a variety of reasons. One of the most significant of these is the time taken for the cleaning procedure, while another is the development of hand irritation and allergies due to repeated exposure to the chemicals currently in use.

The challenge for the Cleanhand project is three-fold. First, the partners are looking for better chemical cleaning agents that are significantly less likely to cause irritation and allergy while, at the same time, achieving very effective disinfection. Secondly, they want to deliver these chemicals in spray form from an automatic hand sanitiser (AHS) that allows the spray to be delivered and to dry in just a few seconds, without the user having to touch any of the system's parts. Finally, the AHS will include a sensor system that can confirm that efficient disinfection has occurred.

Expertise across the board

The Cleanhand partnership includes three research performers – Mainsani AS of Norway, the National Institute of Technology of Norway, and Pera Innovation Ltd of the UK. This research experience reflects the fact that enhanced scientific understanding of the action and effectiveness of disinfectants is required in order to achieve the project's aims. Work is under way to develop a new sanitising fluid that does not contain alcohol, chlorine or iodine – all of which are associated with irritations and allergies caused by many

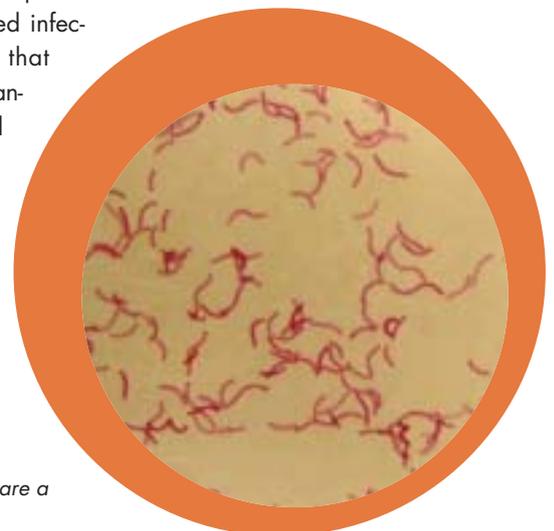
of the fluids currently being used. Links with large university-based research groups that are not formal partners in the project are also being exploited to assist in this task.

Three SME (small and medium-sized enterprise) partners from Belgium, Norway and France bring experience in technology manufacturing processes, electronics and high-tech electrical applications. The Co-operative Research project team is completed by a larger institution, Skidata AG of Austria. This company actually specialises in the development and marketing of visitor management systems, including access and ticketing solutions. It is interesting that a large company founded to serve a very different industry can bring its marketing presence and commercial know-how to assist the development of innovative technology for the medical market.

Healthcare and beyond

The system being developed by Cleanhand will be available in various forms, as both wall-mounted wired-in units and battery-powered mobile facilities. Hopefully, it will reduce the time it takes to clean hands by up to 75%, as well as improving disinfection efficiency. The significant reduction in time taken for a procedure that must be repeated many times each day will offer considerable labour-cost savings, while encouraging people to follow good hand sanitation practice.

Research into the problem of hospital-acquired infections suggests that effective hand sanitation could reduce such infections by



Micro-organisms are a constant threat.

"Our system could be useful wherever people meet with the potential to transmit infections."

at least 30%. A reduction on that scale would bring huge cost savings to healthcare organisations, in addition to the very significant improvements in patient care and the many lives that would be saved.

With very few commercial automatic hand sanitisers on the market at present, the project also offers a big commercial opportunity for the partners. The partners hope to commercialise their product by means of a licence agreement with international distributors. The potential annual global market for the Cleanhand system is estimated at €310 million per year. That figure is based on assuming a modest market penetration of only 3%. Clearly, there is potential for a significantly higher market capture, especially if the product can also penetrate non-medical sectors, such as the hotel, catering and airline industries.

Project title

Preventing 10 000 European hospital deaths by securing efficient hand disinfection through an automatic, easy to use, environmentally friendly and verifiable disinfection process (CLEANHAND)

Contract number

CT-2004-508489

Duration

24 months

Global project cost

€ 1 099 012

EC contribution

€ 555 952

Contact person

Mr Petter Mehren
Mainsani AS
Akersveien 24 C
0177 Oslo
Norway
Tel: +47 90 03 5190
Fax: +47 94 08 5190
petter@mehrenonline.com

Project website

www.mainsani.com

Participants

- 1 Mainsani AS (NO)
- 2 Ascor Spolka Akcyjna (PL)
- 3 Capflow (BE)
- 4 Mikron Tunsberg AS (NO)
- 5 Pera Innovation Ltd (UK)
- 6 Skidata AG (AT)
- 7 Solems SA (FR)
- 8 Stiftelsen Teknologisk Institutt (NO)



Cleaning hands is a simple but crucial protection against infection.



“This collaboration will bring us up to the ‘state of the art’ in second-generation superconductor technology.”

Superconductivity is a key technology in developing a sustainable economy using available energy resources. Although superconductors are highly efficient and powerful components of electrical applications, they must be cooled to extremely low temperatures to eliminate electrical resistance. A second generation of higher temperature tapes exist but are not available in commercially feasible lengths. The Cocon Co-operative Research project brings together SMEs involved in the production and testing of HTS tapes, as well as research institutes with expertise in coating processes, to establish the viability of commercial production.

Discovered at the beginning of the 20th century, superconductors eliminate all electrical resistance when cooled to a threshold temperature. The first commercially used superconductors had to be cooled to -248°C , using liquid helium. In the late eighties, so-called high-temperature superconductor (HTS) materials were discovered which exhibited the same properties when cooled to a mere -196°C . This is still extremely cold, but by using liquid nitrogen as a coolant, this technique saves both space and money.

Although superconductors require operating temperatures way below zero, they still offer industry enormous advantages. Not only do they present no resistance, and thus no electrical losses, but they allow large quantities of power to pass through cables with small cross-sections, making them highly efficient and compact. Superconducting materials are already used in magnets, high-tension cables, the medical field for NMR (Nuclear Magnetic Resonance), motors and storage devices, exhibiting lower weight, higher efficiency, smaller losses and superior performance to those of conventional devices.

Superconductivity is key to developing a sustainable economy with currently available energy resources. Crucial to this is the commercial exploitation of the second generation of coated conductors which the Cocon Co-operative Research project is researching.

Lengthy procedures

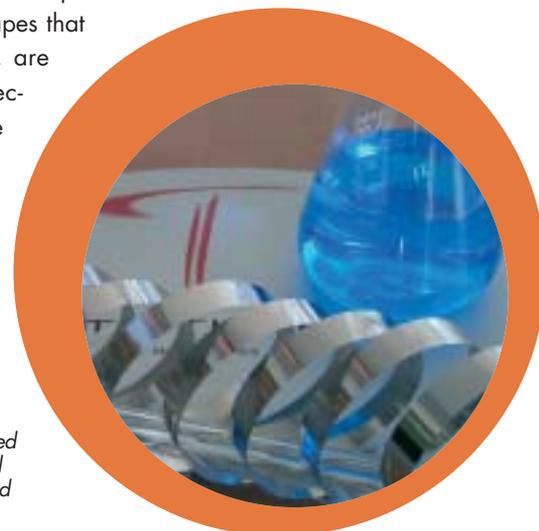
The second generation of HTS conductors use the superconducting ceramic material yttrium-barium-copper-oxide (YBCO). Being inherently rigid, a ceramic is unsuitable for use as a tape or wire, so it has to be deposited as a fine coating on to a metal substrate. This coating process is both lengthy and complex, and currently is only feasible for tapes 5cm in length. If the beneficial and economic advantages of second-generation tapes are to be fully realised, then lengths in the order of kilometres must be manufactured. Cocon aims to establish the viability of SMEs (small and medium-sized enterprises) as suppliers of the raw materials and able to apply suitable technology to produce high-quality tapes of the requisite length. The specific objective is to establish the proof of concept by creating a high-quality tape 100 metres long.

To meet the required cost-effectiveness, the consortium is focusing on the development of chemical coating techniques, with the cooperation of two research institutes. The Leibniz-Institut Für Festkörper-Und Werkstofforschung in Dresden (Germany) has specialised knowledge on coating and chemical reactions. The University of Cambridge in the UK is working on new techniques for applying the coatings using the established principles of ink-jet printing. The remaining partners are concentrating on production aspects.

The Danish company, Polyteknisk Forskning & Udvikling APS, is providing the chemical solutions used as raw material – to be commercially viable they must become cheaper to produce and more stable. Kraft Electronics in Hungary is developing machines to apply the coating. Werkstoffzentrum Rheinbach GmbH, another manufacturing SME based in Germany, is defining the quality and testing parameters as well as designing the apparatus and the test procedures to guarantee quality. The German company Trithor, which is coordinating the project, already manufactures superconducting wires and is responsible for the production of the sample second-generation tapes.

Capacity to react

If superconducting tapes and wires are to be adopted for wide-scale electrical applications, the manufacturing processes must satisfy three criteria. The consortium must judge whether all components in the process can produce tapes that perform better, are more cost effective, and can be produced on a commercial



Materials for coated conductors: metal substrate tape and coating solution.

scale by 2010. If SMEs are to benefit from this opportunity, it is essential they have both the know-how and capacity to supply the market. While the second generation of coated conductor tapes has the potential to meet customer requirements, the reality is by no means certain. Without the collaboration and breadth of expertise offered by the consortium, the burden of attempting to establish the proof of concept would be extremely difficult and entail unacceptable financial risks.

The outcome of Cocon will determine whether or not the second generation of superconductors is commercially viable. If they do reach maturity, they will change the paradigms of the electricity infrastructure. For example, ship motors could become one-third lighter and smaller, while railway transformers could carry 50 more passengers for the same power. Apart from consumers of electricity, the ultimate beneficiary will be the environment with reduced demand on its precious and rapidly depleting natural resources.

Project title

Coated Conductor by economic processing route (COCON)

Contract number

CT-2004-508273

Duration

24 months

Global project cost

€ 1 983 336

EC contribution

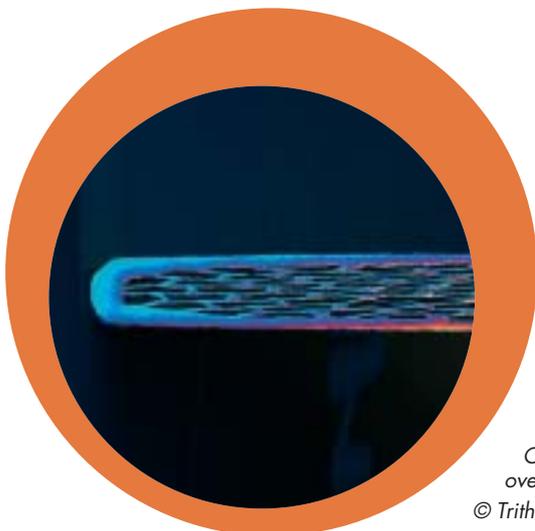
€ 1 119 561

Contact person

Mr Michael Bäcker
Trithor GmbH
Heisenbergstr. 16
53359 Rheinbach
Germany
Tel: +49 222690 60301
michael.baecker@trithor.de
www.trithor.de

Participants

- 1 Trithor GmbH (DE)
- 2 Kraft Electronics Inc. (HU)
- 3 Leibniz-Institut Für Festkoerper-Und Werkstofforschung Dresden (DE)
- 4 Polyteknisk Forskning & Udvikling APS (DK)
- 5 The Chancellor, Masters and Scholars of the University of Cambridge (UK)
- 6 Werkstoffzentrum Rheinbach GmbH (DE)



Cross-section of HTS wire – the black filaments carry over 50 times more current than copper.

© Trithor GmbH



“The approach is more accurate and works more quickly.”

The formulation of a wood colorant to obtain a high-quality finish on wooden furniture production is not an easy task. Highly labour intensive, it is very much a trial-and-error process because of the inherent non-uniformity of wooden surfaces. Colormatch aims to bring state-of-the art vision and expert system analysis to this problem. This task of the Co-operative Research project will involve a complex calibration of imaging equipment and the development of an intelligent expert system to analyse the images and propose an optimum colorant formulation. A successful outcome will increase accuracy and reduce the time and cost of the process in the furniture industry, thereby increasing the competitiveness of European manufacturer’.

Non-opaque wood stains and dyes are widely used around the globe in the manufacture of furniture. These colorants provide a variety of different finishes covering the entire spectrum of colours used across the full range of pieces of furniture, whether for use in the home (including kitchen and bathroom furniture) or in office and commercial establishments.

However, formulation of the dyes and stains is no simple task. The quantifying of colour differences in the raw wood materials and the formulation of colorants to achieve a uniform appearance is currently done by semi-automated or manual methods. Such techniques can have many drawbacks as they involve operators acting in a decision-making and subjective task that usually involves a considerable amount of trial and error to achieve the desired results.

At present, there are no methods capable of quantifying colour differences for non-uniformly coloured surfaces such as wood, which is where Colormatch comes in.

Computer vision

The Co-operative Research project aims to develop a computer vision system capable of quantifying and describing the colour of non-uniformly coloured surfaces. The system will then use an expert technique to propose a colorant formulation that can achieve a given target colour when it is applied to the surface of a wood sample.

Colormatch is coordinated by the Spanish company Industrias Quimicas Iruena which produces dyes and wood stain, among a variety of products. Other partners from the colorant sector are 3h-Lacke Lackfabrik Hammen and Wessendorf Oberflaechentechnik of Germany and Alberto Mora Galiana of Spain. Furniture-makers are represented by Camila Moveis Industria de Mobiliario of Portugal. Cidemco-Centro de Investigacion Tecnologica is a Spanish research organisation with expertise in materials and building research, including vision and expert systems, whilst Metrotec SA provides specialist measurement instrumentation. Other research contributors to the project are the Institut fur Holztechnologie based in Dresden, Germany which has experience in application-related research on the use of wood, and the University of Leeds, UK, home to world experts on colour calibration.

The formulation of a wood colorant to obtain a high-quality finish on wooden furniture production is not an easy task. Highly labour intensive, it is very much a trial-and-error process because of the inherent non-uniformity of wooden surfaces. Colormatch aims to bring state-of-the art vision and expert system analysis to this problem. This task of the Co-operative Research project will involve a complex calibration of imaging equipment and the development of an intelligent expert system to analyse the images and propose an optimum colorant formulation. A successful outcome will increase accuracy and reduce the time and cost of the process in the furniture industry, thereby increasing the competitiveness of European manufacturer’.

Camera correction

The major problem with colouring a wooden surface is its non-uniform appearance. The wood stains or dyes used are transparent so the surface of the wood is important to the final finish obtained. Effects, such as grain colour and background colour, vary and there is usually a high contrast between the two. The system to be developed will involve two parts: the first is a system to obtain the best possible image of the wood surface that also corrects for artefacts introduced by the camera; and, secondly, an expert vision system to analyse the image and suggest the formulation needed.

The signal provided by any video camera does not give a ‘real’ colour. The signal is a RGB (red-green-blue) signal that is dependent on the characteristics of the camera itself. To obtain a true colour the camera needs to be calibrated and that calibration used to transform the RGB signal to unambiguous CIE LAB values. This system, developed by the Commission Internationale de l’Eclairage (CIE), assigns a unique number to the spectrum of colours that humans can perceive. Prior to making the transformation to CIE LAB values, corrections for differences in illumination of the sample being tested and camera characteristics are needed.

An analysis of the image is then performed. Full details of the expert analysis to be used are still being considered but a number of descriptors for the image are proposed including the average colour of the sample, average grain colour, and average background colour. From analysis of the descriptors



Wood or wood-veneered furniture can be found in most homes.

and comparison with the target colour required a colorant formulation can be calculated.

The system will learn as it develops and should significantly reduce the time to reach the optimum formulation, producing savings in both time and money.

Solid benefits

By providing significant cost reductions for furniture manufacturers, the system could further increase European competitiveness in the global furniture market. The device will eliminate highly labour intensive and monotonous inspection tasks in the production process and reduce the exposure of workers to potentially hazardous environments. Operator stress and error caused by the need for great attention to detail and raw material variability will also be avoided, and waste from rejected wood panels will be reduced, along with the total amount of dyes used in production. Both these benefits will assist sustainable production objectives. In addition, it is estimated that cumulative profits from the sales of the Colormatch expert system could reach €6.5 million within four years of the — project's completion.

Project title

Development of an expert system for the colorant formulation in the dyeing process of veneer in furniture industry (COLORMATCH)

Contract number

CT-2004-508312

Duration

24 months

Global project cost

€ 944 000

EC contribution

€ 487 000

"The system will reduce both waste and costs for the industry."

Contact person

Mr Jokin Zubizarreta
Indústrias Químicas Iruena S.A.
Carretera de Tolosa, s/n – Apdo. 30
20730 Azpeitia (Gipuzoka)
Spain
Tel: +34 943 15 7099
Fax: +34 943 81 0911
jokin@irurena.com
www.irurena.com

Participants

- 1 Indústrias Químicas Iruena SA (ES)
- 2 3h-Lacke Lackfabrik Hammen GmbH & CO. KG (DE)
- 3 Alberto Mora Galiana SA (ES)
- 4 Camila Moveis Indústria de Mobiliario LDA (PT)
- 5 Cidemco – Centro de Investigación Tecnológica (ES)
- 6 Institut für Holztechnologie Dresden GmbH (DE)
- 7 Metrotec SA (ES)
- 8 University of Leeds (UK)
- 9 Wessendorf Oberflächentechnik GmbH (DE)



Colorants can change the appearance of the wood.



“This approach will provide a simple, economic, robust solution.”

The application of thermal coatings is a well-established industrial practice and the performance of any coating depends to a large extent on its quality. While the quality of both the materials and the process can be quantified and assured, stability throughout the sometimes lengthy spraying processes required for particular products can be difficult and expensive to monitor. The Desire Co-operative Research project aims to provide a simple, effective, robust and economical system for SMEs in this field to use and manufacture. The participants will ensure that existing technology can be transferred, adapted and tested to meet the specific requirements of the industry.

Thermal coatings are used to provide protective surfaces that extend the life of components operating in hostile environments, such as aerospace turbine engines subjected to high temperatures, prosthetic devices implanted in the body, and oil and gas rig components that have to withstand erosion, corrosion and abrasion. These coatings offer resistance to wear, corrosion, and heat, as well as creating surfaces with specific characteristics like electrical conductivity. Thermal spraying produces a continuous coating by melting or softening the coating material into droplets then projecting it on to the substrate at high velocity. The processes currently in use include Low Pressure Plasma Spraying (LPPS), High Velocity Oxy Fuel Spraying (HVOF) and Arc Plasma Spraying (APS) amongst others. The parameters controlling the quality of the end result concern the spray gun, the material feed, the spray stream (plasma or flame), and the substrate.

In order to compete economically and meet the industry's stringent quality demands, SMEs need a cheap, robust and reliable means of guaranteeing the stability of the coating process. To achieve this, the Co-operative Research project – Development of Simple and Reliable on-line Monitoring Equipment for Thermal Spraying Control (Desire) – has been set up. SMEs engaged in the application of coatings and the manufacture of coating equipment, along with a technology transfer institute, are collaborating with university researchers who are investigating how technologies not previously employed in this field can be adapted to address current industrial specifications.

Suitable systems

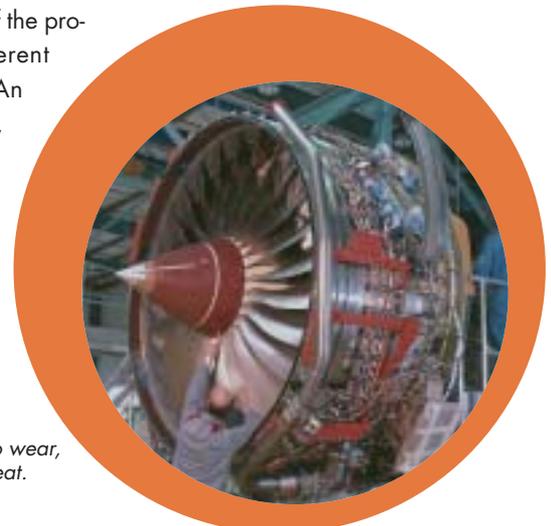
Coating performance is largely dependent upon its quality, so the provision of high-quality coatings is a priority for all thermal spray companies. Advanced control systems are available to monitor and control the primary input parameters, thereby ensuring reproducible conditions. However, such systems do not present a comprehensive control system, nor are they particularly well-suited for small and medium-sized enterprises (SMEs). Measurement of physical parameters – such as the velocity, and temperature of the powder particles – requires complex instrumentation, making the systems expensive and complicated to use. More importantly, they are ineffective at monitoring the stability of the spray process, and high-quality applications require processes that take four to six hours

of continuous spraying to complete. Changes due to damage or wear in the nozzle, problems in the feed lines, or gas leaks, all of which have a crucial impact on the quality of the finish, may remain undetected.

In current procedures, maintaining the procedure's stability comes down mainly to the operator's powers of observation and experience. This is difficult and impractical to maintain during a long spraying process, as is ensuring consistency over the weeks and months that the spraying equipment may be in use. So, the Desire project will aim to develop a reliable, simple, cost-effective, and robust control system that can be integrated easily into existing spray cells to monitor the stability of the procedure.

Quality performers

The participants in the project team will cover all aspects of the system's development, from research through to testing then manufacture. The Inasmet foundation in Spain, acting as project coordinator, is involved in technology transfer. Italy's University of Firenze is responsible for the initial development of a lab-scale prototype of the system which will be tested by three thermal spraying SMEs in Germany, Italy and the UK. Between them, these companies cover an extensive range of processes and products including those exacting the most stringent quality requirements, such as turbines and aeronautical components. They will calibrate and evaluate the performance of the prototype in different applications. An Italian company, Artec, which manufactures



Thermal coatings offer resistance to wear, corrosion, and heat.
© Airbus

"The philosophy of this approach is stability."

spraying equipment, will also assess the prototype with a view to incorporating it into existing equipment, and will ensure it is economical to manufacture and use. Finally, the University of Firenze will refine the original prototype according to the results of the testing procedure.

The development of this control system will provide a solution to one of the most significant problems currently facing SMEs in the thermal spraying industry – that of guaranteeing the stability of their processes. The resulting system will provide an affordable and easily implemented solution even for small spray companies or workshops, enabling them to improve the overall quality of their coatings. This, in turn, will increase the SMEs' efficiency and competitiveness and ultimately yield economic benefits to those involved in all stages of the procedure.

Project title

Development of Simple and Reliable on-line Monitoring Equipment for Thermal Spraying Control (DESIRE)

Contract number

CT-2004-508320

Duration

24 months

Global project cost

€ 1 098 000

EC contribution

€ 597 100

Contact person

Mr Ignacio Fagoaga
Fundacion Inasmet
2 Mikeletegi
20009 San Sebastian
Spain
Tel: +34 94300 3700
Fax: +34 94300 3800
ifagoaga@inasmet.es
www.inasmet.es

Participants

- 1 Fundacion Inasmet (ES)
- 2 Artec Sas Di Coppelletti Girolamo E C. (IT)
- 3 Consorzio Interuniversitario Nazionale Per La Scienza E Tecnologia Dei Materiali (IT)
- 4 Monitor Coatings Limited (UK)
- 5 Putzier Oberflächentechnik GmbH (DE)
- 6 Turbocoating S.P.A. (IT)



The HVOF system and monitoring device prototype.

© Inasmet



“The number of people who actually have to handle potentially contaminated sharp instruments will be significantly reduced.”

The challenge for the Co-operative Research project Disblade is to develop a new type of disposable surgical blade. There is a pressing need for disposable blades as a result of the dangers of contamination by the ‘prion’ pathogens, responsible for Creutzfeldt-Jakob disease, which can only be destroyed using expensive specialised sterilisation procedures. The new polymer-based blades must meet the exacting specifications required to match conventional steel scalpels. The project is also developing a safe disposal system to blunt each blade immediately after use. Commercial exploitation of the system will make the project an effective business proposition for all partners, displacing currently imported products.

One of the most prominent health stories of recent years has been the discovery that infectious proteins known as prions (proteinaceous infectious particles) are responsible for Creutzfeldt-Jakob disease (CJD) in humans and bovine spongiform encephalopathy (BSE) in cattle. An outbreak of BSE, popularly known as ‘mad cow disease’, brought the dangers of prion diseases to the notice of the European public.

One of the biggest problems with such diseases is that the infectious particles are resistant to the conventional procedures used to sterilise surgical blades and tools. This has generated widespread concern about the dangers of transmitting fatal diseases such as CJD by the reuse of surgical instruments. Effective destruction of prions requires expensive specialised sterilisation processes. Consequently, there is great interest in developing cost-effective methods for making disposable instruments.

The disposable instruments that exist today are of low quality, still rely on steel blades, and are not popular with surgeons. The primary objective of the Disblade project is to develop an automated and economically viable method to prepare disposable surgical blades that can match steel blades in the key criteria of sharpness, surface hardness and stiffness. A second objective is to develop a disposal system based on fast heating of the blades, to render them blunt and suitable for straightforward disposal without any remaining danger of sharp injuries and the associated risks of contamination. Use of this system within the operating theatre, immediately after use, will ensure contaminated sharp blades never leave that controlled environment.

High-value partnership

The Disblade partners are a consortium of five SMEs in Ireland, Denmark, UK, Italy and the Czech Republic, working with one large enterprise (Rosti AS of Denmark) and two RTD performers (Pera Innovation Ltd, UK and The National Institute of Technology of Norway). This structure will allow the innovative technology to be channelled through a trusted and large-scale supplier to the general medical market. The SMEs (small and medium-sized enterprises) have expertise in medical instrument design, moulding technology and machinery, and sterilisation techniques. But these small specialised companies would find it difficult to bring a new

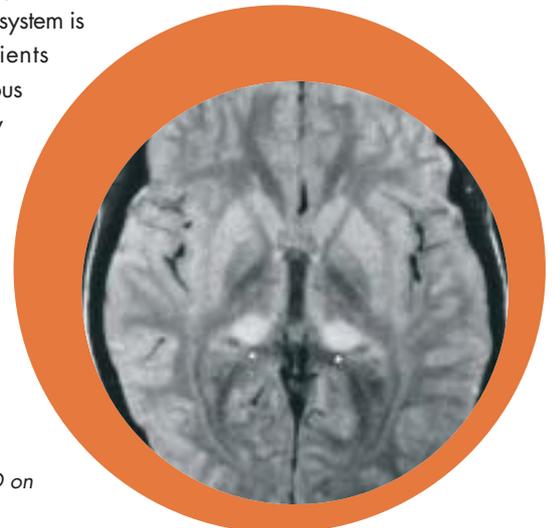
innovation to the mainstream European and global market if they had to do so on their own. While the SMEs gain the marketing benefits of working with Rosti AS, this larger partner gains the advantage of direct access to the combined talents and ideas of several SMEs spread across Europe.

By working together as part of a Co-operative Research project, the partners hope to produce a new high-value and high-technology product, which is exactly the sort of thing the European Union needs to compete successfully against the low-labour-cost countries. Without EU assistance, getting the system developed could prove much more daunting.

Midway through the project, the partners have already proven the principles of their system, but are working to optimise it and to achieve the most useful and appealing product designs.

A lasting impact

The long-term hope of the Disblade partners is that the system they are developing will bring a higher level of routine safety into the surgical procedures used across Europe. At present, the costs of the sterilisation processes that are effective against prions mean that they are not widely used. They can only be justified for specific procedures or for patients who have been previously identified as ‘high-risk’ as regards prion contamination. The problem with such a selective system is that some patients carrying infectious prions inevitably slip through the net.



The effects of CJD on the human brain.

"It is difficult for SMEs to launch a new product, but working with a large commercial partner gives us our route to market."

The prion-based diseases are not easy to detect, and may exist undiagnosed in many people, or may be discovered only after a patient's death or many years after they have undergone surgery. The system Disblade is developing should allow disposable blades to be used in most or even all operations, removing the need for doctors to make 'judgement calls' about whether specialised procedures are necessary.

If the system for manufacturing and disposing of surgical blades proves successful, there is potential for the same basic procedures to be used to develop a wider range of disposable surgical instruments.

In addition to providing a technologically improved product, the success of the project will allow European companies to displace a significant amount of medical technology that is currently imported into the EU. The total value of imported medical technology and devices is €9.8 billion per year, and a successful Disblade project could displace at least 0.1% of that. The partners hope to provide automated disposable surgical blade manufacturing systems with a value of at least €6 million per year.

Project title

A new concept for the Hardening of Polymers allowing the Production of Disposable Surgical Blades Preventing the need for Sterilisation (DISBLADE)

Contract number

CT-2004-508225

Duration

24 months

Global project cost

€ 1 251 570

EC contribution

€ 640 222

Contact person

Dr Jo Love
Pera Innovation Ltd
Pera Innovation Park
Nottingham Road, Melton Mowbray
Leicestershire LE13 OPB
United Kingdom
Tel: +44 1664 501 501
Fax: +44 1664 501 556
jo.love@pera.com
www.pera.com

Project website

www.disblade.com

Participants

- 1 Clare-Pak Ltd (IE)
- 2 A/S Kenneth Winther-Vaerktojsfabrik (DK)
- 3 Clinipart Ltd (UK)
- 4 Fedegari Autoclavi SpA (IT)
- 5 Mapro Spol S.R.O. (CZ)
- 6 Pera Innovation Ltd (UK)
- 7 Rosti AS (DK)
- 8 Stiftelsen Teknologisk Institut (NO)



Reusable surgical equipment brings risks of contamination.



"The dream is that our system will really assist doctors to take good decisions."

Cardiovascular disease, which affects the heart and the circulatory system, is both complex and very common in Europe. Information from a wide variety of tests must be considered when diagnosing cardiovascular problems, choosing the best treatment and predicting the likely outcome of any intervention. The Disheart Co-operative Research project is developing a computer-based decision support system to collate image data on a patient's condition and allow doctors to identify the problem and choose the best course of action. The project draws on the expertise of SMEs specialising in software and medical hardware, and the academic and medical know-how of universities, hospitals and an engineering research organisation.

Cardiovascular disease (CVD) is the main cause of death and of years of life lost from early death across the EU and the wider European continent. Heart disease, strokes and other forms of CVD impose a huge burden on the healthcare systems of all EU Member States. There is therefore great potential for any innovations in this area to have a significant medical and socio-economic impact.

Clinicians assessing a patient with CVD have a wide range of complex techniques at their disposal, including magnetic resonance imaging and ultrasound echocardiograms. The objective of the Disheart project is to develop a new computer-based system to collect and integrate the available clinical image data and present the results in a form that can help both diagnosis and treatment.

The key inputs to the new decision support system (DSS) will be the raw medical images from all the available techniques. The system will analyse and manipulate these images using simulation tools and artificial intelligence techniques. The artificial intelligence process will include a decision-making procedure that can be educated to respond to the unique data flowing in from each particular patient. The end result will be computer-generated images and animations of a patient's cardiovascular system, which can highlight problems and predict the outcomes of different treatment options.

As the DSS will require considerable computational resources, the partners are investigating the use of grid computing technology in which a group of small computers at different locations can work together as part of a single computational network. Many scientific modelling and simulation projects are discovering that grid computing can be a highly effective way to utilise the combined computing power of large numbers of isolated computers.

Core group

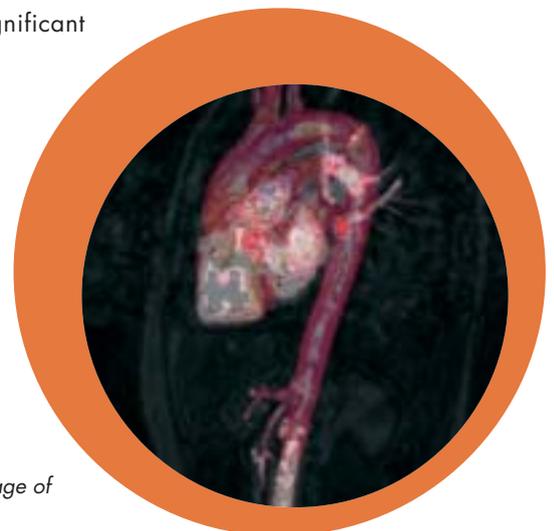
The Disheart project is a partnership of four SMEs (small and medium-sized enterprises), a non-profit research organisation, four universities and a large hospital. The two Spanish SMEs – Compass Ingeniería y Sistemas and Quantech ATZ – are software specialists. The other two small companies, Endoart from Switzerland and Heart Core of the Netherlands, produce hardware tools for the medical sector. University teams from Spain, France, Austria and the

US contribute a wealth of academic experience in the medical and computing fields. CIMNE of Spain, an engineering research organisation, is adding its experience in numerical analysis in a wide range of fields from engineering to medicine.

Some of the necessary decision-making systems are being developed using experience gained by CIMNE in previous applications designed to assess the dangers of flooding. The project is therefore a good example of the transfer of know-how across very different disciplines. Another interesting aspect of Disheart is the involvement of a US academic partner – George Mason University of Virginia.

Healthy prospects

The four SMEs in the Disheart project hope to develop good long-term business opportunities in addition to participating in an important medical advance. In selling the software-based DSS system resulting from the project, along with the hardware tools and kits to support the clinical interventions the system decides are appropriate, these SMEs will also contribute to improving the efficiency of European healthcare. CVD is currently costing the EU an estimated €64 billion per year in lost productivity and the cost of informal care, out of a total annual cost of CVD in the EU currently estimated at €169 billion. Few medical conditions can rival CVD in their relevance to the medical and socio-economic health of Europe, and likewise few areas have such potential for new developments and improvements to make a significant impact.



Angiography image of heart and aorta.

"This work can be both a business and a scientific success."

Disheart began in November 2004 and will run for two years. At the end of the project the partners expect to have a working system that can select a region of the body and be 'educated', by the input of data from many patients, to respond to different scenarios that might unfold in a particular patient. It should be able to analyse data sent in from patients regardless of their location, and predict how each patient's condition might respond if left untreated, or if treated in various alternative ways. Whenever a doctor is presented with clinical data from one patient that falls within the range of cases already studied by the system, the DSS should allow that doctor to anticipate what may happen next and thus decide if it is best to intervene with surgery or drugs.

A successful project will lay the foundations for these complex analyses to become a familiar part of CVD diagnosis and care. Having developed a system focused on CVD, the lessons learned may also be applicable to other conditions, and to various complex systems outside the realm of medicine.

Project title

Grid based decision support system for clinical diagnosis and Interventions in cardiovascular problems (DISHEART)

Contract number

CT-2004-513226

Duration

24 months

Global project cost

€ 1 923 500

EC contribution

€ 1 069 750

Contact person

Prof. Eugenio Oñate

Centre Internacional de Metodes Numerics en Enginyeria

Edifici C-1, Campus Nord UPC

Gran Capita, s/n

08034 Barcelona

Spain

Tel: +34 93 205 7016

Fax: +34 93 401 6517

onate@cimne.upc.edu

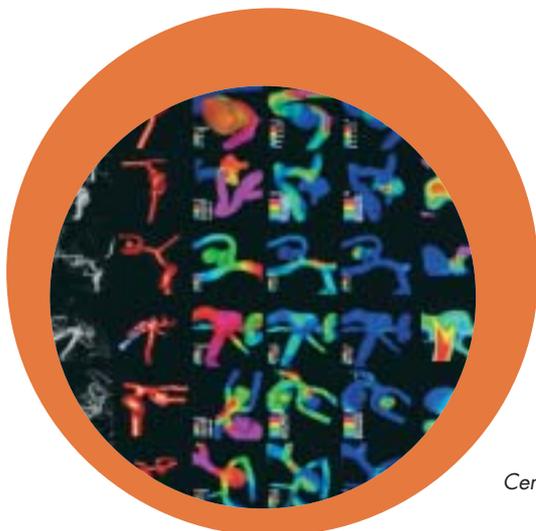
www.cimne.com

Project website

www.cimne.com/disheart

Participants

- 1 Centre Internacional de Metodes Numerics en Enginyeria (ES)
- 2 Compass Ingenieria y Sistemas SA (ES)
- 3 Endoart SA (CH)
- 4 George Mason University (US)
- 5 Heart Core B.V. (NL)
- 6 Hospital de Santa Creu I Sant Pau (ES)
- 7 Quantech ATZ SA (ES)
- 8 Technische Universitaet Graz (AT)
- 9 Universidad de Zaragoza (ES)
- 10 Université Joseph Fourier Grenoble 1 (FR)



Cerebral aneurysm.



“The collaboration means we can effectively meet the market requirements for precision and ease of use.”

Eye Tracking Devices provide valuable information about drivers, pilots and website users, among others. The Drivesafe Co-operative Research project offers those SMEs involved in these sectors the opportunity to develop, manufacture and use a high-tech tool with applications in a wide variety of fields.

Adding contributions from researchers exploring human-machine interfaces and eye physiology to the existing technology ensures that the device not only meets the highest technical specifications but that it is also easy to use.

At first sight there appears to be little in common between the activities involved in driving a car and those for surfing the web. But in both cases, monitoring the eye movements of the person behind the wheel or in front of the computer screen provides invaluable information about the performance of the driver and the website. Eye movements, the rate at which they move, the time they rest or gaze, and the paths they follow – as well as the activity of the eyelids and the position of the head – reveal not only how tired a driver may be but also how he or she is reacting to the vehicle, its occupants and the traffic conditions. The activity of the eyes as they scan web pages indicates which items attract, or fail to attract, the degree of attention and, consequently, how effectively and profitably a website behaves.

Focus on expertise

A diverse consortium of participants in the Drivesafe project are collaborating to develop, test, manufacture, market and use an Eye Tracking Device (ETD) that is highly functional, easy to use and readily applicable to different fields of interest and difficult environments.

The technology already exists. One partner SME (small and medium-sized enterprise) – the German Kayser Threde – has already developed an ETD for NASA (the National Aeronautics and Space Administration) which, although highly functional, is limited in scope to the conditions experienced in space. It is not adapted to work in an environment disturbed by external luminosity, weight does not pose a problem, and it is unable to record or analyse the external environment. Kayser Threde will be responsible for the hardware of the new 3-D device, but the design will be enhanced by the involvement of two research institutes in the Drivesafe project.

EURISCO (the European Institute of Cognitive Sciences and Engineering, France) is contributing to the specifications of the human-machine interface, and INRIA (Institut National de Recherche en Informatique et Automatique) is providing input relating to the physiological aspects of eye movement. Software to analyse the results is being developed by a German SME, Media Score, while a French SME, One-too, will handle manufacturing and production issues.

The breadth of expertise amongst the collaborators in these various fields will ensure that the final apparatus will more than adequately meet the market demands for precision of movement detection, frequency of data acquisition and analysis, and comfort.

Seeing is believing

As part of this collaborative design and development project, the device will be applied and tested in three particular industries, one of which is aeronautics. Two partners, Siemens and Airbus, will assess its use in simulators to investigate the behaviour of pilots and the design of aircraft control panels. The automotive industry offers a huge potential for the device with the growing interest in, and need to understand, driver behaviour and attentiveness in particular. Here the device can be employed both in simulators and real road situations to evaluate factors affecting the driver inside and outside the vehicle. A camera can record the surrounding environment enabling researchers to determine exactly what is attracting a driver's attention when he or she moves their eyes to the left or right. Eye-tracking tests can provide data to improve the layout of the dashboard and the design of alert systems and warnings.

The multimedia industry can also use these techniques to analyse the effectiveness and usefulness of a website. It is crucial that a user can find the information being searched readily and thereby achieve his or her objective in visiting the site. If they cannot locate what they are looking for, even when it is there on the screen, visitors to the site will simply go elsewhere and potential busi-



ETD system unit and head unit.

"It provides an opportunity for SMEs to enter new domains."

ness will be lost. SMEs that design and test the usability of sites will take part in the assessment of the final product. In addition, the ETD will be of value to any laboratory or agency seeking a better understanding of human behaviour through the action of the eyes. The design concept of the device will make it easily adaptable to a variety of fields without the need for customisation.

The breadth of application of this device presents significant potential to the SMEs participating in its development and testing. It provides them with access to new sectors, opening up business opportunities that would otherwise be difficult to break into. The ultimate beneficiaries of this project, however, are EU citizens who drive cars, travel in planes or use the internet to book the tickets or plan the trip. Driver hypo-vigilance is an important cause of accidents, and it is estimated that 10-20% of all accidents on EU roads are related to driver fatigue. A better understanding of this phenomenon alone will yield benefits for all road users in Europe and beyond.

Project title

Development of 3-D Eye tracking device for safer driving and more efficient Web Page production (DRIVESAFE)

Contract number

CT-2004-508280

Duration

24 months

Global project cost

€ 1 879 720

EC contribution

€ 973 908

Contact person

Mr Daniel Nowacki
One-Too S.A.
1, Zac de St Estève
06640 St Jeannet Les Plans
France
Tel: +33 4 92 12 0480
Fax: +33 4 92 12 0201
dnowacki@one-too.com
www.one-too.com

Participants

- 1 One-Too S.A. (FR)
- 2 Airbus SAS (FR)
- 3 Area 17 AB (SE)
- 4 Eurisco International (FR)
- 5 Incordia AB (SE)
- 6 Institut National de Recherche en Informatique et en Automatique (FR)
- 7 Kayser-Threde GMBH (DE)
- 8 Mediascore Gesellschaft Fuledien-Und Kommunikationsforschung MBH (DE)
- 9 Multimedia LTD (RO)
- 10 Plan B Media GmbH (DE)
- 11 Siemens Vdo Automotive SAS (FR)



Testing in progress on the ETD head unit and face mask.



“Improving the management of relationships within a distribution network will help SMEs compete in the global market.”

Industrial small and medium-sized enterprises (SMEs) which sell complex products to a global market need a robust and responsive distribution network. These companies often rely on third parties, such as commercial distributors and agents, to sell their goods abroad. Unfortunately, this approach can lead to weaknesses in the distribution network because the relationship between agent and SME is not always particularly strong or well supported. A Co-operative Research project called DRM – Distribution Networks Relationship Management in Industrial SMEs – intends to address this situation by creating a business model and software application which will improve the management of distribution networks.

Selling complex products such as industrial machinery to foreign markets is quite a challenge for export-orientated SMEs. Their distribution networks must do more than simply deliver goods to the customer. Issues like training and installation have to be addressed – and complex products often have to be tailored to the particular needs of a customer. In a domestic market, SMEs tend to look after these issues themselves, but when exporting they rely heavily on independent distributors.

Product complexity often requires a level of knowledge that distributors simply do not have. This problem can put a strain on the management of relationships within distribution networks, leaving customers unhappy with the service they receive. A distributor’s lack of knowledge and understanding can also have a knock-on effect at company headquarters, as SME managers fail to receive feedback that could help them solve problems and innovate their products.

Strategic solutions

The DRM project brings together three research performers, seven exporting SMEs from Germany, Italy and Spain, and two service SMEs responsible for the dissemination and exploitation activities. They aim to develop a business model and software tool that can optimise the management of relationships within distribution networks. The project SMEs will be able to commercialise and exploit the results using their own business strategies.

The work will cover three major processes that are crucial to building strong links between a company and its distributor. The first concerns the flow of knowledge and information relating to a product, and will involve the Co-operative Research team in the creation of technical, marketing and training material, as well as providing details about competitors and their products. DRM will also examine the sales and commercial process and look for ways to make it run more smoothly for all parties. In an attempt to bring more clarity to the after-sales and technical assistance processes, the project will establish technical assistance protocols that will make it easier to collect and analyse customer complaints and related distribution problems.

Industrial small and medium-sized enterprises (SMEs) which sell complex products to a global market need a robust and responsive distribution network. These companies often rely on third parties, such as commercial distributors and agents, to sell their goods abroad. Unfortunately, this approach can lead to weaknesses in the distribution network because the relationship between agent and SME is not always particularly strong or well supported. A Co-operative Research project called DRM – Distribution Networks Relationship Management in Industrial SMEs – intends to address this situation by creating a business model and software application which will improve the management of distribution networks.

Agile tools for the job

The project has set itself the challenge of devising an optimum business model for the management of the relationships throughout a distribution network. Based on that model, the project will identify data and knowledge from all actors in the distribution network – and examine how such information flows to and from a company and its distribution network. DRM will concentrate on collecting information on products and after-sales service, along with details about customers and markets. Based on this groundwork, DRM is developing a software tool which will be installed and tested by seven of the consortium’s SMEs. Rather than being built from scratch, the software platform will be based on existing technology. This should guarantee a high level of usability as companies will find it relatively easy to familiarise themselves with a system that shares many of the characteristics of commercial off-the-shelf software products.

The project team is also committed to designing and developing a low-cost solution. Keeping the installation costs down, and ensuring that implementation and maintenance costs are also low should provide the SMEs with an attractive package. Access to the software can be adapted to the internet or through a company extranet. The entire user environment should therefore be familiar to company employees and system administrators. Nothing like the DRM model currently exists to help SMEs improve the management of their distribution networks.



DRM's business model and software will make it easier for firms to manage relationships throughout their distribution network. Getting this issue right will lead to an improvement in SME competitiveness. DRM can help by providing better access to technical information relating to a product that is being distributed abroad. And there is little doubt that a firm that is in better control of its distribution activities will make better commercial decisions and improve coordination and team working. In time, these greater efficiencies should lower distribution costs and boost a firm's market-place reputation for reliability and responsiveness.

According to the DRM partners, companies that keep a tight grip on their distribution strategies and services are more agile and better able to adapt to market forces. In the long term, improving distribution networks will provide customers with a better service, allowing the project SMEs to retain contracts and to generate new sales.

Project title

Distribution networks Relationship Management in industrial SMEs (DRM)

Contract number

CT-2004-508101

Duration

18 months

Global project cost

€ 1 334 571

EC contribution

€ 691 453

Contact person

Mr Aitor Alzaga
Fundación Tekniker
Apdo. 44
Otaola 20
20600 Eibar
Gipuzkoa
Spain
Tel: +34 943 20 6744
Fax: +34 943 20 2757
aalzaga@tekniker.es
www.tekniker.es

Project website

www.fundaciontekniker.com/drm/home.asp

Participants

- 1 Fundacion Tekniker (ES)
- 2 Aixonix GmbH (DE)
- 3 Bett Sistemi SRL (IT)
- 4 Bombas Itur SA (ES)
- 5 Democenter – Centro Servizi per l'innovazione S.C.A.R.L. (IT)
- 6 Fraunhofer-Gesellschaft Zur Foerderung Der Angewandten Forschung E.V. (DE)
- 7 Miguel Carrera y Compania. S.A. (ES)
- 8 Ona Electroerosion SA (ES)
- 9 Ralph Zernisch Lichtaktive Flächen (DE)
- 10 RCM S.p.A. (IT)
- 11 Softec SL Software y Tecnologia (ES)
- 12 Tellure Rôta SpA (IT)



“The project includes the best people from lubricant producers to tool makers and the end-user.”

Over the last decade or so, many manufacturers, in particular the automotive industry, have moved to reduce energy and costs by replacing traditional materials like steel with lighter plastics and metals. Magnesium and magnesium-based hybrid materials are becoming increasingly popular as they combine high strength with low density. However, machining these materials presents major challenges in terms of quality and safety. Ecohyb brings together partners from along the machine tool supply chain to investigate best practice and improve methodologies for machining magnesium materials. The Co-operative Research project will benefit all stakeholders through better quality products and will open up new business opportunities.

In heavy manufacturing, efforts to save energy costs for industry and produce energy-efficient products for customers have led to the introduction of components made from lighter materials. In the automotive industry, the weight of a typical mid-range car has been considerably reduced by replacement of steel with aluminium and plastics. Today, magnesium and magnesium hybrid materials are attracting greater interest. These magnesium-based materials have a 33% lower density in comparison to aluminium and 77% compared to steel. Magnesium can also be formed into complex part shapes, while the hybrid materials have low weight combined with good strength and wear properties.

It is clear that vehicle and other manufacturers are looking to increase their use of magnesium-based materials in the coming years, in particular in larger auto parts that are moved around the assembly area. The favoured types of material include magnesium-aluminium (Mg-Al) hybrids and magnesium sintered metal hybrid constructions.

However, there are a number of issues relating to the safe and accurate machining of magnesium hybrid materials that must be resolved if the European metal machining industry is to be able to respond effectively to this market ‘pull’ and provide the services its customers demand.

A magnesium machine

Machining hybrid aluminium/magnesium components presents a number of difficulties. The two metals have different machining qualities and the machine tool parameters need to be adjusted when moving from one to the other to avoid quality discontinuity. Magnesium also has issues relating to fire and explosive safety during machining. This can either arise from the chipping or cuttings from the magnesium material itself or as a consequence of the chemical reaction of magnesium (abstraction of hydrogen) with the large amounts of cooling lubricant used.

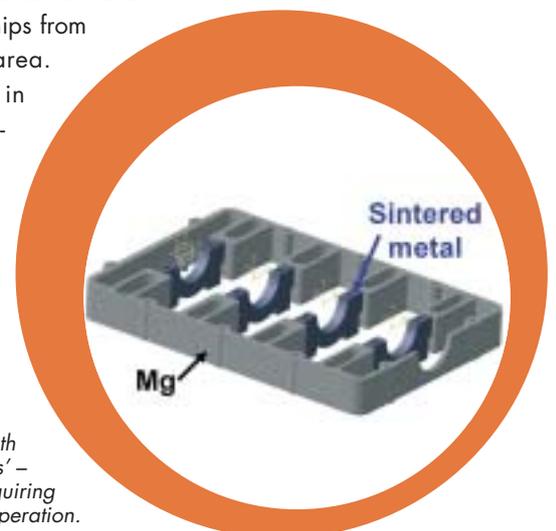
The Ecohyb consortium will develop a machine tool prototype that is capable of the safe machining of magnesium-based hybrid materials. In parallel, the project will optimise tools, machining strategies and develop appropriate cutting lubricants. Standards for minimum-quantity machining of magnesium-hybrid materials will also be set.

To achieve this, Ecohyb has assembled a project team possessing skills from a wide spectrum of the machine tool value chain. The Co-operative Research project is being coordinated by Profactor Produktionforschungs GmbH of Austria – an industrial research organisation. Other project members include a machine tool maker (Anger Anton in Austria), a cutting-tool manufacturer (Losconcz Mernoki, Hungary), a machine-tool lubricant producer (Brugarolas of Spain), two further research organisations (Budapesti Muszaki of Hungary and Fundación Tekniker of Spain) and a machine tool end-user (Protan Produktionstechnik).

Hot chips need special care

The specially designed machine tool must have inherent safety concepts, and specific lubricants are required to machine hybrid magnesium materials safely. In particular, sintered metal/magnesium hybrids will produce high-temperature sintered metal chips and highly flammable magnesium chips. The different cutting forces experienced by the tool as it moves between the different materials in a hybrid call in part for detailed investigations of the behaviour of the cutting tools, their cutting edges and various coating materials. In addition, the production of very stable machine tools is a prerequisite for the successful working of hybrid materials.

To avoid dangers of ignition, current technologies for machining magnesium use large amounts of cooling lubricants – oil or emulsions – that flush the hot chips from the working area. This results in additional hazards such as the possible



A magnesium engine casing with hybrid ‘half shells’ – two materials requiring one machining operation.

"It will benefit the machine tool firms and improve quality for their customers."

ignition of hot oil vapour or the release of free hydrogen – another flammable hazard. Ecohyb aims to make the machining of magnesium based hybrid materials an effective, safe and environmentally friendly process in the metal-cutting sector, using conventional cutting speeds as well as high-speed-cutting applications.

A successful conclusion to the project will provide a major benefit to the machine tool companies involved and the whole value chain. Assembling the know-how to build safe magnesium machine tools will require the incorporation of sensors for fire hazards and extinguishing systems, but the final outcome will be a tool that operates at optimum safety standards. It will incorporate the best practice in machining hybrid materials and improve the quality of the magnesium components produced.

This will be good news for the European automotive industry and its associated suppliers, enabling it to source the best quality components from its traditional suppliers. There should also be 'knock-on' effects for drivers, society, and the environment – magnesium parts make lighter vehicles which consume less fuel and produce less emissions per kilometer travelled.

Project title

Ecological and Economical Machining of Magnesium based Hybrid Materials (ECOHYB)

Contract number

CT-2004-508452

Duration

24 months

Global project cost

€ 1 393 951

EC contribution

€ 750 620

Contact person

Mr Franz Obermair
Profactor Produktionsforschungs GmbH
Im Stadtgut A2
4407 Steyr-Gleink
Austria
Tel: +43 7252 885 204
Fax: +43 7252 885 101
franz.obermair@profactor.at
www.profactor.at

Project website

www.ecohyb.com

Participants

- 1 Profactor Produktionsforschungs GmbH (AT)
- 2 Anger Anton Gesellschaft mbH (AT)
- 3 Brugarolas SA (ES)
- 4 Budapesti Muszaki es Gazdasagtudomanyi Egyetem (HU)
- 5 Fundación Tekniker (ES)
- 6 Losonczi Mernoki, Szolgaltato es Kereskedelmi Kft (HU)
- 7 Protan Produktionstechnik GmbH & Co KG (AT)



Vehicle makers like BMW are using more magnesium components.

© BMW AG



“The Eco-Soil method is an innovative, simple and economical technology for the on-site, in situ removal of all kinds of hazardous substances.”

Across the world there are numerous sites where the ground has been contaminated by harmful substances such as hydrocarbons and heavy metals. The usual way to deal with these scars of industrialisation is excavate and remove polluted soil before treatment off-site. But this can be costly and very difficult if the contaminated land is either around or underneath buildings or other structures. A Co-operative Research project has set out to harness new methods that will make it possible to remove poisons from soil without the need for excavation. Eco-Soil promises a low-cost solution that can be used to tackle a variety of contaminants in awkward and sensitive locations.

Finding innovative ways to remove toxic substances from land has become a priority because of the threat they pose to the environment and to human health. But the high cost of excavation and removal can mean that some sites simply cannot undergo remediation. And if contamination is under a building, for example, it may not be possible to remove the soil at all. In certain circumstances it may be necessary to knock down a structure before excavation and treatment can be carried out. Also, some sites may be too remote or difficult to reach with large vehicles and digging equipment. And removing contaminated land from a site can have a detrimental environmental impact as soil often has to be transported long distances either for treatment or to be dumped in a landfill.

Testing times

The Eco-Soil project aims to devise and use innovative processes that will make it possible to carry out on-site decontamination of soils at much lower costs and with a greater flexibility than is possible with conventional techniques. The Eco-Soil method will use a small machine to drill a number of horizontal holes into a contaminated site. Then, suitable (bio)sorbents – essentially these are materials that absorb the harmful substances – are applied through the holes into the soil. After a certain time period, the decontamination system would be removed from the soil and the (bio)sorbent recycled for further use. Work will be carried out to examine the different hydrological conditions such a system may have to face so that it can eventually be applied to a wide range of soil types.

The research team is pooling know-how and expertise from several EU countries including Germany, the UK, Sweden, Poland and Finland. It is made up of ten institutes and SMEs (small and medium-sized enterprises) with specialist knowledge and understanding of land-contamination issues and waste-treatment technologies. They are using a site in Sweden to test and perfect the Eco-Soil method – it used to house a chemical plant and is polluted with chlorinated hydrocarbons and mineral oil hydrocarbons. The project will develop and test the appropriate (bio)sorbents to tackle the contamination – they are currently looking at substances such as activated carbon, special clays, and pine bark. Meanwhile, the Eco-Soil drilling system will be tested using different bores and pipe sizes, and then built so it can position the (bio)sorbents in the soil at the Swedish site. The team will also examine the value of using pressurised air and water to help the (bio)sorbent absorb into the soil.

Buried bonus

If successful, the Eco-Soil method could easily be adapted to deal with different soil types and different contaminants. The Co-operative Research team aims to create a patented product that will have a practical and commercial application in a variety of settings. It will be possible to use the Eco-Soil drilling platform in awkward places where it is very difficult to remove soil. For example, mineral oil contamination could be removed from soil underneath an airport runway without having to dig up the tarmac. This would allow the airport to continue operating with minimal disruption. Petrol stations could also benefit from the project outputs – pollution could be extracted from underneath a station forecourt without closing down the pumps.

The Eco-Soil method will certainly mean lower costs for those who are responsible for cleaning up contaminated land. At the moment it can cost anything between €25 and €400 per tonne to remove and treat contaminated soil using traditional methods of remediation. The cost depends on the type of soils and contaminant present at a site and the country where the work is being carried out. These prices do not include the cost to those organisations which may have to suspend their operations while treatment works are carried out using traditional excavation and removal methods. The innovative method could work out a lot cheaper, with treatment estimated to cost between €20 and €50 per tonne of contaminated land.



The ECO-SOIL drilling machine.

Green gains

From the environmental point of view, the project aims to remediate contaminated soils to the point where their vital functions can be restored. If it is to be environmentally effective, Eco-Soil must also avoid groundwater contamination and the spread of pollution through leaching. Success should make it easier and more economical to treat contaminated land at sites that were previously considered too difficult or costly to clean up. Eco-Soil should therefore become a significant tool to support European Union and national soil protection and environmental policies. Human health should also benefit if more land is freed from harmful substances which, if left untreated long enough, can make their way into the food chain and water supplies.

Project title

Innovative process for the on-site decontamination of soils (ECO-SOIL)

Contract number

CT-2004-508442

Duration

24 months

Global project cost

€ 1 243 514

EC contribution

€ 772 306

Contact person

Mr René Surma

Verein zur Foerderung des Technologietransfers an der Hochschule Bremerhaven e.V.

An der Karlstadt 6
27568 Bremerhaven

Germany

Tel: +49 471 9448 717

Fax: +49 471 9448 722

rsurma@ttz-bremerhaven.de

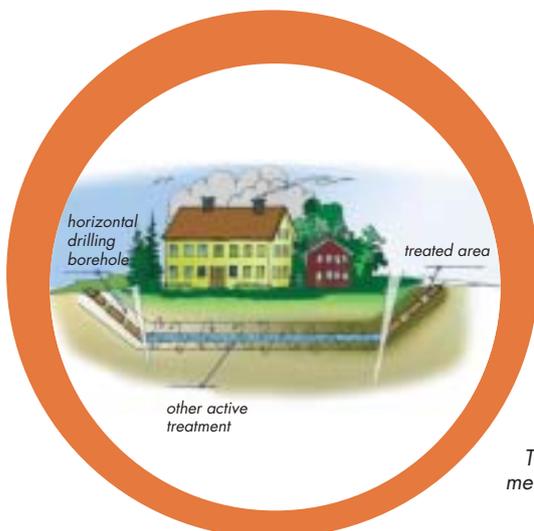
www.ttz-bremerhaven.de

Project website

www.ttz-bremerhaven.de/english/umwelt/projekte/ecosoil.htm

Participants

- 1 Verein zur Foerderung des Technologietransfers an der Hochschule Bremerhaven e.V. (DE)
- 2 Argus Umweltbiotechnologie GmbH (DE)
- 3 Envirotreat Technologies Ltd (UK)
- 4 Globe Water AB (SE)
- 5 Hydrogeotechnika Spolka z Ograniczona Odpowiedzialnoscia (PL)
- 6 Lannen Alituspalvelu OY (FI)
- 7 Linkoepings Universitet (SE)
- 8 Politechnika Warszawska (PL)
- 9 Stadspartner AB (SE)
- 10 Styrod Ingenjorsfirma AB (SE)



The innovative decontamination method in action.



“Energy efficiency could be boosted by 30%.”

European suppliers in the refrigerated appliance sector face fierce competition from low-cost base international competition. EU companies need to add value continually to compete effectively. The Elation Co-operative Research project brings together partners across the value chain in this sector in a bid to develop a new insulation material that can reduce energy use in both domestic and commercial refrigerating appliances. The development could significantly reduce the energy consumption and cost of running these appliances, thereby benefiting both appliance user and producer, whilst broadly reducing European energy demands. The system to be developed is a smart adaptation of vacuum-insulated panel technology.

Businesses across a number of sectors in Europe see a clear need for an ultra-high performance insulation material that is capable of significantly reducing the energy consumption of refrigerated appliances. Refrigeration is a vital element of the logistics supply chain from large cold stores to commercial display freezers via refrigerated vehicles and domestic fridges and freezers. Increasing the efficiency of ‘cold’ insulation could make a significant impact on European energy demand, and contribute to security of supply by reducing Europe’s reliance on imported energy.

Conventional insulation materials (such as expanded polystyrene foams) are inexpensive, but they do not provide the ultra-high levels of thermal insulation required to achieve significant energy reductions. Vacuum-insulated panels constructed using metallic barrier layers are the current state-of-the-art technology for high-performance thermal insulation. However, these panels suffer from significant disadvantages in smaller applications because of energy losses from ‘edge leakage’. This energy loss is even more pronounced in three-dimensional systems such as refrigerators.

Cool concept

The Elation project aims to develop an innovative ultra-high-performance, low-cost, lightweight insulation material. The insulation performance of this new system should match that of vacuum-insulated panels (i.e. 10 mW/mK) whilst achieving a cost that is comparable to conventional foam insulation. The overall aim of the project is to improve the energy efficiency of refrigeration equipment by 30%.

The new insulating material will be based on the vacuum-insulated panel concept but will overcome the problems associated with conventional panels by using an all-polymer-barrier layers system. As a bonus, innovation in the manufacturing process will produce insulation in three-dimensional forms with integrated thermal storage and a predictive time-temperature electronic system. This control system will be capable of ensuring that the lower levels of electrical energy consumed by the refrigerated devices using the insulation system will occur at off-peak times, thereby helping to further reduce the cost of running the equipment and easing energy demand.

Elation for SMEs

The project is particularly relevant to small to medium-sized enterprises (SMEs) in this sector as they are currently heavily exposed to issues related to globalisation of trade. Most international competitors in the sector have virtually identical insulation technologies to those in Europe and can compete on both quality and delivery times. However, because of low labour costs they have a significant competitive advantage. European SMEs need to continually innovate to differentiate and add value to their products. Elation is a perfect mechanism to bring together a European partnership with critical commercial mass and the leading research and technology capability to deliver an innovative system.

A successful outcome for Elation will allow the European partners in the consortium to grow their businesses by developing new products and services for a market that is looking for innovation – a market with total current sales of more than €6 billion per annum. This market consists of some 36 million domestic refrigerator sales per annum, 2 million commercial refrigeration units per annum, and around 100 000 refrigerated vehicles sold every year.

The consortium, led by Icelite Limited a UK SME involved in adapting and producing vehicles for refrigerated transport, includes a broad skill set from companies and organisations in the UK, Germany, Ireland and Spain. The main research effort will be undertaken by Pera International from the UK



*A vacuum insulation panel (VIP) using a novel barrier film developed by Elation.
© Elation consortium*

"The consortium is seeking a competitive edge through innovation."

and Fraunhofer-Technologie-Entwicklungsgruppe TEG in Germany, whilst specialist expertise on polymer barrier films, control systems and eutectic fluids will be provided respectively by Suedpack Verpackungen GmbH & Co of Germany, Convex Electrical Limited of Ireland, and Environmental Process Systems Limited of the UK. The VAC Company GmbH is a German vacuum-insulated panel manufacturer, and Faperin SL of Spain is a specialist tool-moulding company. The consortium is completed by Miele & Cie. Kg which brings considerable expertise in domestic refrigeration.

The partners need to achieve a variety of operational targets to ensure the objectives of the project are achieved. These include testing targets relating to insulation factors, cost base, system mass, vacuum sustainability, food safety standards, and standards for durability. Success will bring considerable reward to the consortium members and will be good news for energy efficiency in Europe as a whole.

Project title

An Ultra Efficient, Low Cost, Light Weight, Thermal Insulation Material to improve the Energy Efficiency of Refrigeration Equipment by 30% (ELATION)

Contract number

CT-2004-508404

Duration

24 months

Global project cost

€ 1 344 308

EC contribution

€ 642 420

Contact person

Mr Chris Warburton
Icelite Limited
Pendle House, Shuttleworth Mead Business Park
Padiham
Lancashire BB12 7NG
United Kingdom
Tel: +44 8707 707458 / +44 7795 844095
Fax: +44 8707 707459
chris@coolmove.co.uk
www.icelite.co.uk

Project website

www.pera.com/rndprojects/project.asp?typeID=10&projectID=62

Participants

- 1 Icelite Ltd (UK)
- 2 Convex Electrical Ltd (IE)
- 3 Environmental Process Systems Ltd (UK)
- 4 Fraunhofer-Gesellschaft zur Foerderung der Angewandten Forschung E.V. (DE)
- 5 IMT International SRL (IT)
- 6 Miele & CIE GmbH CO (DE)
- 7 Pera Innovation Limited (UK)
- 8 Suedpack Verpackungen GmbH & CO (DE)
- 9 The Vac Company GmbH (DE)



*A vacuum insulation panel (VIP)
using perlite as a filler.*

© Elation consortium



“Our system will allow the medical staff to work with more patients in the same amount of time.”

The Electroband project is developing a better way to promote the healing of chronic leg ulcers, which are a very common, debilitating and difficult to treat. This medical problem costs EU health authorities over €8 billion per year.

The Co-operative Research project’s innovation combines an improved compression bandage with an electrical muscle stimulation system to facilitate healing. After development and commercialisation, the partners expect to capture at least 5% of the European market share for the treatment of chronic leg ulcers. Commercial success on that scale would generate annually a saving of €2 billion on healthcare expenditure in the EU, in addition to the obvious benefits for patients.

Leg ulcers are breakages in the skin, often accompanied by significant inflammation, that are caused by poor blood circulation. They are particularly common in diabetic patients and the elderly, often becoming a chronic condition that is very difficult to treat. Typical treatment incorporates the application of a compression bandage around the wound, but achieving the correct tension requires skill and involves significant risk. If the bandage is applied too tightly the blood supply can be cut off. If the bandage is not sufficiently tight it will be ineffective and can fall off long before a patient is due the next visit from a nurse.

The Electroband project has two main objectives. The first is to develop a new type of bandage that will be more likely to exert the correct treatment pressure over a wide extension range. In other words, it will reduce the individual skill level required on the part of the person applying the bandage, because the compression will self-adjust within wide limits to an appropriate level. The second objective is to incorporate electrodes into the bandage to administer electrical muscle stimulation (ES), to promote the healing process. Specifically, stimulation of the calf muscle with around 340 volts at 1.8 milliamps appears to promote the regeneration of the wound tissue that is required for healing to begin, and be maintained.

The equipment to supply and control the power for the Electroband system will probably be about the size of a large textbook. This will make it small enough to be readily moved around, and taken by patients when they travel on holiday or on business. A typical treatment schedule might involve the system being used for a period of about a month, with the electricity being delivered at selected times each day, followed by a few months more during which a bandage alone would be sufficient. The key contribution of the ES process is to get effective healing under way.

From electronics to weaving

The diversity of the project partners naturally reflects the different challenges faced by the Co-operative Research project. The coordinator is Pera Innovation, a research and development organisation based in the UK. Other specialised research input comes from the National Institute of Technology of Norway. The knowledge from these research performers is being transferred to the SME participants, each of which also brings its own specific expertise.

Hc Electronics in the Czech Republic is an electronics specialist interested in moving into the medical market. It will make the electrical stimulation system. This involves some complex procedures because it must deliver a specific wave-form of electricity in order to penetrate the skin and promote healing without causing electrical burns or other damage.

Three UK-based SMEs (small and medium-sized enterprises) are working on the fabrication of the required bandage, or perhaps ‘Tubigrip’, material. Ladkin Hosiery has expertise relevant to the weaving of the material. Fibre Extrusion Technology makes equipment for extruding the chosen polymer into the yarn that will be used to make the bandage. Ormiston Wire of the UK will supply the electrical wiring and flexible electrodes that will need to be woven into the material in a way that is both robust and electrically effective.

Polykemi AB of Sweden are specialists in polymer technology and so are closely involved in the selection and manufacture of polymers used in the bandage fibres.

The partnership is completed by the large commercial enterprise Rosti AS of Denmark which manufactures and distributes medical equipment, among many other types of equipment. This company provides the partnership with a well-known and trusted name for the marketing and distribution of the new technology.



Chronic leg ulcers can resist treatment for many years.

"There is the possibility for a range of spin-offs into other applications."

Benefits and beyond

The healthcare savings achieved by this new technology will largely be due to reduced labour costs. Visits by healthcare staff to patients will become less frequent because the system will reliably maintain the correct pressure without needing to be checked so often. Also, the total time of treatment will be reduced due to the acceleration of the healing process. A 30% reduction in labour costs devoted to chronic ulcers could save the EU €2 billion per year.

There are also wider potential applications, in the medical sector and beyond. There is a growing interest in the possibilities for putting electrical equipment into clothing, for applications ranging from simple heating systems to complex electronics for military use. The experience the partners gain during the Electroband project will leave them well placed to become involved in these wider opportunities.

Project title

A Cost Effective Treatment For Venous Leg Ulcers Combining Novel Compression Bandage And Electrical Stimulation To Dramatically Reduce Healing Time. (ELECTROBAND)

Contract number

CT-2004-508242

Duration

24 months

Global project cost

€ 1 228 585

EC contribution

€ 624 580

Contact person

Mr Warren Pope
Pera Innovation Limited
Pera Innovation Park
Melton Mowbray
LE13 OPB – Leicestershire
United Kingdom
Tel: +44 1664 501 501
Fax: +44 1664 501 556
warren.pope@pera.com
www.pera.com

Project website

www.electroband.info

Participants

- 1 Pera Innovation Ltd (UK)
- 2 Fibre Extrusion Technology Ltd (UK)
- 3 Hc Electronics S.R.O. (CZ)
- 4 Ladkin Hosiery Ltd (UK)
- 5 Ormiston Wire Ltd (UK)
- 6 Polykemi AB (SE)
- 7 Rosti AS (DK)
- 8 Stiftelsen Teknologisk Institut (NO)



Achieving appropriate compression is critical.



“The third dimension makes a huge difference. We can place parts where we want them, and so avoid long connector lines.”

A major drawback of current printed circuit board (PCB) technology is that all the electronic components are located on the surface of the board. Building on its members' experience, a seven-strong consortium of SMEs is developing a completely new type of PCB that embeds some components inside the board. Short connections between these components enable electronic signals to move much more rapidly to the output. This could mean much faster PCs and other electronic devices. Production with the new process is also easier and cheaper, and has less impact on the environment. It is hoped the project will lead to a new start to the European electronics manufacturing industry.

To build ever smaller, faster, more powerful computers the PCBs that carry microprocessor chips will ultimately need to be redesigned. All the components in currently available PCBs are placed on the surface, connected by a maze of conductive material. The thin connecting lines on the tiny boards may run for many metres. Further reduction in the size of boards is limited by the need to maintain a minimum distance between these lines. If they are too close, electrical short circuits will occur. Another potential cause of short circuits is the soldering material itself, since it possesses a surface tension that induces balling at the edges of the lines. Even more of a problem than the lack of space on the boards is the slowing of the electronic signal as it passes from one component to another, due to the electrical induction generated in opposition to the signal's movement.

Now a German-led consortium has discovered a new way of embedding pre-manufactured and checked components into the board itself. The Embedded Micro Connector Injection (EMCI) process, developed by the company ITC Intercircuit, Munich, is completely novel. Since the design is 3-D, the connections between the parts can be made much shorter. Smaller and more efficient PCBs can therefore be made to do the same job. This is an ambitious project because although the concept is simple, it represents a major advance in electronics technology.

Pioneers

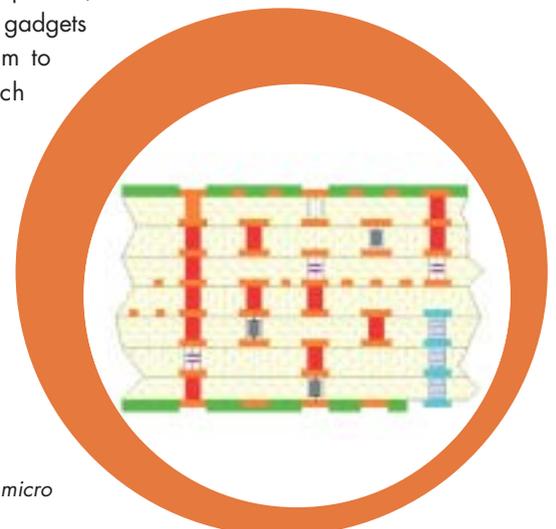
The small and medium-sized enterprise (SME) partners all hope to have radically new products by the end of the project. ITC Intercircuit, a producer of equipment for manufacturing PCBs, which had the original concept, aims to become the sole producer of the novel EMCI-injector used to produce PCBs employing the EMCI process. The Slovenian firm, KEKON, brings to the project its experience in the manufacture of very small capacitors and resistors for PCBs. Another SME, Feinwerkbau in Germany, makes sports guns that work with compressed air. The injector used to embed components into the boards is similar in some ways to the ones used in sports guns, and the company offers know-how in air compression technology related to the injection process. Its goal is the construction of the novel PCB injector, which will open up a second customer base for the company, entirely separate from its current business. Europrint, Belgium, a manufacturer of PCBs, is writing the design

software for EMCI process. This is a demanding task that draws heavily on its extensive research capabilities. Europrint will have the rights to the software developed, which it will be able to license out later to other companies.

There are three research partners. Budapest University of Technology and Economics is responsible for evaluating different types of PCBs that might be suitable for use with EMCI. Erlangen is discovering how to automate the process, because the injector has to be mounted on an automated machine that inserts the components in the right place in the PCB. At Ilmenau, researchers are examining the different components and how to make the right connections between them on the PCBs, including those actually embedded in the board itself. This means experimenting with very short connections for the first time.

New industry

Over the past five years or so, many producers of PCBs and ancillary equipment in both Europe and the US have had to close down in the face of competition from Asian countries, particularly China. These countries are able to make the boards more cheaply while maintaining the same high quality found in the West. The European industry needs to adopt new technologies that will give it the capacity to manufacture well-differentiated products. This is the hope for the new PCBs, which should enable PCs, cell phones, and other electronic gadgets containing them to operate much more quickly.



The principle of embedded micro components and micro connectors.

"This is a big technology advance, which could create a lot of opportunities for SMEs."

As might be expected, there are significant environmental and cost benefits when this technology is applied in mass production. The amount of material used is less, and fewer process steps and chemicals are required. This also makes manufacturing itself easier. The boards are smaller and comparatively cheaper to produce for the same functionality. Although confidentiality surrounds the early results of the project, these appear to be positive. The project participants hope to save about 40% of board area in the prototype PCBs and to reduce the signal rise time by about 50%. If everything goes according to plan, EMCI technology could eventually regenerate the European electronics industry and return it to its former glory.

Project title

A new process for the realisation of Electrical connections between the layers of printed circuit boards and a method to implant micro components using the proposed embedded micro connector injection process (EMCI)

Contract number

CT-2004-508172

Duration

24 months

Global project cost

€ 1 804 440

EC contribution

€ 1 365 040

Contact person

Mr. Hubertus Hein
I.T.C. Intercircuit Electronic GMBH
Wasserburger Landstrasse 280
81827 München
Germany
Tel: +49 89 4536040
Fax: +49 89 45360420
hubertushein@aol.com
www.itc-intercircuit.de

Project website

www.faps.uni-erlangen.de/emci

Participants

- 1 I.T.C. Intercircuit Electronic GMBH (DE)
- 2 Budapest University Of Technology And Economics (HU)
- 3 Europrint N.V. (BE)
- 4 Feinwerkbau Westinger & Altenburger GMBH (DE)
- 5 Friedrich-Alexander Universität Erlangen – Nürnberg (DE)
- 6 Kekon Ceramic Capacitors (SI)
- 7 Technische Universität Ilmenau (DE)

