



EUROPEAN
COMMISSION

Community research

Collective Research projects for SMEs Volume 3



HORIZONTAL ACTIVITIES INVOLVING SMEs

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30384	SustainAqua	Integrated Approach For A Sustainable And Healthy Freshwater Aquaculture
29743	TECH-SPRING	Improving Technical Performance Of Springs Through Scientific Understanding Of Dynamic Stress Profiles Utilising Advances In Software Design And Measurement Technologies
30234	TESS	Toolbox To Evaluate Sustainable Systems
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THE PERFORMANCE ENHANCING ADDITIVE

ADOPTIC

“Gone are the days when ceramics were only used for making table and sanitary ‘ware’.”

What do a digital watch and a soup bowl have in common? Well, nothing, at least at first glance. But with a more thorough look, we can find that common point: ceramic. Ceramic is quite visibly the main material used to make soup bowls, but it is more difficult to see that the tiny quartz crystal measuring time in watches is also made of ceramic. This example of two completely different objects shows how widely ceramics are used. To produce the various types of ceramic needed for the manufacturing of different products, additives are used. The general aim of the Adoptic project is to capture and increase knowledge on how additives improve ceramics manufacturing.

The future of European SMEs involved in ceramics depends on their ability to choose the best additives to optimise production efficiency and create more varied and better quality products. The range of additives available is very large and companies are not always aware of what products can best suit their needs. New research is needed to raise awareness on how to make the most of existing additives.

The Adoptic consortium gathers 25 partners from four EU Member States and comprises IAGs, SMEs and RTD performers. The project supports the ceramic manufacturing industry, which needs to improve the yields and properties of end-products, because it faces strong competition from emerging countries. New and improved additives could bring SMEs the competitive edge needed to fend off the competition.

From pottery to high technology

Gone are the days when ceramics were only used for the production of table and sanitary ware, such as plates and chamber pots. Nowadays, high tech electronics and mechanical devices rely on ceramic elements for top level performance.

Ceramic is a hard, porous and brittle material, but different chemistries can introduce a variety of important properties (e.g. good conductive and piezoelectric characteristics — piezoelectricity being the ability to use electricity to produce a movement, or the opposite). These attributes are the reason why ceramic is often used for high-tech applications, such as digital watches or in surge-protection devices. It can also be used in actuators, sensors and transformers in the fields of mechatronics, robotics, domotics and biomedicine.

The Adoptic project proposes to study existing additives to improve the performance of ceramics in all the possible application fields. The research focuses on developing a better understanding of the link between additives and the properties of ceramic products, and to investigate the performance of various types of additives. By taking a broad approach to include the most common ceramic production methods — pressing, plastic forming and suspension technologies, as well as emerging nano-ceramics — the project will offer answers to the specific additive related issues raised by the industry.

Spreading the news

To fully disseminate the results of the project, a spin-off entity has been created, called IPECC srl. This institution is specifically aimed at transferring knowledge concerning ceramic piezoelectric devices to industrial actors.

Adoptic will have a direct positive impact on the whole European ceramics manufacturing sector. Indeed, the project is upgrading and introducing new rheological quality control tests, in order to assist in the development of future production standards.

However, the most important tool being developed by the research team is a web-based knowledge system, to support industrials in identifying and selecting the more appropriate additives for their field of activity. This system, or software, incorporates the existing additives and a database of industry specifications and manufacturing methods. When queried by the user, the software will identify the best additive for the best possible performance for a given product.

The Adoptic project intends to improve the competitiveness of the whole ceramics manufacturing sector by encouraging the use of additives to produce better products with contained costs. The web-based knowledge system will benefit all ceramic producers, from table and sanitary ware to high-tech ceramics.



Collective Research Volume 3

“The Adoptic project proposes to study existing additives to improve the performance of ceramics in all the possible application fields.”

Project title

Additive Optimisation for Improved Ceramics (ADOPTIC)

Contract number

30338

Duration

36 months

Global project costs

€1 863 899

EC contribution

€1 316 782

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OPTIMISING AGRICULTURAL RESOURCES FOR THE PRODUCTION OF GREEN ENERGY

AGROBIOGAS

“Biogas is the main product of AD, along with a rich liquid and a solid residue, potentially used as fertilisers.”

Over the past decade, the economic situation of European farmers has deteriorated constantly, and some farmers have been forced out of business by their severe economic predicament. In the meantime, a potential treasure has literally been wasted: agricultural waste. Each year, around 700 million tons of residue, such as straw and manure, are produced and inadequately disposed of. Agrobiogas is a research project aimed at encouraging anaerobic digestion (AD) as a waste treatment process, which can not only prevent pollution, but also enable energy production and generate additional income for farmers.

Decomposition by AD is a natural process for organic material such as grass clippings, sewage or animal waste. AD plants, or installations, are already being used to produce biogas and fertilisers in some European countries, like Germany. The purpose of Agrobiogas is to offer farmers the ideal conditions that would encourage them to treat their own residue, and to provide them with the opportunity to generate profit as a result.

However, before European farmers can have AD plants that will produce biogas and their own heat or electric energy, and boost their income, further research is needed. Agrobiogas participants are in need of further research concerning the financial, legal and technical requirements for the development of AD treatments, that will be suitable for diverse European locations and conditions.

A landmark for biogas production

Biogas is a green energy, with high availability of source materials. In the process of AD, organic material is decomposed under the action of microbes. In plants, digesters are filled with animal waste and energy crops; when decomposed, these produce higher quantities of biogas. Biogas is the main product of AD, along with a rich liquid and a solid residue, with the potential to be used as fertiliser.

The main objective of Agrobiogas is to increase the efficiency of agricultural waste's AD in co-digestion with other organic materials. To achieve this, the project team is conducting laboratory experiments on co-fermentation of agricultural waste and preparing a database of substrates. A simulation toolkit for the evaluation of the best substrate mixtures is also being planned. Furthermore, in the course of the project, participants will be gathering the scattered information about local biogas projects throughout Europe. The knowledge pool will serve as a source of information for farmers and their associations, enabling the improvement of existing and future AD plants.

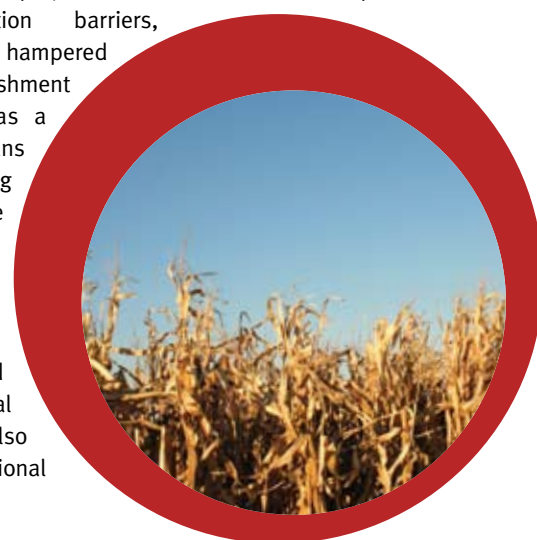
From waste to riches

Agrobiogas will support efforts to convert what is currently a disposal problem, into a source of income for farmers. AD allows for the production of biogas from waste which, to date, has been mainly disposed of in landfills (a method soon to be prohibited throughout the EU). Farmers will be able to produce and sell biogas and even energy surpluses to energy production companies, and AD residues will have the capacity to be sold as fertilisers. For example, a small AD plant for the production of biogas from cow manure, from a herd of 150 heads, could generate an additional income of EUR 2 500 a year.

These revenues can be complemented by support systems such as EU subsidies, established under the Common Agricultural Policy (CAP). Since the latest CAP reform in 2003, subsidies are partly allocated on the basis of compliance and contribution to environmental standards. Farmers producing energy crops, and using them in AD plants during co-fermentation of waste, are entitled to such aid.

Farmers are not the only group that could benefit from the development of AD. There are currently 3 000 biogas plants run by SMEs, of which 800 are agricultural plants. Agrobiogas results can potentially increase the demand for more plants, increasing new expansion prospects for plant manufacturers.

The Agrobiogas project aims to eliminate the performance and information barriers, which have hampered the establishment of AD plants as a widespread means of producing biogas. Once farmers are able to convert farm waste into gas, they will not only put an end to the disposal problem, but also enjoy additional revenues.



“Agrobiogas will support efforts to convert a disposal problem into a source of income for farmers.”

Project title

An integrated approach for biogas production with agricultural waste (AGROBIOGAS)

Contract number

030348

Duration

36 months

Global project costs

€2 891 939

EC contribution

€2 103 464

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ADAPTING AN ANCESTRAL TRADITION

Barley Bread

“There are no functional healthy bread alternatives on the European market today that can contribute with healthy β -glucan, high fibre and prebiotics, be low on salt, and still satisfy the consumer preferences.”

Barley production has become a European specialty owing to the favourable climate, excellent growth conditions, and a heritage spanning over 8000 years. To date, barley crop has been an extremely important source for animal feed. However, it is increasingly being replaced by soybeans, which have proved to be even better suited to animals. Given Europe's leadership in barley production, a substantial part of its agrofood sector is now at stake. The BARLEY BREAD initiative has been launched so as to provide this European specialty with a new future.

Within the European farming sector, 22% of those in employment are currently associated with the production of barley, which represents EUR 5.9 billion, or approximately 1% of the total European food and beverage production. However, due to the emergence of soya feed, the demand for barley has been diminishing continually over the past years. Owing to the properties of the competing crop, it is unlikely that alternative or novel markets will be established for barley. Consequently, 3 European organisations representing the agro-food sectors in Norway, Spain and Denmark, (accounting for some 345 000 farmers, 2 000 millers and 27 000 bakeries), have joined forces in an attempt to address this issue.

From feed to food

The BARLEY BREAD project aims to forge a closer connection between barley farmers and the supply chain within the milling and bakery sector. Its purpose is to provide new technological input and knowledge, so as to significantly increase barley use in the production of bread and other baked products. Indeed, less than 1% of the total amount of produced barley is currently used as food; the existing varieties are more suited to feed. Nevertheless, European barley's potential for success in the bread markets should not be underestimated. Barley bread is an excellent source of several valuable health-promoting compounds. White bread – the best-selling type of bread type on the market – may taste better, but it is also less healthy.

Due to the huge commodity trade of bulk wheat and wheat flour, 'white' cereals are dominating the European and Global Market. But such products are commonly low in fibre and high in salt. Furthermore, there are currently no viable healthy bread alternatives containing healthy β -glucan, high fibre and prebiotics, and low salt, which can still satisfy consumer preferences. Barley bread has the potential to become such an alternative.

Healthy and tasty

The BARLEY BREAD consortium has embarked on an exploration of the crop's hitherto uncharted potential. Firstly, a novel process that measures barley grain size prior to milling, will allow for retention of at least 75% of its healthy components. Secondly, recent improvements in wheat-based ingredient technologies have been adapted and further developed; this will result in the production of a mixed bread (wheat and barley) with a salt content below 0,4% that is just as tasty as conventionally produced wheat-based bread. Finally, a new formulation and baking process is being developed for use with specific combinations of barley and wheat flour. This will help to reduce the enzymatic degradation of the starch in the barley-based dough. The bitter taste normally associated with barley-based products will be reduced with the addition of antioxidants and minute amounts of spices. The salt content will be further reduced by applying alternative salt types and specific flavour enhancers. Throughout the process, primary consideration will be given to the end consumer, with recognition of local and regional preferences.

Altogether, the impact of the BARLEY BREAD project will be felt in a higher added-value market for barley farmers, inclusive of a presence on the health food market. Furthermore, the understanding and exploration of milling and baking technology knowledge will be expanded. But barley bread's success will not be vital for the European milling and baking industry alone. As an affordable, tasty and healthier alternative to wheat based bread, it will also considerably improve consumer health, especially through the reduction of the risk of cardio-vascular disease.



Collective Research Volume 3

“As the name suggests, the outcome of the Barley Bread project will be bread. But not just any bread.”

Project title

European Guideline for healthy high fibre/ low salt baking process based on the use of European Barley (Barley Bread)

Contract number

30269

Duration

36 months

Global project costs

€1 847 547

EC contribution

€1 104 392

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WRITING THE NEW LIFE OF BEET PULP RESIDUES

BEET-PULP

“Finding a new valorisation system for beet pulp would positively impact on the economic revenues of beet producers and paper manufacturers.”

Combining environmental concerns with economic interests is not an easy task for European businesses. This struggle hampers a variety of industries, one of which is that of paper production. Paper producers are required to deliver high quality paper materials, while at the same time reducing the industry's environmental burden. The BEET-PULP project aims to replace at least partly the mineral fillers currently used in the making of paper, with vegetable micro-fillers from beet pulp. This improved application for the residue of beet sugar production will represent a new source of income for nearly 400 000 beet-growing SMEs.

The 116 million beet plants produced annually in Europe are used principally for sugar production. The final residue of this production is a dry matter, called beet pulp, and it amounts to roughly 7 million tons a year. Under the Common Agricultural Policy, it is the beet producers who own and are responsible for the beet pulp.

To date, beet pulp has been used as cattle feed. However, the income generated from its sale is extremely low (approximately €1,00). Finding a new valorisation system for beet pulp would positively impact on the economic revenues of beet producers and paper manufacturers. To achieve its goals, the BEET-PULP consortium relies on the expertise of its 14 members in the fields of beet and paper processing.

Greener paper production

Paper was originally prepared from 100% vegetal fibres. As a result of the evolution of manufacturing processes, paper now constitutes a combination of natural wood fibres (from 60 to 100%) with recycled paper, mineral components (from 0 to 40%) and different chemical additives (up to 2% of the composition of a paper).

In the process of paper making, wood fibres are mixed with mineral fillers to improve the opacity of different paper grades. Despite this being common practice, the addition of such materials poses an environmental problem, and negatively affects the mechanical properties of the paper. Indeed during the recycling of the paper, part of these mineral fillers ends up in the deinking sludge, which needs to be disposed of or burnt. In this latter case, the presence of mineral fillers will result in the production of ash residues.

To reduce the negative impact of paper making on the environment, the BEET-PULP project proposes that these mineral fillers be replaced with organic material. Some types of papers already exist that are using no mineral fillers (sanitary and tissue paper, and paper used for packaging based on virgin fibers), but all the writing and printing papers contain mineral fillers. This project thus intends to apply beet pulp additives to the production of more mainstream paper types.

BEET-PULP is a cellulosic matter which could partly or completely replace the mineral fillers used today. For this possibility to

become a reality, it is necessary to micronise (i.e. to reduce to particles the size of a thousandth of a millimetre) and to bleach beet pulp components. The project team intends to research the best methods of bleaching to match paper and board specifications, such as brightness characteristics, for instance. The bleaching will be performed using environmentally friendly chemicals, such as oxygen, hydrogen peroxide, and ozone.

Fodder or paper: that is the question

The results obtained by the BEET-PULP project are expected to add value to the residue of sugar beet production by transforming it into paper filler material, allowing it to be exploited beyond its use as cattle feed. To facilitate the process for sugar and beet producers, the project will explore the possibility of integrating the production process of the beet filler into sugar factories.

For the paper industry, this project provides new opportunities to improve product quality. It also supports efforts to respond to environmental protection requirements, by reducing the prevalence of mineral fillers in the manufacture of paper and board. As a result, paper producers can expect to enhance their competitive edge by producing a new type of 'greener' paper.

Accordingly, the valorisation of beet pulp as a paper additive may serve as a source for higher incomes for beet producers, whilst offering paper manufacturers a means of producing more environmentally-friendly products.



“Beet pulp is a dry matter which could replace, partly or as a whole, the mineral fillers used nowadays.”

Project title

Use of micronised and bleached beet pulp as additive in white board and papers (BEET-PULP)

Contract number

30340

Duration

36 months

Global project costs

€1 496 881

EC contribution

€956 950

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HEALTHY BUSINESS IS GOOD BUSINESS

COMFOR

“The pan-European problem of poor occupational health and economic performance calls for a collective solution.”

Throughout Europe, SMEs in the forestry sector are affected by new realities such as the outsourcing of forest operations and mechanised harvesting. These structural changes are causing an increasing number of occupational health problems in forestry work as well as economic pressure on SMEs involved in this field. Current ergonomic research provides solutions for healthier working practices and also improves performance. However, putting science into practice is difficult for businesses that face practical and financial barriers. The COMFOR project has been launched to change this situation.

Due to a range of financial, social and cultural pressures, forest operations businesses have shown a reluctance to adopt ergonomically efficient methods of working. Despite regional differences in economy and culture, these businesses face the same constraints all over Europe. Consequently, the pan-European problem of poor occupational health and economic performance calls for a collective solution. Designed to maximise the impact of its results on forestry SMEs by transforming research into practical applications, the COMFOR project aims at solving the underlying problem of knowledge transfer at the European level.

Same problems in varying conditions

Given the fact that forestry contractors are not in a position to undertake research and development themselves, the COMFOR consortium will undertake a 3 year pan-European project of integrated work science research linked to the most effective ways of transferring knowledge to these businesses. The research topics will focus on new research into the impact of structural change across the European wood supply chain, the economic benefits of ergonomic investment, and the learning patterns of SMEs. The main output of the project will be an innovative knowledge transfer package for the improvement of health and performance. The package will be customised for SMEs operating in three European regions: North, West Central, and East Central Europe.

The global yet local context of the forestry sector means that its characteristics vary in different parts of Europe. This calls for regional expertise in tackling the problems of occupational health and knowledge transfer. Still, there are many similarities across the continent. For instance, forestry contractors employ the same machines, are mostly micro-businesses and rely on only one or two large customers. Furthermore, they all have to adopt new standards regarding certification and environmental regulations. As a consequence, forestry operations SMEs throughout Europe face, or will face, similar challenges, including occupational health problems associated with capital intensive modes of production.

Pan-European approach

The COMFOR methodology draws on the Collective Research, pan-European approach, combining the unique competences of a range of research institutions, industrial associations plus the participating SMEs themselves. While a common research methodology will be employed to address the pan-European problems of occupational health associated with mechanisation, the tailored solutions provided will reflect regional differences. A large body of European forestry contractors will maximise the uptake of good ergonomic working practices. Additionally, the COMFOR project will develop research and knowledge transfer capacities in the field of Work Science and contribute to mutual standards required by the European market for products and services.

Overall, the adoption of ergonomically efficient ways of working proposed by the COMFOR project will improve the well-being and economic performance of European forestry operations businesses. In the long term, this should considerably strengthen the forestry workforce and the sustainability of forestry-dependent rural communities in general.



“The COMFOR project aims at solving the underlying problem of knowledge transfer at the European level.”

Project title

Collective work science approach to solving the common problems of occupational health and performance in European forest operation SMEs (COMFOR)

Contract number

30300

Duration

36 months

Global project costs

€2 184 734

EC contribution

€1 647 545

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“The project partners are seeking to enhance the level of innovation and technology exploitation in accordance with toughening global competition.”

European SMEs involved in the crustaceans sector are facing increased competition from North America and Asia. To safeguard the jobs attached to this rural business, these SMEs need to improve their structural deficiencies and regain their competitiveness. A high level of mortality (10-50%) of live crustaceans, a very costly transportation method and an outdated grading system are key issues that need to be addressed. The CrustaSea initiative has been set up to counter these deficiencies by improving the infrastructure of the European crustacean fishery sector.

The CrustaSea project aims to reduce or even eliminate mortality and quality loss after capture and also to expand market opportunities for live crustaceans from Europe. The project partners are seeking to enhance the levels of innovation and technology exploitation in accordance with toughening global competition. This will be achieved through new technical solutions for the transport, holding and grading of live crustaceans, especially crabs and lobsters.

Plenty of room for improvement

Costs related to the mortality of live crabs are estimated at €11.09 million a year. The quality loss problem due to insufficient grading can decrease sales value by €0,60 per kg, resulting in a further reduction of value by €12 million. With a total loss of 9,5% of the complete commodity value, the economical potential for improvements in the live crustacean sector seems obvious.

Improving the grading system, water treatment method, and transportation technology of live crustaceans implies an enhanced understanding of the biological factors and technical standards involved. Another topic is the market segmentation related to quality and freshness, which has an impact on pricing. The CrustaSea consortium aims to expand technological knowledge and raise awareness about market opportunities in order to develop Best Practice. This double goal will be reached through targeted research in both fields, and the results will be disseminated beyond the consortium.

From average to premium label

CrustaSea is working on several innovative concepts to improve the efficiency of the European crustacean fishery sector. The tools developed include a grading technology based on light transmission for specific use in crustacean processing plants. A new water treatment system seeks to improve the animal welfare at holding stations, especially to reduce ammonia concentration in holdingwater.

Transportation and holding boxes will be designed for applications in both dry and wet conditions with bivalve commodity to ease drainage and water circulation. Thanks to a sophisticated stacking system, they will reduce the manual handling. The consortium is furthermore working on a technological solution to reduce water consumption of transport and holding systems to 40% instead of the 50% needed today. If successful, such a solution would not only significantly reduce transport and holding costs, but also generate more profit thanks to the increased transport capacity of ships and trucks.

The knowledge gathered by the CrustaSea consortium will be used to develop innovative technologies that will also have applications in other sectors such as the aquaculture sector and the farming of crustaceans. But above all, these technologies will be protected by intellectual property rights. This measure will ensure a long-term competitive advantage of European SMEs over their global competitors, whether they are involved in the catching, trading, transportation or processing of live crustaceans.



Collective Research Volume 3

“CrustaSea is working on several innovative concepts to improve the efficiency of the European crustacean fishery sector.”

Project title

Development of Best Practice, grading and transportation technology in the crustacean fishery sector (CrustaSea)

Contract number

30421

Duration

36 months

Global project costs

€2 500 000

EC contribution

€1 700 000

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BURNING AWAY CARCINOGENIC DIOXINS

DIOFUR

“The danger with dioxins lies in the fact that even a small exposure can, if regular, originate cancers.”

Human health. Industrial activity means currently some kind of risks. Nowadays dioxins are focused as an objective to avoid because they are related to cancer. Good prevention remains, however, a better solution than the best cures. The danger with dioxins lies in the fact that even slight exposure can result in cancers, if this exposure is regular. The DIOFUR project originated with the intention to study and introduce new measures aimed at reducing the level of dioxins produced in ferrous foundries.

Dioxins are toxic organic chemicals, produced principally as a result of human activity, such as waste incineration, pesticide production or even cigarette smoke and car exhausts. Dioxins are deposited on land and water, where they can remain for exceedingly long periods of time. Animals accumulate dioxins through exposure or consumption of contaminated food. Through each link of the food chain, the concentration levels of these toxic chemicals increase, and consequently the risk to the final consumers — frequently humans — likewise increases.

Despite the fact that the foundry sector is not the main dioxin producer, as many other industries, also some foundries emit dioxin levels above the legally authorised values (as set by the Incineration Directive, 2000/76/EC, concerning integrated pollution prevention and control). Furthermore, the European Integrated Pollution Prevention and Control Bureau (EIPPCB, in Seville), has emphasised the need for a better understanding of the contribution of the process parameters to the formation of dioxins. This requires the monitoring of dioxin emissions for various installations and under varying conditions. Because of that need of measurements results in addition to the fact that rotary furnaces, electric arc furnaces and cupolas are a good representation of the European furnaces and that they have the highest emissions, DIOFUR project team has focused its work to the measurement in these furnaces.

Trying to avoid a worst-case scenario

Dioxins could be a by-product of ferrous foundries. They originate in the metal-melting process, while burning coal, coke and fuel oils, which can contain chloride ions and organic carbon. The presence of oxygen and of catalysts such as copper are also factors inducing dioxin formation. When the elements mentioned above are placed together, and exposed with a sufficient residence time to temperatures ranging from 250 to 450 °C, the conditions for dioxin emissions are possible.

The DIOFUR project team follows a two-step approach in reducing dioxin emissions below an acceptable toxicity level. Indeed, due to the very nature of the process, one single step would be insufficient.

Specifically, the first step is the optimisation of process parameters, in order to avoid the dioxin formation conditions.

For example, during melting processes, when the temperatures in the furnace reach 850 °C, dioxins are destroyed; however, when the temperature drops to between 250 and 450 °C, in the cooling phase, new dioxins can be formed.

A second step is necessary in order to achieve the required emission reduction. Modified end-of-pipe techniques, such as carbon activated and sorbent injection, will be used to capture or retain the dioxins after the cooling phase. Adapting existing foundries to include these measures should be both simple and affordable for most SMEs.

One small giant step for foundries

DIOFUR aims at a sector-wide reduction in dioxin emissions. There are approximately 800 furnaces in European foundry SMEs, representing 80% of the companies in the sector. The project builds on the experience and knowledge of its members, who are experts in iron and steel foundries, environmental and foundry researchers, and equipment manufacturers.

The 16 partners concerned will contribute with the creation of a ‘good practice book’ to widely disseminate best practice guidelines to as many foundries as possible. This approach will raise awareness of this vital issue; it will also contribute to reducing the cancer risk for workers and, to a wider extent, for the population in general.

Foundry workers are predominantly those at risk of exposure; any reduction in emissions represents an improvement of health and safety standards at work.



Moreover, the areas neighbouring foundries will also benefit from the reduction in dioxin production, as fewer particles representing a potential risk will be dispersed in the atmosphere.

DIOFUR will have a positive impact on public health, hard-working in its own sector by eliminating the carcinogenic dioxins produced in foundry processes.

“The areas neighbouring foundries will also benefit from the reduction in dioxin production, as fewer particles representing a potential risk will be dispersed in the atmosphere.”

Project title

Dioxins in cupolas, rotary and electric arc furnaces — emissions free melting practices in foundries (DIOFUR)

Contract number

30298-2

Duration

30 months

Global project costs

€2 878 936

EC contribution

€1 606 067

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THE ROAD TO STANDARDISED WINDOW PRODUCTION

ECWINS

“Individual designs will be made much easier, and SMEs will maintain their ability to satisfy their customers.”

The European labels of conformity, known as CE markings, are a guarantee of quality and safety for goods produced and sold in the EU. One of the most recent CE-conformity standards, code-named EN 14351-1, relates to window manufacturing; it stipulates that all window models put on sale, will have undergone a series of performance tests, within the next three years. However, some window-producing SMEs might struggle to cope with the new requirements, for financial reasons — and Ecwins may provide these companies with support in this process, through the development of new tools.

The conformity standard EN 14351-1, requires tests ensuring that all windows and front doors produced in Europe have an adequate and uniform level of comfort and safety. However, these tests entail additional costs; small companies with limited resources may not viably be able to withstand such expense. In order for SMEs to avoid the financial difficulties stemming from these additional costs and also to avoid competitive disadvantages, new design tools are needed. Creating a European CE-based assessment tool for flexible and innovative window systems is an ambitious goal for ECWINS.

Design made easy

ECWINS proposes to develop new software comprising two prediction models. The first, an elaboration of a ‘CE-Assessment-Model’ is the major objective of the project, and it aims at simplifying the production of windows and avoiding the need for full-size testing. This model, constructed from a database of all window profiles, designs and materials, informs users whether their intended products are compliant with CE requirements. The production of individual designs will be much easier, and SMEs will be able to maintain customer satisfaction, while simultaneously respecting international standards.

The second prediction tool will be designed with another objective. Taking into account particular national legislations and specific design traditions, the ‘European Window Interface Model’ simplifies a design of windows that can easily be applied to buildings in different countries. Based on a collection of national characteristics, this model will predict if a window complies with specific legislations and building traditions of a country, other than those of the manufacturer. This flexibility in adapting products to other regulations may expand small companies, by creating new export market opportunities.

The possibility of using these two models (inserted in a unique software package), will revolutionise the way windows are currently designed. Instead of building costly prototypes and individually testing each one against EU and national requirements, the manufacturer can concurrently design, test and evaluate the qualities and defaults of a virtual window against its qualities and defaults.

Life after Ecwins

The project has intends to utilise the expertise of 28 IAG, SMEs and RTD performers from 8 countries. The new software development will constitute a major task for the project team, which will dedicate two years to compiling information and testing the new models in real-life situations. The dissemination of project results and the organising of workshops and training for SMEs will require another year. The IAGs in the consortium also expect to set up a joint venture for managing the assessment tools and the derived intellectual property rights.

The impact of Ecwins will be felt long after the actual project’s completion, with enduring effects on the competitiveness and sustainability of SMEs, the main participants in window manufacturing in Europe. The window producers will be simultaneously be able to reduce their costs and diversify their employment offers.

Conversely, customers will have greater choice in selecting windows that best suit their tastes, combined with confidence in the quality of their goods, wherever they shop.



Collective Research Volume 3

“The impact of ECWINS will last far beyond the duration of the project, with enduring effects on the competitiveness and sustainability of the main actors of window manufacturing in Europe: SMEs.”

Project title

A European CE-based assessment tool for flexible and innovative window systems (ECWINS)

Contract number

30490

Duration

36 months

Global project costs

€3 344 532

EC contribution

€2 230 838

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INJECTING NEW LIFE INTO PLASTIC MOULDING

EMOLD

“Emold participants intend to radically redefine the plastic injection process by introducing mechatronics into the moulding cycle.”

The variety of plastic materials, specifications and applications ensures the viability of a range of different production techniques.

Among those, plastic injection is one of the most commonly used and applies to the manufacturing of thermoplastic elements of all sizes, from small parts to entire car body panels. In the global marketplace, European SMEs involved in plastic injection are facing ever increasing challenges from their international rivals. To boost their competitiveness, European SMEs need newer and more efficient processes. Emold aims at following a total life cycle approach (from mould design to plastic production) to develop new ‘intelligent’ and ‘interoperable’ moulds, able to adapt in real time to the different demands of both customers and producers.

European plastic producers are at the cutting-edge of moulding technologies; however, cost and time effectiveness can further be improved. Emold participants intend to radically redefine the plastic injection process by introducing mechatronics into the moulding cycle. The challenge faced by the project team is to create active and intelligent moulds that can be networked and that embed knowledge of different process parameters.

Parting away from tradition

The process of injection moulding was created in the middle of the 19th century. The technology used nowadays was, for its part, introduced in 1946 and the screw injection system, via which plastic is heated, mixed and injected into a mould, has been maintained ever since.

In injection moulding, molten plastic is introduced at high pressure into a mould. The mould is a block of metal (steel or aluminium) hollowed-out to allow for the plastic to take shape. Once the molten plastic cools down, it can be removed from the mould. Great care is taken to ensure the correct design and manufacture of moulds, which are expensive to produce and to modify, if necessary.

Emold participants intend to make the moulds ‘more intelligent’ and able to adapt to changing circumstances. This will be achieved by introducing mechatronics in the moulds. Mechatronics is the combination of mechanics, electronics and software engineering, which together achieve the automation of a system. In practice, the new generation of moulds will include sensors and devices that will enable SMEs to monitor what is going on inside the mould in real time. Depending on the situation, the characteristics of the mould can be adapted to modify the shape or other particulars of the injected plastic.

The next step for Emold will be to integrate the mechatronics moulds into networks. A centralised system, at the heart of which lies a server, will receive information from all the linked moulds, even if they are thousands of kilometres apart. The Emold system sends information to mould-makers and injection moulders, in order for them to follow the process and make adjustments, if needed.

In time, this network will become a Knowledge-Based System (KBS), that will pool and process the knowledge embedded

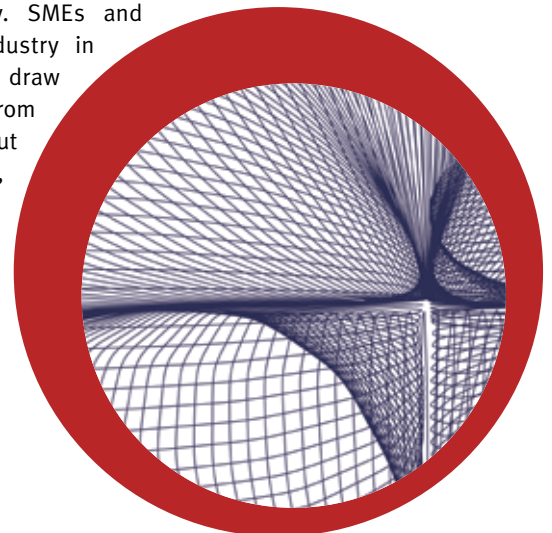
in the intelligent moulds. The objective of this information gathering is to optimise the efficiency of processes and the design of future moulds.

Benefits of the new working model

The strength of 39 000 European plastic companies (of which 85% are SMEs) lies in the top-end technology used. Nonetheless, in terms of injection moulding, processes can still be optimised to improve production by up to 25% and to reduce the final cost of parts.

By developing an intelligent network, Emold aims at reducing the number of faulty batches of products, by offering the possibility to modify the configuration of moulds to correct imperfections. The development of new moulds is expected to reduce by up to 30% the time required for the set-up phase of production. The moulds themselves are manufactured with recycling as a key element: Emold participants are studying the possibility of re-using mould components — whereas currently, moulds are discarded or melted away once their life-cycle ends.

Emold introduces a new concept of injection moulding, placing the emphasis on intelligent mechatronic moulds. The networking of these central elements of plastic manufacturing will enable all industrial actors to monitor moulding processes in real time and to constantly improve their efficiency. SMEs and the plastic industry in general will draw benefits from Emold, but consumers will, potentially, enjoy better quality products, available at lower costs.



"The strength of 39 000 European plastic companies (of which 85% are SMEs) resides in the top-end technology used."

Project title

Total life cycle approach for efficient and networking plastic injection moulding processes (EMOLD)

Contract number

30339

Duration

36 months

Global project costs

€3 727 418

EC contribution

€2 222 214

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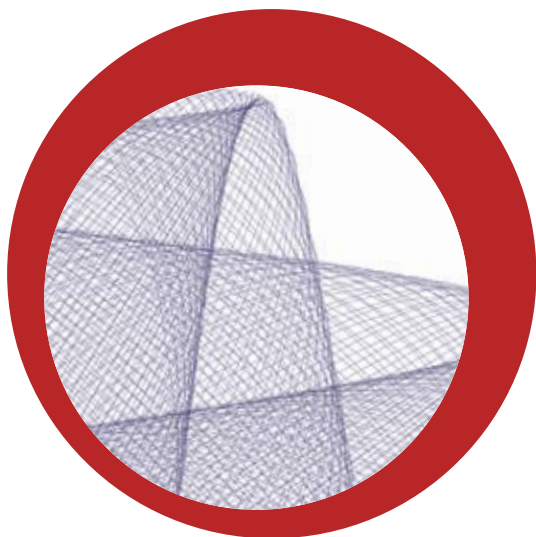
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PUSHING THE BOUNDARIES OF MAINTENANCE

E-Support

“New possibilities open up to such SMEs thanks to the increased affordability of mobile wireless devices with broadband access to the Internet.”

Field Service Engineers (FSEs) represent a so-called ‘mobile workforce’: they spend most of their working day out of the office, on-site. Many FSEs are employed by maintenance and repair companies, of which many have a limited size: currently, more than 15 000 maintenance SMEs operate in Europe. It is crucial for these smaller businesses to have access to the most effective information tools. This is necessary to ensure that their FSEs are well prepared and able to provide the highest possible service quality to the customers. The E-SUPPORT initiative has been set up to develop a technical solution that will bring an unprecedented flexibility to this business area.

European maintenance associations and SMEs have expressed a need to provide their FSEs with an affordable, flexible and easy to use system to get on-site, remote and timely access to accurate technical data. Current systems are still insufficient in terms of data retrieval and/or management. Moreover, they are quite bulky and therefore impractical in field situations or where hands-free operation is required. The mobile nature of FSEs’ work furthermore requires e-learning platforms that would allow maintenance SMEs to rapidly and remotely train their FSEs on new or modified machinery, parts, etc. New possibilities open up to such SMEs thanks to the increased affordability of mobile wireless devices with broadband access to the Internet.

Anywhere, anytime

Only large companies have access to costly tools and elaborate information systems, far beyond the scope of SMEs. Taking up this challenge, the E-SUPPORT project is developing novel intelligent agent-based technology to deliver two systems specifically adapted to the business needs of SMEs. These two systems rely on a web-based application accessible via mobile devices. The first one, ‘FSE-assistant’, will support corporate knowledge management and deployment with utility tools like PDF documents, CAD files, emails, Word documents and training videos. The second one, an open e-learning system named ‘FSE-master’, will integrate processes, templates and web-based tools to create a flexible and adaptable training program. Both systems will be easy to operate, maintain and configure. On top of that, they will be low cost.

There is a growing focus on the customer, on added value and effective service in business today. This has an important impact on the competitiveness of thousands of European SMEs involved in maintenance and repair of industrial plants, machinery or buildings. These SMEs have to rely even more on the quality and reliability of the on-site service delivered by their FSEs. Like their larger competitors, SMEs are seeking ways to equip their FSEs to become more productive by providing them quick access to user manuals, technical drawings, etc. while on site. The novelty of E-SUPPORT will be to overcome the limitations identified in existing Computer Maintenance Management Systems: support of real mobility on the field (access from smartphones, PDAs and laptops), use of document retrieval techniques based on Artificial Intelligence (AI), implementation

of Adaptive Learning and AI-based knowledge sharing features will clearly give E-SUPPORT the edge over current systems.

A perfect match

The E-SUPPORT project will lead to a commercial product targeted and adaptable to any SME that has specific maintenance needs. E-SUPPORT’s Multi Agent architecture will ease future system enhancement through reusable and structured learning objects, profile-based itineraries, and agent-based profile matching. This technology is ideally suited for knowledge sharing in the maintenance industry, particularly for field engineers roaming around the world with wireless access to the system. In short, the perfect virtual assistant for Field Service Engineers is about to be born.



“The novelty of E-SUPPORT will be to overcome the limitations identified in existing Computer Maintenance Management Systems.”

Project title

A knowledge transfer and on-site information agent driven access system for SME field service engineers (E-Support).

Contract number

30386

Duration

36 months

Global project costs

€3 056 943

EC contribution

€1 784 157

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FILTERING TOXIC SPENT METALWORKING FLUIDS

FILTER

“The goal of this project is to ... develop a technique which can effectively treat complex spent metalworking fluids (MWFs).”

Engineering companies are an essential pillar of the EU economy, since they are represented by nearly 375 000 companies and 20 million workers. Like many other sectors, engineering specialists face tough competition from Far-East countries where labour costs are very low. In addition, ever-tightening EU legislation on waste disposal is another factor that has contributed to 20% of engineering workshops going out of business in the past 5 years. The Filter project proposes to introduce a solution for the disposal of toxic spent metalworking liquids, and to reduce the associated disposal costs.

Filter aims to create new recycling opportunities for spent metalworking fluids (MWFs), to replace the current practice of discharging them into sewers. Each year, four billion litres of MWFs are disposed of in the EU. The goal of this project is to reduce this quantity by 50% by the development of a two-stage treatment system and new recycling opportunities.

New solutions for a recurrent problem

Engineering companies use MWFs during machining processes for lubrication and cooling purposes. Due to the very nature and application of these fluids, they can only be used for a limited period of time — this is generally confined to 1 year.

The Filter consortium comprises 13 institutions, inclusive of IAGs, SMEs and RTD performers. Representing the interests of the whole engineering sector, the project team is developing a new disposal technique, based on a two-stage approach.

The first stage aims to enhance separation membranes, in order to separate water from various components of spent MWFs (bacteria, mineral oil, metal parts, etc). The second phase includes a ceramic photo-catalytic oxidation process, which will polish up the recovered water.

Washing away external competition

The Filter team has divided the work among its members, so as to achieve the best possible results and ensure that its findings are shared with the other industry participants. For instance, RTD performers draw on their knowledge to help SMEs build the disposal technology. Likewise, at the end of the chain, IAGs promote the technology and train future users in the engineering sector.

Initially, the objective is that the Filter product assumes a moderate market penetration of only 2%. Although this may appear modest in terms of percentage, the market share translates into EUR 32 million of disposal cost savings. If more SMEs — who account for 90% of the companies in engineering — adopt Filter, many more millions can be saved. These economies will have long-lasting effects. For instance, industry competitiveness could be improved, and the pressure from low labour and production cost countries will be more lightly felt.

It is significant that the Filter technology will also have a positive impact on the environment, in enabling engineering companies to comply with EU legislation on pollution and waste disposal.

Facing up to the challenge of improving the competitiveness of European engineering SMEs, Filter proposes a novel way to address an environmental problem with few or no current solutions. In creating a new recycling process, Filter will certainly boost the engineering sector, and improve its financial position.



Collective Research Volume 3

“... the Filter technology will also have a positive impact on the environment.”

Project title

A total metalworking fluid disposal technology (FILTER)

Contract number

30364

Duration

36 months

Global project costs

€2 038 153

EC contribution

€1 153 651

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MORE FLEXIBILITY FOR METAL FORMED COMPONENTS

FLEXFORM

“For Flexform participants, the solution for the future of special vehicle manufacturers is ‘dieless’ Incremental Sheet Forming.”

The special vehicle sector requires unique production processes due to its specific technical challenges that cannot be dealt with using mainstream manufacturing methods. Special vehicles are mainly hand-made on a small-scale production based on craft skills, but the Flexform project aims at encouraging a shift towards a less resource-dependent manufacturing process. To support the move towards a more efficient, reliable and profitable technique, the project team aims to improve the knowledge of an emerging technology for sheet metal shaping: Incremental Sheet Forming.

Flexform is a consortium pooling the competence and experience of 19 participants, among which are SMEs, IAGs and RTD performers in the fields of special vehicle production and metal technologies. The participants will encourage the adoption of ‘dieless’ Incremental Sheet Forming by the industry and develop software tools to facilitate the change in production methods.

Special market niches

‘Special vehicles’ are limited production cars with less than 2 000 units produced yearly. Examples of special vehicles include ambulances, funeral cars, buses, coaches, military vehicles, cleaning vehicles, sports cars and cars for disabled people. In Europe, nearly 120 000 special vehicles of all types are produced yearly. There are 2 500 European SMEs involved in this sector, with a business volume of EUR 4 billion and approximately 75 000 employment positions.

Currently, the demand for special cars is on the increase, and production difficulties have arisen. Indeed, hand-made craft production has high costs because it is very specific. Producers find it difficult to respond to escalating and fluctuating customer demands while at the same time managing complex supply chains. The competitiveness of EU SMEs in this sector is dependent on their ability to adopt an innovative, more flexible and automated high-value production method.

The new method will reduce manufacturing time and be more effective and reliable. As a result, the profitability for SMEs will increase: faster production means more production capacity, hence, more profits. For Flexform participants, the solution for the future of special vehicle manufacturers is ‘dieless’ Incremental Sheet Forming.

Challenging production solutions

‘Dieless’ Incremental Sheet Forming (ISF) is a technique used to shape sheet metal components, based on an incremental process of small successive deformations and on rapid manufacturing techniques. These techniques are normally used for producing complex shapes in steel and aluminium. One of the particularities of ISF is that it allows for the production of parts that are not symmetrical.

To support the adoption of ISF technology, Flexform participants will design a computer assisted engineering and manufacturing (CAEM) algorithm to allow for the easier design of parts. The input of all consortium participants will be crucial to gain a better understanding of the requirements of the industry, which will determine the rules and procedures that are to be used in ISF development.

ISF will result in cost reductions in product manufacturing and in tooling needs. In terms of time economy, the Flexform team expects reductions of up to 60% in product development time and 50% as far as manufacture is concerned. Although Flexform focuses on special vehicles, the ISF technology could also have significant applications in other industries, such as aerospace, naval and railway construction and even furniture and medical device manufacturing.

Moving away from a manual manufacturing process towards an automated and computer assisted process will be the key for the continued success of special vehicle producers. The competitiveness of these producers will be reinforced, with the more effective production of vehicles corresponding to the diverse demands of customers.



“Although Flexform focuses on special vehicles, the ISF technology could also have significant applications in other industries.”

Project title

Development of a new flexible manufacturing process for low series production of metal parts for custom and special vehicles (FLEXFORM)

Contract number

30273

Duration

36 months

Global project costs

€3 288 472

EC contribution

€2 176 908

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“Until now ... PLC has not been adopted as a mainstream solution, mainly because of electro-magnetic (EM) problems.”

Computers, electronic gadgets and anything automated have become indispensable companions for many people; but have we become dependant on technology, or can we still use it to our benefit? Is technology useful and does it improve our quality of life? The members of the Flexonline@home consortium believe that technology can indeed improve our lives, for example by allowing us to communicate more easily. To this end, the team is developing a new power supply system, which will make home networking affordable for a large proportion of EU citizens.

At the same time, the project will enable European SMEs to overcome the skilled labour shortage affecting the electricity sector.

Flexonline@home gathers the skills of 10 RTD performers, IAGs and SMEs, specialising in electronic components and systems. The aim of the project is to develop a cost efficient, reusable and innovative power supply system that will allow for the generalisation of Power Line Communication (PLC). The PLC idea is to use the power supply cables as a communication network. In practice, Internet, telephone and television can be transmitted via electrical cables normally used to convey power. Until now, however, PLC has not been adopted as a mainstream solution, mainly because of electro-magnetic (EM) problems.

The use of PLC in houses can drastically reduce the time needed for wiring and the costs of cabling installations. A significant cabling price reduction could lead to a reduction in the price of new houses and, at the same time, enable more people to improve their houses with home networking capabilities. In the information era, enabling people to connect to the wider world can add to their quality of life.

Automation for the people

Despite the prospects for PLC in terms of home networking and automation, the technology needs to be further developed. The project team aims at improving the knowledge of factors influencing high-speed PLC in planar copper conductors, such as the choice of materials, the distance of transmission and radio frequency radiations. This understanding of different factors will allow Flexonline@home participants to create a novel arrangement of copper conductors and insulators, as well as a differential mode transmission to reduce EM interference and electronic smog.

The project participants also aim at improving the network bit rate capacity and transmission by protecting it from external interference, such as radio signals. If successful, the performance enhancement will exceed all current and foreseeable state-of-the-art solutions.

Although the Flexonline@home research is being conducted to improve the use of PLC in newly built or renovated houses — for example, to enable the installation of automation systems to assist elderly people living alone — further applications can be found in offices, scientific laboratories and hospitals.

Building on the network knowledge

Flexonline@home is not just a project aimed at developing a product and making profit out of it — although the resulting power supply will find its way into the market in the months following completion of the project. In fact, the project goes beyond that: for the team, it is crucial to spread the findings of the research to electricity, IT and building SMEs.

The project findings will be published in journals and at conferences. The knowledge created will be protected by patents, but the emphasis will be placed in training and transferring knowledge to professionals. This stage of the project is of vital importance to solve the skilled labour crisis hitting the electricity sector.

Technology is generally used to solve the problems and difficulties people face in their lives. Flexonline@home, however, goes further and kills two birds with a stone, solving two problems with a single solution. By developing a new PLC power supply, the project paves the way for home networking for the general public, while at the same time overcoming the skilled labour shortages hampering the EU electricity sector.



“The performance enhancement will exceed all current and foreseeable state-of-the-art solutions.”

Project title

Development of a cost efficient, innovative, reusable, integrated power supply system, enabling interference free high speed power line based communication architecture for the affordable smart house.
(Flexonline@home)

Contract number

30313

Duration

36 months

Global project costs

€1 860 736

EC contribution

€1 075 412

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A SMOOTH RIDE TOWARDS EURO-ECO-LABELS

"In comparison to mineral oils, bio-lubricants are much greener."

IBIOLAB

Pollution and global warming constitute serious threats to our environment and therefore to our very existence as well. To date, most environment-sensitive research has focused on the development of new fuels, and this 'bio' or 'green' effort is now also being oriented in the direction of other heavy polluters, such as lubricants. The project aims to support SMEs in the creation of new bio-lubricants, with increased performance levels and lower production costs, which will comply with the Euro-eco-label requirements.

The Euro-eco-labels, as established by EC Regulation 1980/2000, apply to a variety of products such as hydraulic oils, chainsaw oils, grease and de-moulding agents. These lubricants, mainly based on mineral oils, are used in the automotive industry and generally for transport applications. Surprisingly, only a few products have been awarded those quality labels as of yet. IBIOLAB aims to significantly increase the proportion of bio-lubricants in the market (currently at just 2%), and to encourage SMEs to apply for Euro-eco-labels.

How good is green?

Mineral oils are the mainstream lubrication solution for industries. Their high availability and low costs ensure their market position, but even so, they remain high-risk products with a negative impact on the environment; water and soil contamination and CO₂ emissions are examples of this effect. Bearing in mind that nearly a third of lubricants finally settle in the ecosystem, it is easy to understand how some countries have progressively grown more attached to bio-lubricants.

In comparison to mineral oils, bio-lubricants are much 'greener'. Indeed, they are based on vegetables or re-used frying oils, and not on fossil fuels. The main disadvantages of green lubricants are the production costs and the lower performance levels, two aspects that IBIOLAB aims to improve through an enhanced understanding and optimising of the existing manufacturing processes.

The project team intends to develop new processes and techniques (emulsions, maleinisation) to advance the performance of lubricants. Moreover, researchers plan to use new vegetable oils, additives and even frying oils to reduce production costs. The evaluation of the results of this work will also take into account the environmental lifecycle of the bio-lubricants.

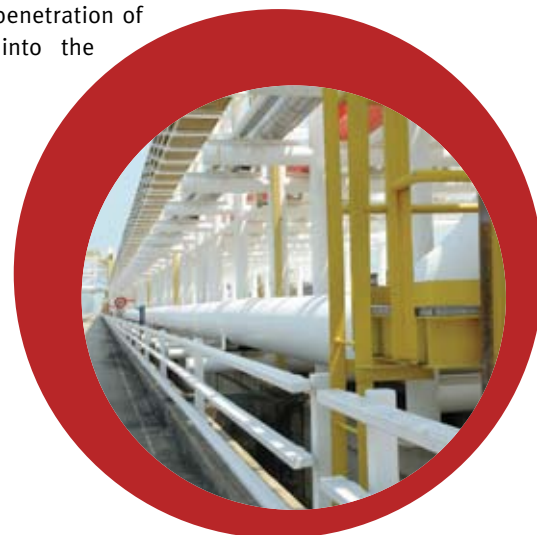
Pioneering innovation shared

The knowledge acquired by IBIOLAB will be beneficial to all SMEs involved in the lubricant production sector. The team of 4 IAG, 12 SMEs and 6 RTD performers from 7 European countries will hold training sessions and organise communication campaigns. As a result, the knowledge base will be expanded, and the project consortium hopes to encourage further development of bio-lubricants. This communication is expected to provide and promote a better awareness of the criteria and benefits of Euro-eco-labels, thus encouraging SMEs to apply for the labels.

The economic potential of a labelled product is not insignificant; it places the product above the competition. In the long term, the position of bio-lubricants could improve dramatically, in a market which, in 2001, saw a consumption of nearly 5 million tons of lubricants in Europe alone.

IBIOLAB targets the labelling of at least one generic bio-lubricant for each of the applications indicated in the Euro-eco-label regulation: two-stroke oil, grease application, hydraulic fluids, chainsaw oils and concrete release agents. These products will showcase the inherent properties of bio-lubricants, and highlight their readiness to replace mineral oils.

Provided that the ambitious project objectives are achieved, IBIOLAB will play a key role in surpassing the cost and performance barriers currently restricting the penetration of bio-lubricants into the market.



Collective Research Volume 3

“IBIOLAB targets the labelling of at least one generic bio-lubricant for each of the applications indicated in the Euro-eco-label regulation.”

Project title

Improvement of bio-lubricant manufacturing and development thanks to the obtaining of Eco-labels in a wide range of industrial sectors (IBIOLAB)

Contract number

030307

Duration

36 months

Global project costs

€3 443 907

EC contribution

€2 181 818

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SMALL COMPANIES, VAST COMPETENCIES

InCaS

“An Intellectual Capital Statement (ICS) enables decision-makers to visualise ‘intangible’ resources that are essential for the success of their company.”

Company-specific knowledge is generally referred to as Intellectual Capital (IC); it pertains to intangible assets, namely non-monetary assets that cannot be seen, touched or physically measured. The InCaS initiative aims to support Intellectual Capital Statement (ICS) as a management tool that would enable European SMEs to detect and communicate their Intellectual Capital, and to take improvement measures accordingly. To this end, the project will implement ICSs in several European SMEs, relying on a consolidated methodology.

Intellectual Capital (IC) can prove particularly useful in the development, production and selling of a company's products and services. It covers a diversified knowledge area, ranging, for instance, from staff qualification and motivation, leadership and management structures, to organisational capacities or relations to the market. Overall, IC can serve as a crucial resource in gaining an advantage over competition, and in ensuring the future success of a business. However, such a powerful resource naturally requires an appropriate operating instrument.

The Intellectual Capital Statement (ICS) makes it possible to assess, report and develop an organisation's Intellectual Capital, to monitor critical success factors systematically, and to support strategic core competencies. It can thus help to decrease operational and strategic risks, serving as a suitable basis for strategic decisions and organisational development. The InCaS consortium will assemble SMEs and IAGs from five European countries, in a bid to develop and implement an ICS method able to meet the specific requirements of European SMEs.

From scattered approaches to a global methodology

While different ICS methods and guidelines have been developed and tested in several European countries, a harmonised approach at EU level has not yet been accomplished. The scattered knowledge gained from the various national approaches needs to be accumulated at a scientific level. Accordingly, the InCaS consortium is basing its research work on the differing ICS approaches, intending to identify common ground, as well as cultural differences and national and branch-specific requirements. The derived consolidated ICS methodology will set pre-normative standards for assessing and reporting Intellectual Capital in European SMEs.

Focusing on five core branches of SME activity, the InCaS project partners are seeking to simplify the procedure, by providing a manageable implementation procedure. In order to render this suitable for SMEs, a practical approach is paramount, as is the maximum benefit possible from improving the exploitation of existing Intellectual Capital, and revealing unused innovation potential. Commencing with 50 pilot implementations in six

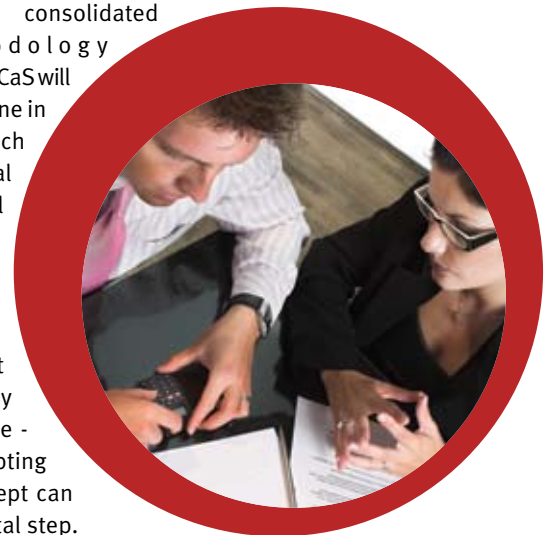
European countries, the methodology developed by InCaS will lead to the creation of practical ICS guidelines that will enable SMEs across Europe to implement ICSs unaided.

Setting the standards for success

A software compendium (ICS Toolbox) will support SME users during the ICS implementation process, while a central database (InCaPedia) will compile data relating to all aspects of ICS generation and its use in relation to SMEs. The development of branch-specific ICS elements will facilitate ICS comparability (ICS Harmonisation), while the minimal requirements for IC reporting will be determined (IC Benchmarking). Based on representative empirical data, a bottom-up contribution to standardisation will be supported. The developed approach will be tested and evaluated, so as to guarantee proof of concept. This will assist in maximising the dissemination impact, expected to extend to over 1 000 European SMEs.

‘Intangible’ resources, such as trade secrets, copyrights, patents, or trademarks, can be essential for business success. With ICS, decision makers in European SMEs will have an efficient tool with which to visualise these assets. Ranging from increased transparency regarding knowledge and competences (the so called ‘soft’ success factors), to systematic research of market niches, the advances engendered by ICS are potentially crucial.

The consolidated ICS methodology established by InCaS will be the cornerstone in a unified approach of Intellectual Capital assessment and reporting in European SMEs. In an economy that is increasingly knowledge-based, adopting the InCaS concept can prove to be a vital step.



Collective Research Volume 3

“... the methodology developed by InCaS will lead to practical ICS guidelines that will enable SMEs across Europe to implement an ICS on their own.”

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Project title

Intellectual Capital Statement – Made in Europe (InCaS)

Contract number

30485

Duration

30 months

Global project costs

€3 217 472

EC contribution

€1 985 087



“The main objective of the initiative is to create an IT based toolbox, to prevent and alleviate manufacturing defects.”

Quality is the recurring theme of the EU textile industry and the key to the success of the nearly 200 000 companies involved. In order to maintain the qualitative edge and to gain a competitive advantage by standing out from low-quality rivals, European SMEs are constantly trying to boost the performance of their production processes. The Innotex project aims at developing new software facilitating the optimisation of existing manufacturing processes for textiles. The software will be integrated into the production chain and support manufacturers in eliminating the root causes of quality defects.

Innotex is a project involving 26 partners from seven countries. The main objective of the initiative is to create a software ‘toolbox’ for preventing and alleviating manufacturing defects. However, project participants will go further, with the results of Innotex expected to contribute to the development of the European technology platform for the future of textiles and clothing. Indeed, the optimised processes and improved product quality can ensure the long-term competitiveness of the European textile industry (which is the second largest exporter of textiles in the world), by ensuring more jobs, growth and export income for the EU.

The missing link

Innotex will mathematically model performance indicators for four types of processes including polymer extraction/yarn manufacturing, dyeing, finishing, and technical fabrics manufacturing. These are among the most commonly used and better-known processes. The new software will be designed to optimise all the production stages, and offer manufacturing operators an indication on how to minimise the risks which potentially threaten product quality.

Technically speaking, the Innotex software will be an automated empirical model, able to construct a stochastic model linking process data to quality risks. Using a self-learning algorithm, the software can use recorded process data to produce a group of output variables, starting from a group of input variables. In practice, the software will process the input variables taking into account past process data.

As a result, all the potential quality risks can be assessed. For example, in the course of a given process, an operator will be able to use the new software to pinpoint the source of a quality defect and to optimise all the control parameters. He can also compare the data recorded by online diagnostic sensors against the control parameters, to spot and solve any quality problem that might arise. Participants at Innotex expect the software to help operators establish the link between process data, recorded by sensors, and the quality risks to the textile product.

Practice makes perfect

Ultimately, consumers will benefit from better quality textiles produced by SMEs using the Innotex software. However, the main beneficiaries from this project’s innovations are expected to be the manufacturers. Powerful software will provide a further way of strengthening the position of European SMEs against their competitors.

Innotex participants are planning on creating a European Competence Group to disseminate the results of the project and to train operators in using the software. This is necessary because operators and production managers must first familiarise themselves with the toolbox before they are able to use it effectively.

Furthermore, the project team aims at making the Innotex software able to connect to existing Enterprise Resource Planning (ERP) solutions, which are often used by textile companies. Compatibility with existing solutions and suitable training for operators pave the way for widespread usage of the Innotex software throughout the industry. A final contribution to the success of the Innotex toolbox is the importance given by its creators to the compliance of the software with ISO standards, which have been widely adopted throughout the industry.

Generating innovation is the main objective of the Innotex toolbox. By simplifying the detection of quality defect risks in textile manufacturing, Innotex will provide valuable support for the European textile industry and strengthen its position in the global market.



“... the powerful software will provide an additional means of strengthening the position of European SMEs against their rivals.”

Project title

A tool box to catalyse continuous process INNOvation within the TEXTile manufacturing lines in Europe (INNOTEX)

Contract number

30312

Duration

36 months

Global project costs

€3 422 145

EC contribution

€1 860 078

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A NEW PERSPECTIVE FOR MACHINING

KnowEDM

“The Know EDM methodology is expected to generate a 50% lead-time reduction and a 30% cost reduction for the whole European tool making sector.”

Currently, the European tool and precision manufacturing sector accounts for some 4 500 SMEs, employing a total of 110 000 people and achieving a turnover of approximately EUR 9 billion. But Europe’s market share in this field is being threatened by low-wage countries, putting 44 000 jobs at risk. In spite of this, decision makers are reluctant to innovate. In addition to this, unpleasant working conditions make the tool manufacturing sector unpopular for young people. The KnowEDM initiative has been set up to address these issues and improve the competitiveness of European precision engineering.

The structural deficiencies of the European machining sector come at a cost. So far, the making of mould tools and precision engineering components has been a labour intensive, craftsmanship based activity. Qualified personnel are urgently needed in highly specialised areas, like computer aided design and manufacturing (CAD/CAM) – methods which are essential for a sector that, until now, has made little effort to attract young and skilled technicians.

Furthermore, one of the most important machining processes in precision manufacturing, Electrode Discharge Machining (EDM), lacks the capability to offer a reliable machining time calculation. Consequently, it is impossible to optimise the total manufacturing process, reduce costs and shorten the period between start and completion of production (i.e. the lead time).

Competitors from Asian countries may compensate for similar technical limitations with lower manufacturing costs, using smaller wage packets. For the European sector however, the only way to counter this tendency is to save costs and attain shorter delivery times, through innovation. This is what KnowEDM is all about.

Getting to KnowEDM

By gathering 20 SMEs from all parts of Europe, the KnowEDM consortium aims to develop an integrated EDM technology, for the design and manufacture of moulds and precision components.

Electrode Discharge Machining is a machining method primarily used for hard metals or those that would be impossible to ‘machine’ with traditional techniques. The term ‘machining’ has broad applications and refers to all types of metal removal and cutting processes. Examples of traditional machining techniques include turning, boring, milling, drilling, and grinding. Because it has the capability to cut and carve small or odd-shaped angles, intricate contours or cavities into extremely hard steel and exotic metals, EDM is the most appropriate machining method for the mould-making tool and dye industries.

The solution developed by the KnowEDM consortium consists of a knowledge-based system, structured around ‘expert’

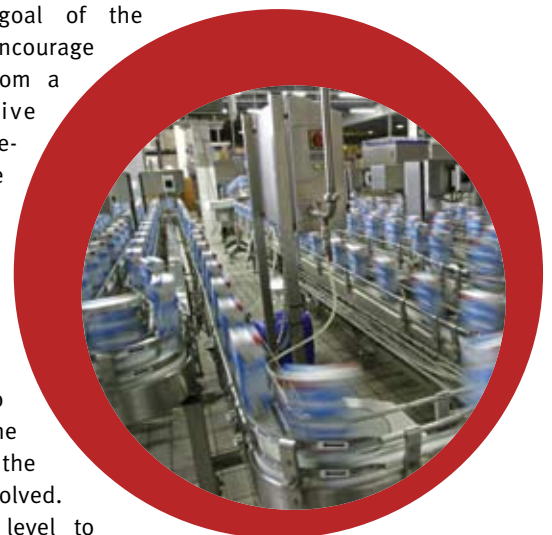
software. The system will handle automated calculation of EDM time, automated design and manufacturing proposals for EDM-electrodes, and provide a computer-based design review of mould tools. This methodology is expected to generate a 50% lead-time reduction and a 30% cost reduction for the whole European tool making and precision engineering sector.

Craftsmanship goes high tech

The KnowEDM system will comprise three software modules, conceived to provide an accurate EDM time estimation, automate electrode design and manufacturing, and optimise the choice between 2 manufacturing processes, EDM or HSM (High Speed Mill). While the support of the HSM process will improve machining for parts of particular geometry, the seamless transition between both methods will allow for an advantage of speed, over the competition.

Thanks to its knowledge-based concept, the modular system will further communication between product designers, mould manufacturers and injection moulders. Moreover, the quality of manufactured moulds will be improved, and the costs and delivery times reduced. The modules will not only be beneficial to mould makers and manufacturers of precision engineering products, but also to other sectors applying EDM technology (e.g. the aerospace, automobile and electronics industries).

Overall, the goal of the project is to encourage a transition from a labour-intensive to a knowledge-intensive working sector. This will not only increase the technological requirements, but also enhance the prestige of the professions involved. Indeed, entry level to



these professions will also encompass university graduates. Their task will be to adapt the modular system to specific applications, which will take place in programming departments rather than in noisy toolshops. Away from an old-fashioned image, the European tool and precision manufacturing sector will become more attractive, thus more able to deal with its current and future recruitment needs.

KnowEDM brings new possibilities and a great deal of potential to help European machining retain a competitive edge over global competition.

Collective Research Volume 3

“KnowEDM’s goal is to create a transition from a labour intensive to knowledge intensive working sector.”

Project title

Automated knowledge based EDM technology for integrated toolmaking and high precision components (KnowEDM)

Contract number

30238

Duration

36 months

Global project costs

€3 791 000

EC contribution

€2 328 000

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PICKING THE RIGHT FRUIT FOR THE RIGHT JUICE

LOWJUICE

"The starting point for a good apple juice is... good apples."

Fruit juice production is a juicy business, but it is not always a sweet one. The competition from countries making low cost juices, as well as the increase in the consumption of other non-alcoholic beverages put a strong pressure on sectors such as apple juice production. Facing up to the challenge of strengthening the position of EU producers, Lowjuice will answer consumer demands for healthier products by developing novel processes for better and more varied apple juices with less sugar and more fibre.

The Lowjuice project draws on the experience of 15 partners to develop a new way of producing apple juice. The members of the consortium are specialists in the fields of apple production, juice processing and also enzyme supply and filter technology, all the elements the project needs to achieve its mission.

Overall, the project aims at producing apple juices suiting consumer taste, but with 50% less sugar and increased fibre content to provide a good share of recommended daily intakes. These improvements must not stretch the total cost of production by more than 20%. Lowjuice will introduce a combination of measures, such as the right choice of apples and modified filtration systems.

Making the right choices

The starting point for a good apple juice is... good apples. Instead of following the frequent practice of using apples rejected from the fresh market to make juice, Lowjuice will use tailor-grown high quality apples. The combinations of high acid and low acid apples, harvested at an early stage, result in lower sugar in fruits. In time, Lowjuice will lead to the establishment of a grower's guide for low sugar juice apples.

This project will achieve the required sugar reduction by using enzymatic conversion. Enzymes are proteins that act on fruit sugars (i.e. sucrose, glucose), converting them into polyols, which have a higher level of sweetness — and thus reduce the need for sugars in the juice. Enzymes will also be selected for their ability to process fibres such as pectin. The removal of fibres before pressing makes for an easier juice extraction. Lowjuice plans to re-introduce the fibres at a later stage of production, in order to make juices healthier for consumers.

Participating teams target the development of two techniques. The first technique is tangential cross-flow osmotic filtration and allows for the removal of compounds that might be in excess and for the adjustment of sweetness levels. The other technique relies on a modified venturi system, to reintroduce fibres into the processed juice.

All the choices made during the project are aimed at achieving better juices with less sugar. The progress made by Lowjuice will enable the preparation of more varieties of juice and even '100%

juices' (i.e. with less than 10% sugar), currently not present in the European market.

A healthy industry

A push for better juice quality will move the technological barriers (i.e. the limited ability to reduce sugars) and open up new doors for the creation of new juice varieties. Due to this diversification effort, the position of EU producers will be strengthened, in a juice market valued at over EUR 18 billion (for 2001). Fruit juices represent a good share of the European market for non-alcoholic beverages, estimated at EUR 52.5 billion for 2003, in a global market of nearly EUR 150 billion.

The evolution induced by Lowjuice will also have an impact on other actors of the industry, such as biotechnology firms developing enzymes or SMEs supplying filter equipment. The new methods will be disseminated and over 6 000 SMEs could benefit from the progress made by this initiative. New patents may also be registered for the sugar and fibre processes.

Furthermore, it is important to highlight that project participants intend to achieve their objectives without significantly raising the costs of juice production, in order for the finished products to remain accessible for consumers.

Lowjuice is a valuable project for the progression and competitiveness of the EU fruit juice sector, which faces internal pressures from demanding consumers and external competition from countries with low production costs. The technological developments enabled by this project have the potential to reinforce the position of European SMEs in the long term.



Collective Research Volume 3

“A push for better juice quality will move the technological barriers (i.e. the limited ability to reduce sugars) and open up new doors for the creation of new juice varieties.”

Project title

Novel processes for reducing sugar and adding fibre to natural apple juices for increased public health and increased competitiveness of the European fruit juice industry (LOWJUICE)

Contract number

30379

Duration

36 months

Global project costs

€1 948 483

EC contribution

€1 185 353

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THE WROUGHT CHOICE FOR MAGNESIUM PARTS

MAGFORGE

"In the forging industry ... SMEs have identified a new specialisation opportunity that will ensure their survival: magnesium forging."

The global marketplace offers almost unlimited economic opportunities for SMEs, but it also puts extreme pressure on small companies to compete with rivals from every corner of the globe. Many European businesses are obliged to cut costs in order to survive against producers from countries with very low labour and production costs. In the forging industry, which directly accounts for 135 000 jobs in Europe, SMEs have identified a new opportunity in specialisation that will ensure their survival i.e. magnesium forging. MagForge is a project destined to support the industry in its quest for innovation and manufacturing enhancement, focusing on lightweight components.

Forging companies mainly work with their automotive counterparts who, due to environmental and fuel-efficiency concerns, require lightweight parts. This requirement opens up new horizons for forging SMEs, with the possibility of replacing the prevailing steel forging with new materials, such as magnesium.

The challenge is for Europe's 1 000 forging SMEs to produce high volumes at low costs. However, before it is feasible to produce magnesium parts within this context, MagForge must first develop new technologies and improve knowledge of materials, processes and tools. The project's 23 participants aim to produce demonstrator components for showcasing the added-value of their research.

Pushing the material limits

Magnesium forging can be done using a variety of techniques, from closed-die forging to coining, impact extrusion and spinning. The production of cast parts (melted into a mould) is widespread, but wrought products are now raising interest as well. Indeed, wrought magnesium parts can be shaped into more formats, and are also stronger and more ductile. Particularly important for the automotive industry is the performance of wrought parts in terms of crash-relevant components.

In order to achieve a satisfactory level of performance for wrought magnesium parts, the MagForge project team aims to optimise the production processes throughout the whole processing chain. The main research areas are materials, processes and components to be developed. The project consortium is developing new materials, based on new alloys, to improve forge ability of the substance and its mechanical properties. MagForge also focuses on the actual forging processes, by improving knowledge on the interrelations between alloy composition, processing temperature and part deformation, as well as on post-forging processes such as machining and heat treatment. New processes are expected to contribute to better quality magnesium parts, and could sustain the cost-cutting efforts the industry has to make.

Forging a new reputation

In the forging industry, steel is the principal material, followed by aluminium. MagForge participants focus on yet another, albeit still underexplored alternative forging material, which is magnesium. The project, if successful, will have developed new processes, enabling high-volume applications with a massive 50% cost reduction over current production prices. Price reduction will be an important asset, adding to the already important weight advantage of magnesium over steel and aluminium. As a matter of fact, magnesium is 75% lighter than steel and 35% lighter than aluminium.

These impressive qualities, if applied to a wide range of products, could reinforce the position of magnesium in the forging sector. The project team will devise benchmark parts, which will be used to measure the performance of magnesium against aluminium, and which will validate the newly developed processes. In order to facilitate the spread of magnesium and its qualities and potential, the knowledge developed by MagForge will be disseminated to industrial associations and forging SMEs, as well as to material producers and end-users.

MagForge hopes to provide the forging industry with tailored and cost-effective technologies for the manufacturing of magnesium-forged components. These developments are expected to offer SMEs the opportunity to produce high-volume magnesium applications, thus strengthening the position of European companies in the global forging market.



Collective Research Volume 3

“The project team will elaborate benchmark parts, which will be used to measure the performance of magnesium against aluminium.”

Project title

Magnesium forged components for structural lightweight transport applications (MAGFORGE)

Contract number

30208

Duration

36 months

Global project costs

€2 900 000

EC contribution

€1 700 000

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MELTING PROCESSING INCONVENIENCE AWAY

“The project focuses on improving rotational moulding processes, by developing two new retrofit tools.”

MICRO-MELT

Plastic is ubiquitous and contained in almost every item we use in our daily lives. The market for these products is, therefore, extremely varied in terms of quantity, quality and types of products. SMEs dominate the European plastic sector but face tough competition from Far East countries, which produce low cost plastics. The competition is such that only an increased understanding and development of plastic processing can ensure the survival of European manufacturers. Micro-Melt aims at advancing the state of the art of rotational moulding and to contribute to the sustainability of European plastic manufacturers.

Micro-Melt brings together the expertise and experience of 14 participants, consisting of SMEs, IAGs and RTD performers. The project focuses on improving rotational moulding processes by developing two new retrofit tools: a microwave heating tool and an internal mould-cooling device. These retrofit devices can be applied to existing mouldings and machinery, and are expected to reduce energy costs and processing times. According to the project team they will also contribute to a significant improvement in the quality of parts.

The importance of being plastic

Household items, working equipment, toys, vehicles and a wide range of other objects are mostly made of plastic. Plastic parts are, for the main part, produced by moulding, a process consisting of shaping material using a model frame, called a mould. The mould is a hollow element, filled with liquid plastic, which will give the material the required shape. Rotational moulding, or rotomoulding, is used to produce hollow one-piece parts, such as kayaks, bins and containers. Such parts are easier to produce with plastic than with metal, and are also cheaper, lighter and more durable.

In rotomoulding, plastic is placed, at low pressure, on a rotating mould (with biaxial rotation). The four phases of the process include loading the plastic powder in the mould, heating and rotation, cooling, and finally the removal of the newly formed part. Once the plastic powder is poured in the mould, the heat melts it, while the rotational movement fills the mould evenly. During the cooling phase, the plastic solidifies and adopts the shape of the mould under the effect of fans. As the part cools down, it shrinks and can be easily removed.

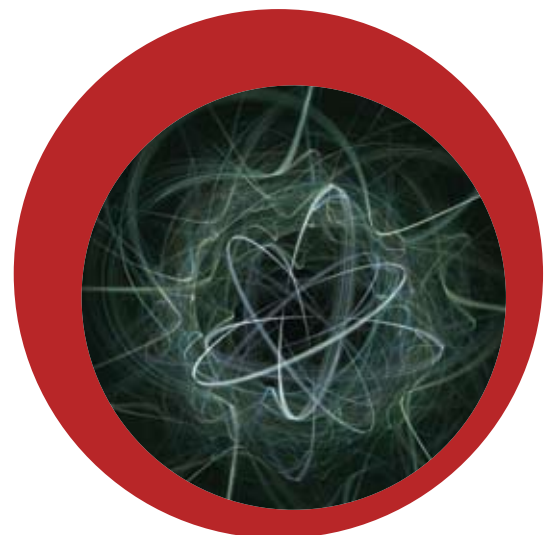
This moulding technique is cheaper than injection moulding, for example, because it uses moulds that are cheaper to produce. In recent years, rotomoulding techniques have evolved and technology now allows for the process to be monitored. Operators no longer have to guess whether a part is ready or not. However, the process remains very lengthy and energy-hungry. Micro-Melt responds to industry needs for shorter and more energy-efficient processing methods.

Two steps, three effects

Micro-Melt envisions the development of two new retrofit devices. The first is a microwave-heating system, which will reduce energy consumption by 70%. The second is a cooling system, which is placed inside a mould and accelerates the cooling process - reducing the overall processing cycle time by 50%. As well as reducing energy consumption and production times, the two new devices will also contribute to improving the quality of plastic parts.

To date, rotomoulding has been limited to low cost applications, but the substantial developments that Micro-Melt is aiming for could change the situation. The scientific advances achieved by the researchers involved in the project could have direct positive effects on the quality of products and on the competitiveness of SMEs and the plastic sector as a whole. The position of European SMEs could be strengthened in terms of their ability to offer high-quality products at low prices and at faster delivery rates.

Micro-Melt will deploy all the efforts required to achieve its main objective, the introduction of new methods for improving rotomoulding processes and to help European SMEs achieve even greater competitiveness.



“The position of European SMEs could be reinforced in terms of their ability to offer high-quality products at low prices and at faster delivery rates.”

Project title

Development of advanced retro-fit processing technologies for rotational moulding to reduce product cost and processing time and increase surface performance (MICRO-MELT)

Contract number

30434

Duration

36 months

Global project costs

€2 548 978

EC contribution

€1 450 082

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CORRUGATED BOARD TOP MODEL BOXES

MODELPACK

“The main difficulty for package manufacturers is to predict the properties of paper products based on heterogeneous source materials.”

To most people, a cardboard box is just a folded piece of tough paper, useful for storing and transferring goods. For the producers of packages, however, the preparation and modelling of performance of corrugated boards is a tough technical challenge demanding intensive research. This is mainly due to the fact that different types of forest-based and recycled fibres are used in the fabrication process. The Modelpack project is developing new software to simplify the design and manufacture of fibre packages — with the overall objective of assisting European SMEs in the sector.

The European corrugated board market is a very demanding sector. On the one hand, customers demand performing products with the lowest possible costs. On the other hand, the relevant legislation requires manufacturers to use recycled paper fibres in the fabrication processes. As a result, small manufacturing companies struggle to combine raw materials with dissimilar characteristics and to produce goods with homogenous properties.

Modelpack, combining the efforts of 15 RTD performers, SMEs and IAGs, hopes to strengthen the position of European SMEs in the global packaging market. The competitiveness of the corrugated goods sector has been hampered by the lack of a quality prediction tool; this project aims to address this issue. The tool will evaluate, in advance, which materials should be used and in which proportions, in order to obtain the best possible final product.

Harmonised heterogeneity

The main difficulty for package manufacturers lies in predicting the properties of paper products, based on heterogeneous source materials. Forest-based materials, traditionally the main source of paper, are slowly being phased out of fibre package-making. The obverse of this is that recycled paper is becoming an increasingly important source material. An additional problem lies in the fact that manufacturers purchase the raw materials for processing on a local basis. Consequently, materials produced in different places tend to have disparate quality characteristics, and manufacturers need to take this factor into account when preparing the final products.

Therefore, manufacturers would welcome the opportunity to predict how the two types of materials — recycled and forest-based — can be combined to satisfy consumer demands. Consumers require corrugated products with homogeneous qualities. They would not accept that two examples of the same box, prepared by the same company for the same use, have different resistance, texture or stiffness characteristics.

The diversity of source materials is a reality that manufacturers must contend with. The solution to the heterogeneity challenge is the development of a prediction tool; this would enable selection of the characteristics and percentages of the ideal

raw material, as suited to the specifications of the desired final product. Modelpack will be a pioneering project, in the sense that it will be the first scientific attempt at developing such a prediction tool.

Helping SMEs go global

The Modelpack software will contribute to the optimisation of all the production stages, from the preparation of paper to final fibre products. This innovative project expects to explore the scientific and technical link between paper properties and the properties of corrugated boards.

To this end, the consortium is gathering information on the existing raw materials used by packaging companies throughout Europe, with a view to constructing a database. A classification of paper grades will be determined, based on their primary properties and production methodologies. Drawing on professional working practices, the project team will define a quality prediction system. Prior to production, manufacturers will be able to predict the packaging quality, with regards to feasibility, costs, profits and energy input.

Use of the new prediction software will allow even the smallest firms to improve and refine products, thus satisfying global market demands, and creating commercial opportunities for the optimised and standardised goods sector.



Collective Research Volume 3

“Drawing on professional working practices, the project team will define a quality prediction system.”

Project title

Advanced quality prediction tool for knowledge-driven packaging design and manufacturing in European SMEs (MODELPACK)

Contract number

030299

Duration

36 months

Global project costs

€2 471 245

EC contribution

€1 744 762

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‘FARM PREGNANCY TESTS’ FOR CATTLE

OVULTEST

“For years, farmers have relied on their experience and observation skills to detect heat in cattle.”

Artificial insemination is a ‘miracle’ technique for individuals who cannot conceive naturally. For dairy cattle, however, insemination is a management technique, which allows farmers to control and induce pregnancy, a sine qua non for milk production. The Ovultest project has been set up with the objective of developing a new biosensor for ovulation detection, aimed at improving the success rates of inseminations. The new detection method will have a significant economic impact on dairy farming in the EU.

The Ovultest biosensor is being developed by a multinational team of 18 RTD centres, IAGs and SMEs, with comprehensive experience in the fields of electronics, information technologies, livestock and dairy farming. The scientific research is expected to lead to the production and commercialisation of a new multianalyte analyser. This instrument will be able to determine ideal insemination times and to detect pregnancy, by means of an analysis of the hormonal presence in milk.

Traditional heat detection methods

For years, farmers have relied on their experience and observation skills to detect heat in cattle — this indicates the period of sexual receptivity, which occurs approximately every 21 days, with a duration of 6 to 30 hours.

The main disadvantage of this method is that it is particularly time-consuming: each observation requires approximately 20 minutes, and must be performed 3 to 4 times a day. Furthermore, efficient heat detection can only be achieved by farmers with a good understanding of cow behaviour; they need to sense the animal’s nervousness and increased activity. Some farmers keep records of fertility events and use pedometers, but the latter technique is still far from reliable.

Unreliable heat detection leads to poorly timed inseminations, and consequently results in lower conception rates. Ovultest aims to solve this problem, by developing a biosensor, which is able to measure the levels of progesterone and estradiol hormones in milk. These hormones are produced at different junctures of the cow’s oestrus cycle; a combined analysis of hormone levels allows for the prediction of the best insemination times.

Current test procedures for the monitoring of hormonal levels in milk, such as ELISA tests (Enzyme-Linked Immuno Sorbent Assay), are not widely implemented, because they require skilled technicians, are time-consuming and are not adaptable to automation.

Pregnancy checks made easy

An invaluable asset for the Ovultest biosensor will be its ease of use, and also its ability to determine heat periods and pregnancy, with unprecedented levels of rapidity and accuracy. The biosensor, or analyser, will also prove its worth in identifying certain reproductive disorders. For example, the analyser will be able to identify anoestrous cows, and monitor postpartum ovarian status, thanks to a strategically scheduled analysis calendar, defined by intelligent software.

Ovultest will be an extremely useful tool for the 600 000 SME dairy farmers across Europe. For example, a dairy-farm with a herd of 100 cows could save up to EUR 15 000 per year, merely by being able to predict ovulation times accurately. The failure to detect heat and pregnancies, and the consequent miscalculated inseminations, account for nearly 90% of unsuccessful inseminations — a problem for which Ovultest will offer a solution.

The economic benefits of the analyser could contribute to the survival the European dairy industry, which between 1990 and 2000 lost half of its farmers. This sector is still, despite the difficulties it encounters, one of the largest food exporters in the EU, worth nearly EUR 4 billion a year. With the progress achieved by Ovultest, the productivity of dairy cows, both in terms of milk production and delivery of calves, could be greatly improved.

The Ovultest analyser will not replace routine veterinary pregnancy examinations. However, it will allow for easier heat and pregnancy detection, by replacing the need for labour intensive observations with innovative technology.



Collective Research Volume 3

“An invaluable asset for the OvulTest biosensor will be its ease of use and ability to determine heat periods and pregnancy with unprecedented levels of rapidity and accuracy.”

Project title

Improving profitability of dairy SMEs through developing, validating and promoting the use of a biosensor for ovulation detection (OVULTEST)

Contract number

30377

Duration

36 months

Global project costs

€2 728 500

EC contribution

€1 819 740

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EARLY WARNING SURVEILLANCE FOR MILK

PATHOMILK

“The implementation of this system enables dairy farmers to reduce economic losses resulting from delayed detection of diseases.”

Milk production is the most important agricultural activity in the majority of EU Member States, representing some 14% (EUR 38 billion) of the total value of agricultural production. With EU consumers placing increasing importance on food safety, traceability, food quality and animal welfare it is essential that a quick, easy to use, portable and cost effective microbiological analyser for pathogen detection in dairy herds is made available across the EU. This would lessen the crippling effects of animal disease, avoid unnecessary extra work and veterinary fees and ultimately safeguard the future of the EU dairy industry.

The Pathomilk project aims to tackle this EU-wide problem through the development of a state-of-the-art veterinary surveillance system that enables simple, affordable on-site diagnosis of diseases. The implementation of this system enables dairy farmers to reduce economic losses resulting from delayed detection of diseases. These measures also help to keep outbreaks under control, facilitate the production of high quality milk and ensure the health and safety of European consumers.

Milking the industry dry?

Despite the importance of the EU dairy industry, most small farms have fallen on hard times with many going out of business altogether, mainly due to low milk prices. Improving current pathogen detection systems would enable even the smaller, more vulnerable dairy farms to produce milk of improved safety and quality, as well as enabling the early detection of disease outbreaks. Such improvements would boost the competitiveness and public image of the EU dairy sector through the reduction of disease-related costs.

In addition to the potentially devastating economic impact, several pathogens affecting dairy herds are also dangerous to humans. Some are often present in raw milk and dairy products, affecting cheeses such as brie, camembert, roulé, semi-soft farmhouse cheeses and unpasteurised milk. Pasteurisation results in a dramatic reduction of milk-borne disease outbreaks but consumption of raw or inadequately pasteurised milk has been associated with several outbreaks of intestinal infections.

Flexibility, speed and accessibility

Most detection techniques only detect one pathogen at a time through blood samples and the farmer may have to wait for several days, even weeks, before getting the results of the tests. Pathomilk aims to develop a rapid multi-pathogen analyser for detecting the most common pathogens in milk, thus avoiding blood sampling. Efficient detection from samples will be possible through the use of an innovative biosensor based on a DNA-hybridisation method and utilising Surface Plasmon Resonance (SPR) technology.

Dairy SMEs and associations are conscious of the benefits of a fast, reliable and cost-effective technology for the accurate detection of pathogenic microorganisms. To ensure the Pathomilk system's development and effective dissemination of the results, a number of associations from different Member States have established a consortium that will raise awareness and ensure appropriate training to maximise the benefits such technology brings.

This support is vital. With the future of SME dairy farms at stake, it is increasingly important that adequate on-farm controls are developed that will enable farmers to produce safer milk, to make their businesses competitive and to ensure the safety of consumers across Europe and beyond.



“With the future of SME dairy farms at stake, it is increasingly important that adequate on-farm controls are developed which will enable farmers to produce safer milk.”

Project title

Providing milk supply chain with a rapid, portable and cost effective biosensor for multipathogen detection in milk (PATHOMILK)

Contract number

30392

Duration

36 months

Global project costs

€2 788 967

EC contribution

€1 784 750

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“The modular design of twin-screw extruders allows a significant flexibility in process set-up and operation, enabling the engineer to tailor the processing and mixing environment to suit specific hardware requirements.”

Plastic extrusion is the most important processing technology for plastics, accounting for more than 30% of all plastics made in Europe. Due to its process design flexibility and high-mixing efficiency, twin-screw extrusion is widely recognised as a key future technology in this sector. But there is a fundamental lack of quantitative and qualitative knowledge on this subject, which proves to be a major barrier to the advancement of twin-screw extrusion as an industrial standard. The PEPT-Flow project has been set up to address this limitation, through the use of an innovative flow-analysis technique.

Throughout the plastics sector, twin-screw extruder technology is widely used for processes such as polymer blending, compounding and reactive processing. The modular design of twin-screw extruders allows a significant flexibility in process set-up and operation, enabling the engineer to tailor the processing and mixing environment to suit specific hardware requirements. However, this diversity in machine design, combined with the complexity of the processing environment and the limitations of existing flow analysis techniques, has led to a significant knowledge gap.

Bridging gaps

Consequently, while guidelines exist for process set-up and optimisation, machine designers and end-user processors are primarily limited to the experience and expertise of the technologist, or to time-consuming trial and error attempts. To overcome this hurdle, the PEPT-Flow consortium relies on an innovative flow-analysis technique — ‘Positron Emission Particle Tracking’ (PEPT) — that will be applied to an experimental twin-screw extruder. The process is being tested under realistic industrial conditions.

In time, the PEPT technique is expected to enable detailed non-invasive quantitative and qualitative investigation of the flow behaviour and mixing mechanisms within the twin-screw process. This is to determine the influence of machine design, process operation and polymer system properties. The results generated shall be used to establish knowledge-based machine design criteria and operation guidelines. They will also assist in developing, optimising and validating both new and existing commercial simulation and modelling software.

Going with the flow

PEPT uses positron-emitting tracer particles that cause the rapid release of collinear back-to-back gamma photons, which are detected by carefully positioned positron imaging cameras. Triangulation of successive photon pairs reveals the particle location in three dimensions. The tracer particle position data can then be processed to yield flow analysis information such as trajectory plot movement, time-averaged velocity vectors and spatial residence time distribution plots. The gathered information provides insight into the flow and mixing behaviour

of the system. A key feature of the PEPT technique is that the gamma photons are able to penetrate relatively thick layers of steel, thereby enabling the analysis of processing equipment operated under realistic industrial conditions, such as high pressure and temperature.

The knowledge base and tools established by the PEPT-Flow project are expected to have a significant impact on the competitiveness of SMEs throughout the European plastic sector. This will result in the improvement of simulation and modelling software, as well as in knowledge-based machine design, optimisation and validation. In addition, new process launches will be reduced in time and cost, and energy will be conserved thanks to improved material properties and production.

All in all, the project is expected to considerably improve machine design and materials. Therefore, PEPT-Flow will not only generate better services and provide more added value, but will also contribute to the sustainability and competitiveness of a European industry sector led by SMEs.



Collective Research Volume 3

“The knowledge base and tools established by the PEPT-Flow project are anticipated to have a significant impact on the competitiveness of SMEs throughout the European plastic sector.”

Project title

Innovative Polymer Flow Visualisation for Optimised Machine Design, Improved Mixing and Material Properties, Process Efficiency and Energy Reductions (PEPT-Flow)

Contract number

30191

Duration

36 months

Global project costs

€3 351 561

EC contribution

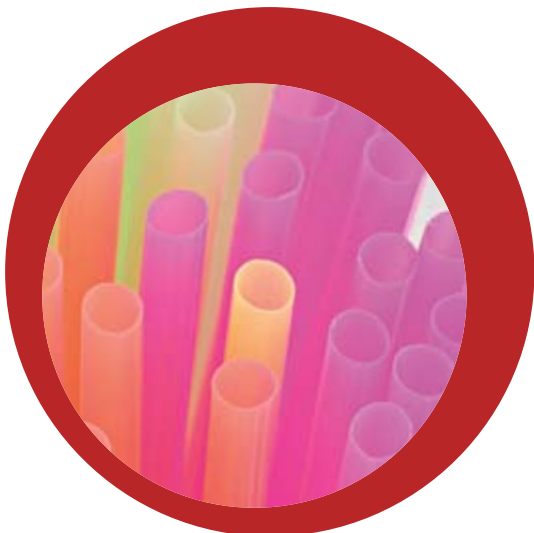
€2 182 667

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FROM TRIAL AND ERROR TO STATE OF THE ART

Pro4Plast

“In term, the measures developed by the Pro4Plast partners are expected to cut the time to market by 50% and to achieve a cost reduction of 30%.”

Injection moulding of plastic products is used in the production of a vast range of items, appliances and consumer goods. At the moment, the design of plastic products and moulds is based largely on craftsmanship and empirical knowledge, while simulation techniques are used only in critical cases. The Pro4Plast initiative is the first European collaboration that aims to place the process on more of a scientific footing. Assembling industry associations, research providers and participants from the entire supply chain of the EU plastic industry, the project aims to improve the competitiveness of European SMEs in the field.

Injection moulding is a widespread manufacturing technique used to produce thermoplastic parts. During the process, molten plastic is injected at high pressure into a mould, which is the inverse of the product's shape. Injection moulding is contingent on the material characteristics, the product design and the process parameters. Typical items produced using this technique include car bumpers, interior and exterior car parts, fuel systems parts, and electric or electronic appliances like washing machines, TV sets and hi-fi systems.

In fact, injection moulding is the most common production method for plastic products. However, the current product development process, with its standard approach of trial and error, is in dire need of change. Trial and error involves selecting a possible solution to a problem, applying it to the problem and, if unsuccessful, selecting or generating another possibility that is subsequently tried. The process ends only when a possibility yields a solution. This approach has its shortcomings: it makes no attempt to discover why a solution works, and moreover, it only produces one solution (there may be more than one accessible), which is therefore not necessarily the best obtainable result.

The Pro4Plast project has been set up to negotiate the transition towards a more precise methodology in the field of injection moulding product-development-process. If successful, the initiative could constitute a vital step for approximately 40 000 European SMEs.

Big market, facing an even bigger challenge

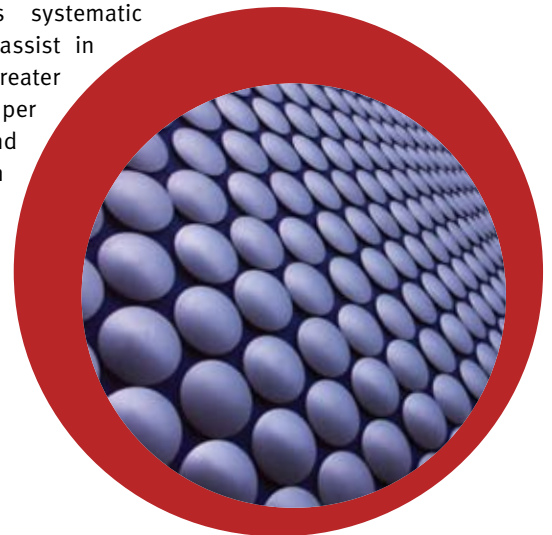
The European injection moulding and mould-making industry has an annual turnover of EUR 150 billion and employs 1.5 million people, mainly in medium-sized companies. Although the European plastics industry is still the worldwide technology leader, it is already losing 5% annually to low-wage countries with less costs and shorter development times. Today, only these countries can develop and produce simple plastic products at competitive prices. If European SMEs in the plastics sector are to maintain their competitiveness, they will need to produce complex and highly functional parts, using both fast and cost effective means. To this end, the Pro4Plast project is seeking to advance the state of the art in injection moulding, by developing a systematic approach to the production process

and especially to the product-development process for complex parts.

Plastic products are becoming progressively more complex; this provides several reasons justifying why the trial and error method is increasingly inefficient for product development and problem solving. The first is that this method requires an injection mould to be conceived and manufactured for each new design of a plastic product. Subsequently, production tests need to be performed to evaluate both injection mould functionality and plastic part quality. Finally, the process of optimising parts, moulds and production processes, generates multiple iterations in the product development process, until an optimised solution is obtained. Consequently, this procedure requires extensive funding and considerable time.

Tackling the “time is money” issue

Pro4Plast is developing an enhanced injection moulding simulation software that will render fastidious trials and testing obsolete. Another powerful tool currently under development is the Product Development Guidance System (PDGS). This flexible, affordable software tool will enable SMEs to establish themselves as ‘strategic development and production partners’, able to produce highly functional and complex parts at low cost and within a short period of time. Tailor-made for the necessities and possibilities of European SMEs, the software’s systematic approach will assist in generating greater productivity per employee and machine in development and production.



Collective Research Volume 3

The new product development process will be supported and promoted by a new training model, leading to a 'PDGS certification'. Once completed, the tools developed by the Pro4Plast partners are expected to cut the time to market by 50%, and to achieve a cost reduction of 30%.

Overall, the measures implemented by the Pro4Plast project have the potential to reinforce the position of the European plastic industry against its low-wage competitors. Moreover, the project's outcomes could effectively help to ensure Europe's continued leadership, in the field of plastic production.

"If European SMEs in the plastics sector are to succeed in competition, they will need the endeavour to produce complex and highly functional parts in a fast and cost effective way."

Project title

New product development guidance system (PDGS) for complex injection moulded plastic parts by enhanced injection moulding simulation and material data measurement applicable by SMEs (Pro4Plast)

Contract number

30205

Duration

36 months

Global project costs

€4 450 097

EC contribution

€2 813 846

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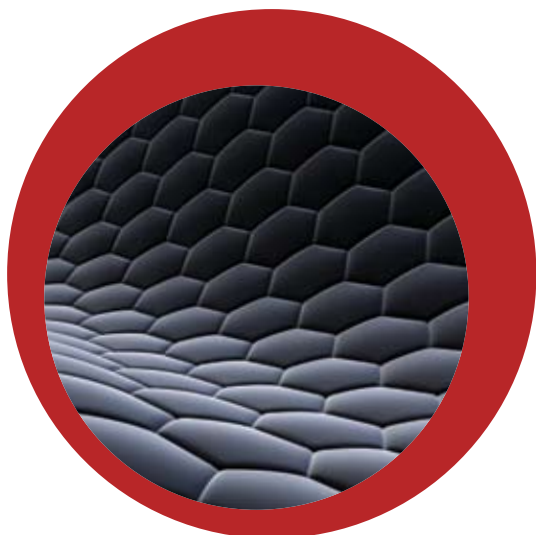
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SCRAPING OFF DISEASES FROM SHEEP POPULATIONS

RISKSCRA

“The visible symptom in infected animals is itching, which causes them to scrape off their fleece against fences or rocks; hence the name, scrapie.”

Free-roaming sheep are common feature in Mediterranean landscapes, but behind the bucolic beauty of these scenes lies an invisible threat by a distinct enemy — scrapie. This disease spreads among flocks and herds and contaminates milk and dairy products. Dairy SMEs need effective tools to enable the regular control and risk assessment of scrapie in milk. The RISKSCRA project is aiming at achieving the scientific and technological objective of improving the safety of sheep milk-based products from the Mediterranean area.

The European sheep population had reached nearly 90 million by the end of 2004. Mediterranean countries are the main producers, with two thirds of total production. The dairy sheep industry represents a strategic sector for Mediterranean agriculture (in Sardinia, for example, sheep breeding is the principal activity) but the vulnerability of herds to some diseases is a worrying factor.

Transmissible spongiform encephalopathy (TSE) diseases, such as scrapie, are of major concern to breeders and sheep dairy SMEs. The industry needs tools to prevent scrapie infection. RISKSCRA is a project with the objective of enabling the dairy sector to quantify and manage the risk of contamination. The work involves 12 partners from the Mediterranean basin including Croatia, Greece, Italy and Spain who will tackle complex issues requiring a combined level of human resources, equipment and facilities that are far beyond the capabilities of individual participants.

Scrapie-free flocks

The RTD oriented tasks focus on the current knowledge regarding the genetic background of this particular form of TSE, in order to introduce a technique or device for detecting scrapie-susceptible genotypes in milk.

Scrapie is a degenerative disease, affecting the nervous system of sheep and goats. The visible symptom in infected animals is itching, which causes them to scrape off their fleece against fences or rocks; hence the name, ‘scrapie’. Like other TSE forms, such as bovine spongiform encephalopathy or BSE, scrapie is caused by a proteinaceous infectious agent, called a prion. After a long incubation period in the host sheep, the disease spreads destroying tissues and organs.

This TSE is transmissible among sheep and goats but it has not yet been confirmed whether it can be passed on to other animals or humans. The spreading mechanism is not yet fully understood and more research is needed. A better understanding of these mechanisms is of particular importance in the context of RISKSCRA, which focuses on free-flocking herds, which move around without any particular restraint.

Risk quantification

RISKSCRA will create new analytical tools and test their effectiveness throughout the production chain of sheep dairy products. The research will benefit all stages of production, from breeding to dairy product preparation. Enhancing risk control methods ensures the safety of milk products — the principle concern for manufacturers wishing to fulfil consumer demands for safe foods.

Safer food products can have a direct economic impact by allowing dairy SMEs to promote their products in new markets. Quality attributes can be put forward under the umbrella of ‘scrapie-free’ products, and goods sold on wider European and international markets. Research results will be disseminated via training courses to give SMEs tailored support for better assimilation of new technology and knowledge. Training is intended to provide dairy producers and sheep breeders with greater incentives for achieving commercial success.

The new RISKSCRA analytical tools are expected to enable a reliable assessment and quantification of scrapie risks in sheep dairy products in the Mediterranean area. The project team aims at reconciling economic development with environmental sustainability, enabling local producers to succeed with disease-free food products in demanding markets.



“Enhancing risk control methods ensures the safety of milk products — the major concern for manufacturers, wishing to fulfil consumer demands for safe foods.”

Project title

Dairy products in Mediterranean sheep populations: quantification of scrapie risk (RISKSCRA)

Contract number

30278

Duration

24 months

Global project costs

€1 540 000

EC contribution

€1 053 000

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“The primary objective of the Safecheese project is to develop a barrier to prevent pathogenic bacteria from growing in raw milk cheeses.”

Raw milk cheeses made in the EU are appreciated by consumers all over the world. But unfortunately, every year people fall ill owing to the consumption of cheese made from non-pasteurised milk, which often gives these products bad publicity. Thousands of European SME cheese producers make cheese from raw milk, which has a unique taste and quality; however, it often fails to enter the market, because it lacks the adequate pathogenic barrier that a pasteurisation process would provide. It is impossible to eliminate occasional contamination of non-pasteurised milk with harmful bacteria, even when dairy farms adhere to strict clean milking and cooling procedures. Current EU legislation calls for measures ensuring that all food made available to consumers should be safe to eat. This legislation, coupled with consumer choice issues and the continued success of the cheese production industry, has induced those involved in the Safecheese project to explore safer means of producing raw milk cheese.

The primary objective of the project is to develop a barrier that will prevent pathogenic bacteria from growing in raw milk cheeses. This will be achieved through the development of a protective culture of lactic acid bacteria, originating from raw milk cheese. This protective culture would subsequently prevent the growth of pathogenic bacteria, ultimately resulting in safer cheese from non-pasteurised milk, for EU consumers. The project's general aim is to expand the current understanding of microbiological growth, affecting both the wanted lactic acid bacteria, and the unwanted pathogenic bacteria in raw milk cheeses. This information would contribute to food safety in a cost-effective way, while respecting consumer preferences for natural foods.

Feeling bleu: Safeguarding consumer health

The lack of a pathogenic barrier is frequently a factor preventing pan-European and global distribution of raw-milk cheeses. It is consequently necessary that EU producers explore and develop the means to produce safer cheese. Food safety is an increasingly important public health and consumer concern, as problems with food safety transpire; worldwide, governments are redoubling their efforts to safeguard both consumer health and the sector itself.

The general public is aware of pathogenic bacteria such as Salmonella, Listeria and E.coli, but food borne diseases are still chronically under-reported, even though it is estimated that these illnesses are responsible for the annual loss of one million working days. There is therefore a perceptible need to produce safer raw milk cheese, with a lower risk of food borne diseases for the consumer. Milk pasteurisation forms a barrier that destroys the pathogenic bacteria in milk, but it can also spoil the characteristic taste and flavour of cheeses. Consequently, a technology which conserves the renowned flavour of these European cheeses, while also ensuring the safety of EU citizens, needs to be developed. This technology would be applied by thousands of SMEs in the raw milk cheese sector, by augmenting existing production methods.

A cultural clash ?

The Safecheese project aims to develop a specific, mixed protective culture of lactic acid bacteria, making it possible for raw milk cheese producers to deliver safer cheese, without compromising on taste. This protective culture will be characterised according to its protective properties, and then produced in a pilot plant, with selected protective cultures added to the starter culture. Once the cheeses are successfully produced and certified, cheese makers across the EU can begin to introduce potential protective cultures.

Safecheese aims to help SMEs in the sector to become more competitive, by reducing costs, adding value and boosting consumer confidence. Milk and cheese producers combined, employ an estimated 910 000 people across the EU, often in rural areas. It is anticipated that the sector will grow substantially, once the average EU consumer is reassured concerning the health risks of raw milk cheese, and the increased safety of the products on the shelves. Cheese producers frequently find it difficult to adhere to safety regulations, while attempting to maintain traditional production methods and customer satisfaction. Through its research and development activities, however, the Safecheese project strives to strike this delicate balance.



“Lack of a pathogenic barrier often prevents pan-European and global distribution of raw-milk cheeses.”

Project title

A barrier for preventing pathogenic bacterial growth in cheese from non-pasteurised milk (SAFECHEESE)

Contract number

30285

Duration

36 months

Global project costs

€1 450 000

EC contribution

€725 000

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A SAFER WORKING ENVIRONMENT

SAFEWORKER

“... the car repair sector faces a serious skills shortage.”

European industrial SMEs operate in competitive markets. To achieve success, business practices must be constantly improved e.g. by developing new production techniques and identifying better materials. One aspect they cannot neglect is the safety of their workers. European legislation imposes strict health and safety rules to reduce, amongst other things, the amount of occupational exposure to certain chemical substances.

In the vehicle repair industry, the use of certain filler materials traditionally used for car body repair has created a situation where workers are exposed to styrene vapour which is given off by the styrene containing compounds used in this sector. In order to reduce this exposure and improve working conditions, the Safeworker project aims to introduce styrene-free fillers to the car repair industry.

Volatile organic compounds (VOCs) such as styrene are currently used in polyester repair fillers. However, alternative products are needed, as the 98/24 EC Directive lists strict rules on ‘the protection of the health and safety of workers from risks related to chemical agents at work’.

The Safeworker consortium of 12 RTDs, IAGs and SMEs expects to develop new body repair fillers used in the repair of dents and damage in vehicle bodies which will reduce or eliminate exposure to styrene in this market sector. Each year, 100 000 workers are affected by styrene, and nearly 300 000 tonnes this chemical is released into the atmosphere.

Looking Ahead

Styrene, an aromatic hydrocarbon, can lead to problems associated with occupational exposure, such as dermatitis. In Europe, the maximum allowable concentration of styrene vapour allowable in the workplace is controlled by legislation. Styrene is also classified by the International Agency for Research on Cancer (IARC) as a possible human carcinogen, so it is important to reduce its uses and applications by finding a suitable replacement.

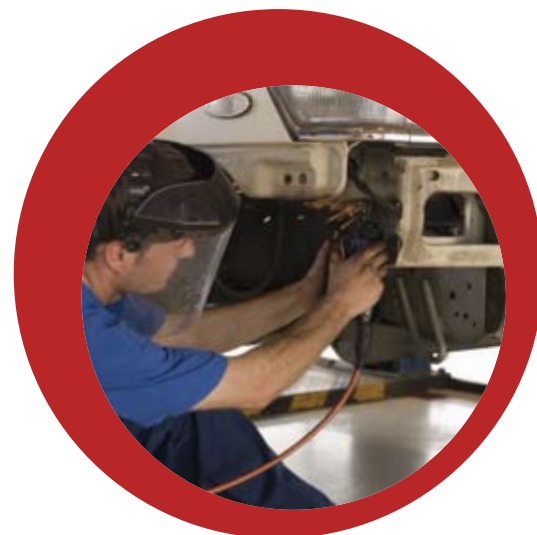
As a result of the dangers presented by chemicals used in industry, the car repair sector faces a serious skills shortage. Indeed, workers are reluctant to follow the car repair professional path. The paradox is that the skills shortage comes at a time when prospects for the repair market are at their highest. There are over 180 million cars in Europe, with an average increase of 2.3% annually, and the demand for repairs follows the same pattern of increase.

Fulfilling the expectations of SMEs

The participants of Safeworker intend to share the development of the new filler with as many industrial participants as possible, thus allowing the whole car repair sector to benefit from it.

Safeworker can have a significant and positive impact on more than 170 000 SMEs working in the car repair sector and represent 98% of the companies involved. First of all, healthier working conditions improve the quality of life for workers and improve their productivity. The filler itself will allow it to cure rapidly and the use of UV lamps will accelerate the turnaround of repairs and reduce costs, hence improving the productivity and revenues of the companies adopting the new technology.

The developments introduced by the Safeworker project are expected to have a positive impact on the situation of workers and employers in the car repair sector. Workers will be less exposed to hazardous products and to skin and respiratory diseases. Employers could attract more skilled people and respond to the demands of a sector with increasing demand.



“... the skills shortage comes at a time when prospects for the repair market are at their highest.”

Project title

Reduction of Occupational Asthma and Dermatitis in the Vehicle Repair Industry (SAFEWORKER)

Contract number

30305

Duration

36 months

Global project costs

€2 466 713

EC contribution

€1 404 824

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NOT EVERYTHING THAT GLITTERS IS SAFFRON

SAFFIC

“The adulteration of saffron in Europe, which has been noticeable in the latest decades, has caused the distrust of consumers.”

The past years have seen a proliferation of fraudulent practices in the saffron spice market. This phenomenon is due to a lack of technological standards applying to the detection of counterfeits: despite the advances achieved in the unification of authenticity criteria, some technological limitations remain unresolved. For instance, there is no definite proposal to modify the outdated test method established by the International Organisation for Standardisation in 2003, which is still the main tool used to counter saffron adulteration. European IAGs, SMEs and research institutes have therefore joined forces to create SAFFIC, a platform intended to develop a new methodology that will improve international quality control norms.

Derived from dried stigmas of the *Crocus Sativus* Linneaus flower, saffron is the most precious and expensive spice worldwide. It is also one of the few spices that can transmit three different sensory properties of food: colour, taste and aroma. These characteristics, combined with its unique taste, render saffron's qualities justly appreciated. However, the adulteration of saffron in Europe — a marked development over the past decades — has caused distrust amongst consumers. As a result, consumption of European saffron has decreased in favour of products provided by countries outside the EU. Considering the fact that European companies control over 90% of the global saffron market, the challenge they face is severe.

The current international norm (ISO) regulating the purity and quality of saffron, does not currently include any reliable analytical techniques capable of detecting basic colorants and natural pigments. Nevertheless, a reliable tool applied to this task, would prove invaluable in fighting fraud and establishing objective criteria of food quality. Furthermore, the test method established in 2003 (ISO/TS 3632), does not provide a tool that can determine microbiological contamination, so as to assure food safety. The necessity for a new testing standard is compelling, both from a market and a consumer-health perspective.

Regaining consumers' trust

The SAFFIC consortium aims to modify the current ISO norm and introduce reliable standard procedures to fight fraud. Within this context, European SMEs could play a crucial role as controlling entities of saffron quality. An efficient control mechanism of synthetic colorants and pigments, would detect possible toxic effects of adulterated saffron thereby ensuring safety standards for consumers, as well as regaining their trust.

Although it is already possible to verify the authenticity of saffron by identifying the compounds responsible for colour, aroma and bitterness, the costs of current techniques is a factor rendering them unsuited to SMEs. Moreover, the choice of techniques varies from country to country. The SAFFIC methodology defining the criteria for purity, quality and food safety, will actually be the main tool supporting the competitiveness of European SMEs in the saffron sector. The project will unify these criteria, and will ultimately provide a unique methodology with the capacity to assess the authenticity of saffron.

Back to nature

In order to simplify the quality control of saffron by SME personnel, the technology developed by the SAFFIC project partners, has to be more reliable and cost-effective than current techniques. To this end, near infrared spectroscopy — the study of interaction between light and matter — provides affordable and fast analyses, not necessitating sample pre-treatment. Moreover, this method can be easily combined with techniques currently in use, at saffron producing facilities.

In addition, the introduction of Polymerase chain reaction (PCR) techniques for microbiological determination, makes it possible to reduce the size of samples and to analyse several strains concurrently. In addition to reducing costs, these methods will require less sample treatment and consequently less analysis time, laboratory equipments and consumable waste, but also less personnel training.

Overall, the SAFFIC methodology will be more sensitive, accurate and reproducible than the current testing norm. Beyond the potential boost it may provide to the European saffron sector, SAFFIC might inspire similar initiatives in the detection of non-legal adulterants in foodstuff, thereby contributing to the overall quality of natural products from Europe.



“The SAFFIC consortium aims to modify the current ISO norm and introduce reliable standard procedures to fight fraud.”

Project title

Methodologies for implementing International Standards for Saffron Purity and Quality (SAFFIC)

Contract number

30195

Duration

36 months

Global project costs

€2 762 312

EC contribution

€1 868 139

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SLIPPING WAS YESTERDAY

SlipSTD

“The production of safer flooring represents a big potential market for the ceramic floor tile industry.”

The societal and economical impacts of slip accidents are wide ranging. Accidents caused by slipping and tripping, are the most common cause of injuries at work. Ninety-five percent of major slips result in broken bones, and with older people comprising an increasing section of the population, such injuries are likely to become even more of an issue. Therefore, there is a pressing need to take action, and try to prevent slip accidents. This can be achieved by improving the slip resistance of shoes and floorings, and by maintaining clean surfaces without slippery interfacial contaminants.

Designing, testing and installing safer flooring surfaces is a first task for enhancing safety. The SlipSTD project is focused on optimising the design of floor tiles and has been set up to stimulate this process at the EU level, and to help reduce the number of slip accidents.

Although numerous safety requirements exist for other products, there are currently no comprehensive European manufacturing guidelines for the production of slip-resistant ceramic tiles, nor are there coordinated test methods to measure slip-resistance. For instance, the current standard defining the minimum requirements for ceramic tiles to be labelled with CE marking, does not include a common ‘European’ requirement for slip characteristics.

Consequently, diverse national standard methods are still used to assess slip-resistance, inevitably leading to trade barriers between European countries, owing to their diverging practices. In the absence of agreed slip requirements harmonised and validated tests, tile manufacturers tend to strive for innovative products in terms of aesthetic appeal, rather than focus on improved health and safety performance. Still, the production of safer flooring represents a substantial untapped market for the European ceramic floor tile industry, which is dominated by SMEs.

Scratching the surface

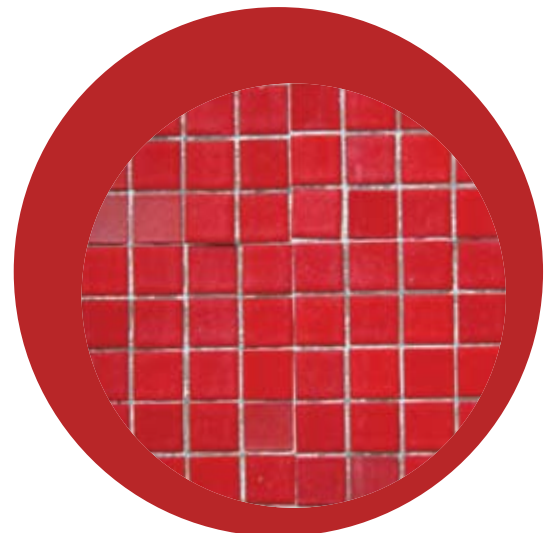
Assembling a balanced mix of end-users, well-known public bodies, tile manufacturers, associations, architects, and European Research Centres, the SlipSTD consortium will rely on this cross-disciplinary expertise. SlipSTD aims to reduce the number of slip accidents, by specifying the main floor surface characteristics associated with engineering slip resistance floorings.

A multidisciplinary approach will be applied, to produce fundamental data concerning slip resistant surfaces, in terms of the topography (micro and macro structures) and the relevance of the surface structure in various environments. This methodology will include research on the tribological properties (friction, lubrication, wear) of ceramic tiles. It will also rely on computer simulations and surface science to design surfaces with graded slip resistance. The generated knowledge will provide sound guidelines that will assist manufacturers when designing improved slip resistant flooring tiles.

Setting safety standards

SlipSTD is to create a reference database of validated surface profiles, and a set of standard surfaces tested with different slip resistance characteristics. This will provide a carefully defined, reproducible validation tool for slip resistance measurements. In addition, the project partners will publish a Publicly Available Specification (PAS), indicating the surface requirements for glazed or unglazed ceramic floor tiles, to be classified as resistant. These results could be used in the future by the corresponding standardisation committees to help them to define this characteristic for ceramic tiles.

In short, SlipSTD will provide rules, guidelines and characteristics advising tile manufacturers how to best produce slip-resistant ceramic floor tiles, and earn the trust of consumers. The project will also provide architects with simple guidelines to generate confidence in designing these safer floors. Ultimately, the outcomes of the SlipSTD project are expected to significantly reduce the number of slip accidents across Europe.



Collective Research Volume 3

“SlipSTD aims at reducing the number of slip accidents by specifying the main floor surface characteristics associated with engineering slip resistance floorings.”

Project title

Development of Slip Resistance Standard Surfaces (SlipSTD)

Contract number

30287

Duration

36 months

Total project cost:

€2 140 769

EC contribution

€1 318 284

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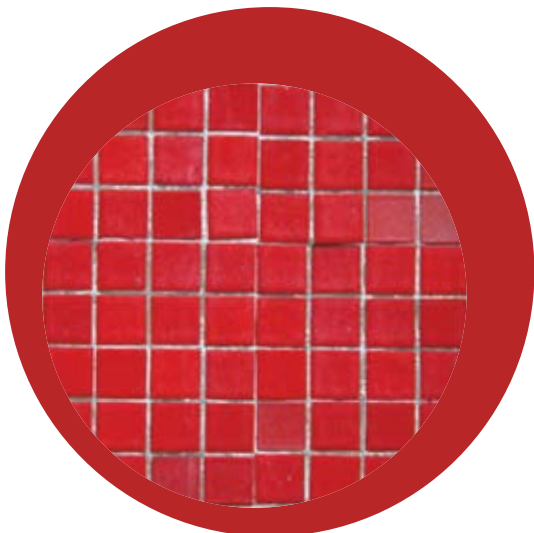
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UNDERWATER PREVENTION AND DETOXIFICATION

SPIES-DETOX

“Most of the toxins are not fatal for shellfish (molluscs and crustaceans), but they can have distressing and even severe effects on humans.”

Aquaculture pertains to the improvement and control of fish production of all types, and also to the attempt to ensure a permanent supply for consumers, without over-fishing. European aquaculture production is still marginal in the worldwide market, and protection against toxins is an issue requiring attention, if this market is to prosper. For instance, in shellfish culture (as with other intensive cultures such as poultry farming), the slightest contamination of a raft or tank can be disastrous for the production output. The SPIES-DETOX project aims to improve the early detection of algal toxins, and to define new protocols for the protection of shellfish aquacultures, thus protecting SMEs and other stakeholders involved in the sector.

Most of the toxins are not fatal for the shellfish per se (molluscs and crustaceans), but they can result in distressing and even severe effects on humans. Notably, some toxins are capable of causing diarrhoea, amnesia and even paralytic poisoning.

The SPIES-DETOX consortium draws on the expertise of 19 IAGs, SMEs and RTD performers in the fields of aquaculture and toxin research, from both the North Sea area and the Mediterranean. Their mission is to develop new methods for detecting and eventually destroying the toxins found in shellfish that are bred in aquaculture.

Mission: search and destroy

The key to effective destruction of contaminating toxins lies in the reliability and performance of the monitoring system. For SPIES-DETOX, the monitoring system will be based on a solid phase adsorption device. The device will contain a gel, to which toxins will attach. The existing data concerning toxins will enable the project team to configure the solid phase device and combine it with remote real-time samplers, placed underwater. The team expects these probes to eventually become the preferred management and control tools for the aquaculture industry.

While working to improve detection of algal toxins, SPIES-DETOX participants intend to investigate new protocols for the destruction of toxins. These protocols will be applied during the mechanical washing/tumbling phase, during which shellfish are cleaned, before being packed and sold.

The project team will also focus on the indispensable study of bacterial degradation of toxins. Whereas the cleaning protocols are applied during processing, bacterial degradation takes place while shellfish grow inside tanks or rafts. The bacteria are in fact fed via microcapsules to the molluscs and crustaceans; once released, the bacteria will destroy the toxins, in a biological process.

Controlling the future of aquaculture

Ultimately, the intention of the participants in SPIES-DETOX is to eradicate toxins from aquaculture. To achieve its goal, the team will develop tools and protocols which in time could be widely adopted by the aquaculture industry.

Once the new technology is perfected, dissemination and training activities must be undertaken, so as to ensure that the knowledge acquired during the project is adequately distributed. On the one hand, dissemination will raise public awareness in relation to the findings of the project. On the other, training will focus on transferring scientific intelligence and skills to industrial users and researchers. Trained industrials will be able to adopt the SPIES-DETOX device as an everyday control tool. As for researchers, they will be able to obtain cutting-edge information on toxins, and also to conduct further research in areas and subjects deriving from the results of this project.

European SMEs involved in aquaculture are far behind their Asian rivals, who produce 91% of all aquaculture fish (as noted in 2004, with regard to all fish types). Nonetheless, European producers are aiming for the best quality and safest products.

By developing new detection and detoxification methods, SPIES-DETOX will not only reduce the risks of contamination for shellfish consumers, but will also contribute to the sustainability of the European aquaculture industry.



“The intention of the participants at SPIES-DETOX is to eradicate toxins from aquaculture.”

Project title

Active biological monitoring and removal of toxins in aquaculture ecosystems and shellfish — including the development of a solid-phase in-situ ecosystem sampler and detoxification of shellfish (SPIES-DETOX)

Contract number

30270

Duration

36 months

Global project costs

€3 064 287

EC contribution

€2 416 226

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FRESH FISH FROM THE FARM

SustainAqua

“A lack of common best practices and the threat from low cost producers put European aquaculture farms under double pressure.”

In the last 30 years, world fish consumption has almost tripled, while roughly 75% of the world's most valuable marine fish stocks are either fished to the limits, or over-fished. It is estimated that consumer demand will rise, and therefore sustainable alternatives for fishery must be developed worldwide, inclusive of Europe.

The freshwater aquaculture industry is certainly a promising solution to the demand of European fish consumers, but it is hampered by an absence of harmonised sustainable best practice strategies, and also by competition from low cost fish producers from abroad. Moreover, European aquaculture farmers will need to adapt to new requirements in the fields of quality, environment and health.

The European aquaculture industry has made substantial leaps of progress over the past decades. Dominated by SMEs (90%) and providing over 60 000 jobs, it is rightly considered a significant segment of the EU economy and global fisheries sector. However, a lack of common and sustainable oriented best practices and the threat posed by low cost producers from Asia, Latin America and the Caribbean, place European aquaculture farms under acute pressure.

In addition, further problems arise as a result of the adverse impact of the discharge of effluents, of the use of chemicals, of the limited number of different fish species or of dense stocking rates. This is due in equal measure to anticipated restrictive European and national legislations, and to increased customer awareness generating new demand. The SustainAqua initiative is set to address these issues, by improving both the knowledge base and the commercial performance and image of European freshwater aquaculture farmers.

Making nature profitable

The project consortium is developing and researching different options for upgrading existing aquaculture farms in the direction of product diversification, quality improvement and optimisation of production processes. This will be done in five different case studies in Hungary, Poland, the Netherlands, Denmark and Switzerland. Each study represents one of Europe's most relevant freshwater aquaculture fish species.

The consortium intends to transfer the highly effective nutrient management principles of natural systems into competitive aquaculture farm strategies. One example: alongside the fish production, organic material will be exploited as far as possible for the production of marketable products like macroinvertebrates, algae or plants for different industrial applications. Product diversification will enable fish farmers to extend their customer range, produce for different demands and cope with market fluctuations. Besides, optimised nutrient chains reduce waste to nearly zero, avoid the implementation of expensive wastewater treatment and filter technologies, and reduce costs. These principles will be tested in different extensive, semi-intensive and intensive aquaculture systems.

The taste of health

The consortium seeks to demonstrate that sustainably managed aquaculture systems have a positive effect on the taste of fish products and the quality of the fish meat. 'Good fish taste' is a crucial marketing criterion and, in this case, its accuracy will be verified through professional sensory tests.

Sustainable farm management – Indicators and criteria

Taking into account already existing indicator systems, the consortium will develop a practical oriented indicator and criteria system for sustainable freshwater aquaculture management. The team intends to scientifically contribute to the development of Europe-wide discussions about sustainable quality standards and to give recommendations for further research activities and co-operations.

Training european aquaculture farmers

More than 10 000 aquaculture farmers will directly benefit from the project results. Research organisations linked to the project will train their partner associations which in turn will train their member SMEs via workshops and E-learning seminars. Additionally a “practical guide for implementation of sustainable farm management” will be developed and ten different “regional advisory platforms for aquaculture farmers” be installed.



Beyond improving the competitiveness of European aquafarmers, the results of the SustainAqua project are also expected to boost employment throughout the European aquaculture production chain. Overall, SustainAqua will encourage sustainable development in rural areas and will support an environmentally sound, economically viable, European freshwater aquaculture.

“The SustainAqua initiative is set to expand both the knowledge base, and the commercial performance and image of European freshwater aquaculture farmers.”

Project title

Integrated approach for a sustainable and healthy freshwater aquaculture (SustainAqua)

Contract number

30384

Duration

36 months

Global project costs

€3 301 493

EC contribution

€2 504 923

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BOUNCING BACK INTO BUSINESS

TECH-SPRING

“The idea behind TECH-SPRING is to produce a toolkit for innovation and for novel spring designs.”

Over the last decade, increasing globalisation has opened many new markets to European SMEs. The reverse side of the coin is that European companies have not always managed to cope with the economic pressures from incoming competition, from Far East countries for example. For spring manufacturers, for instance, the last 10 years have seen a decline in sales and revenue. Rising to the challenge of reversing the situation and sending European business to the top of the market hierarchy, the TECH-SPRING project plans to introduce various technical advances to spring technology.

The spring revolution

The idea behind TECH-SPRING is to produce a toolkit for innovation and for novel spring designs. The toolkit is expected to facilitate the manufacture of lighter springs with improved performance and durability, coping with the requirements of the producers and customers. Using the toolkit, SMEs will be able to individualise their production strategy and their commercial approach to obtain the best possible economic results.

Reflecting the ambition of revolutionising the whole spring sector, the TECH-SPRING consortium pools the expert knowledge and professional experience of 10 participants. Their research activities will support over 600 spring manufacturing SMEs.

New tools for new prospects

TECH-SPRING introduces some important breakthroughs for the spring sector. The first innovative aspects are knowledge-related, with the improved understanding of residual and applied stresses. Better knowledge forms the basis on which the prediction models for the optimisation of spring design are built. The toolkit created by the project team intends to include a software design tool to enhance the quality of preparation work, prior to manufacturing stages.

Two new methods will also be used. The first is a system using a camera and stroboscopic technologies, whereas the second is an adapted X-ray machine. Both methods should enable new methods of stress analysis to be used by the spring industry.

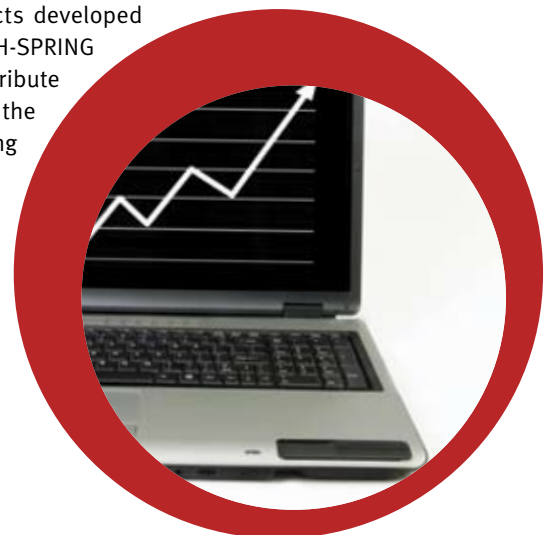
The project team also plans to contribute to the revision of current EU and global standards for the production of springs.

The TECH-SPRING project is a programme of structured research, dissemination and training activities. The dissemination stages are intended to raise awareness on the results of the project. Potential professional users will benefit from the practical training sessions on using the toolkit when it becomes available.

The project participants expect the toolkit to be adopted by European SMEs, to increase their market share by 5% in the next five years. Such a market share increase would generate additional revenues of EUR 114 million a year. More revenues could be followed by new employment opportunities, with a further 960 jobs being created.

Overall, TECH-SPRING will offer the ideal conditions for spring SMEs to add value to their products and to use fewer resources to produce more and better springs. The added value means that products are of higher quality and performance and correspond to a superior level of specifications. Importantly too, the new products will be available at competitive prices. All these aspects mean that European SMEs will be in a position to provide Large Enterprises, for example the automotive industry, with superior quality products.

European SMEs will draw on this project to gain an advantage over their competitors. The quality and costs of products developed using the TECH-SPRING toolkit will contribute to increasing the revenues of spring manufacturers.



“... SMEs will be able to individualise their production strategy and their commercial approach.”

Project title

Improving technical performance of springs through scientific understanding of dynamic stress profiles utilising advances in software design and measurement technologies (TECH-SPRING)

Contract number

29743

Duration

36 months

Global project costs

€2 228 810

EC contribution

€1 234 191

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“Because of the new legislation, there is a risk that some SMEs involved in the chemicals sector may become vulnerable and need to outsource their manufacturing to third countries.”

From 1st June 2007, a major new Directive (2006/12/EC), known as REACH (registration, evaluation, and authorisation of chemicals), will be effective in the EU. The new law will require formal approval of all chemicals which are stored, used and manufactured in significant quantities, according to their health and ecological impact. The costs involved in carrying out these tests could be so substantial that some smaller manufacturers might be forced out of business. The TESS initiative has been set up to avoid this scenario. Its goal is to solve a complicated situation by developing a simple tool.

In the closing weeks of 2006, the European Parliament passed a finalized legislation to provide better control on chemical manufacturing in Europe. From now on, firms will have to prove that the chemicals they manufacture are safe. To achieve this, the new legislation requires that the manufacturer performs tests and declares potential dangers before certificates of approval can be issued. Under REACH, chemicals of ‘very high concern’ will mean substances that may cause adverse effects on biological systems (toxic substances), cancer (carcinogens) or genetic mutation of living things (mutagens), to name a few.

There are about 30 000 different chemicals being produced across Europe, all of which need to be registered. Since the majority fall into the so-called Specialty and Fines Sector, this is where most of the testing needs to take place. The Specialty and Fines Sector, which is responsible for producing many key chemical ingredients, accounts for 20 000 SME manufacturers and blenders, representing 94% of all manufacturers and formulators in Europe. These SMEs provide the ‘building blocks’ for the European manufacture of dyes, inks, pigments, pharmaceuticals, surfactants, food additives, electronics, advanced materials, sensory products, etc. They also account for a contribution of EUR 157 billion per year to European Gross Value Added.

Green, clean and affordable

Because of the new legislation, there is a risk that some SMEs involved in the chemicals sector may become vulnerable and need to outsource their manufacturing to Third Countries. TESS aims to avert this situation. Gathering SMEs and IAGs from eight European countries, the project aims at supporting European SMEs of the Specialty and Fines Sector in cost-effectively updating to sustainable supply chains.

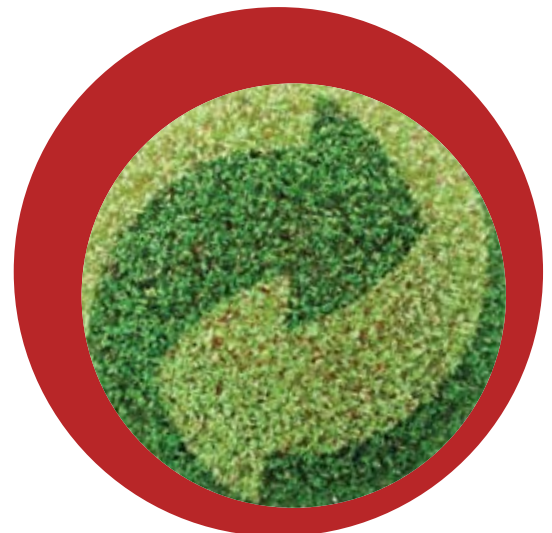
The TESS consortium is to provide advice and methodologies for low cost compliance to SMEs threatened by the costs involved with the REACH legislation. To this end, the project is developing an online, self-help toolbox enabling these SMEs to identify gaps in their current level of preparedness for REACH. The TESS project partners will thereby focus on four principal areas of research.

TESS will seek to gain in-depth knowledge of REACH legislation, which will be evaluated and simplified in order to adapt it to

an SME context. Furthermore, the project partners will use screening and testing techniques to analyse the specific impacts of chemical toxicology on health and on the environment. Another research area will be ‘green chemistry’, with a special focus on its ecological and sustainable approach to the future of SME manufacturing. Finally, the practicalities of sustainable supply chains will be assessed.

Four research areas, several outcomes

The results and knowledge gathered through target research will be used in the development of the ‘TESS Toolbox’, which will be put in a real life context and tested by the six SMEs participating in the project. The seven IAGs involved will use their regional and pan-European networks to create awareness and provide training to existing and potential toolbox users. The focus will be on SME users, but larger operators may also benefit from the compiled knowledge system.



Collective Research Volume 3

“TESS is to provide advice and methodologies for low cost compliance to SMEs threatened by the costs involved with the REACH legislation.”

Project title

Toolbox to Evaluate Sustainable Systems (TESS)

Contract number

30234

Duration

36 months

Global project costs

€4 722 069

EC contribution

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“... Europe’s gear industry needs to implement major changes in gear design and gear manufacturing techniques.”

The European mechanical transmission sector employs some 135 000 people in SMEs, producing gears and gearing products. These businesses rely on traditional technologies and are somewhat reluctant to make technical innovations. However, end products using gears have become increasingly complex, making the use of more sophisticated and reliable gears a necessity. The X-Gear project has been set up to help the European industry take on the challenges created by increased requirements on gear manufacturing.

Mechanical Engineering, a domain where the EU has achieved a dominant position worldwide, is one of the most important and largest industrial sectors in Europe. In the related field of gear design and manufacturing, however, major changes have to be implemented in order to keep up with the evolving requirements of end products. In addition, European SMEs in the sector are increasingly challenged by China, due to the country’s enormous output of mechanical engineering equipment, which is growing much faster than in Europe.

A new generation of gears

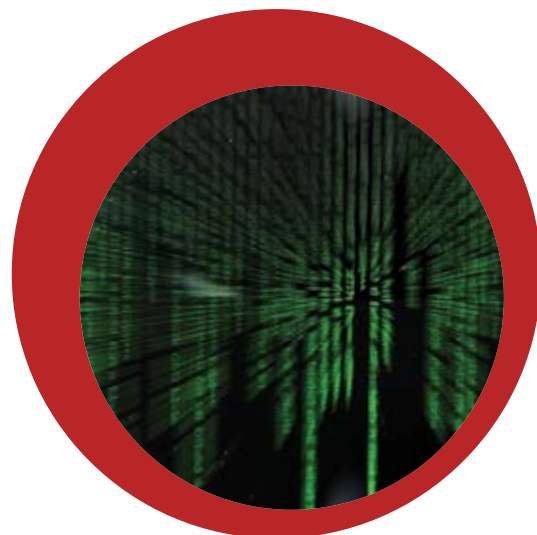
To keep up with the growing competition, the X-Gear project is to spread and standardise novel technologies and materials for a new generation of gears. The latter will be characterised by higher accuracy, resistance, reliability, and improved tribological properties (friction, lubrication and wear). Typical requirements in gear manufacturing are lighter weight, higher torque transmissions and quieter, more efficient gear trains. The X-Gear partners will concentrate on the automotive and wind energy sectors, thereby focusing on helical gears only. While the automotive sector needs more cost-effective processes due to a big market demand, the wind energy production sector needs to improve the reliability, noise and efficiency of turbine gearboxes. New materials and surface treatments will be combined in a way to satisfy the constraints of both sectors.

The project’s research activities will feature an innovative combination of new surface treatments based on flame spraying, physical vapor deposition and laser shot peening. New materials are to be developed, based on nanopowders, new direct hardening and air quenching steels, and advanced sintered steels. A special emphasis will be put on detonation diamonds; also called ultra disperses diamond powders (UDDP), with a particle diameter of 4 to 6 nanometers. Markedly enhanced properties are expected from the exploitation of novel coatings based on UDDP applied on the surface of gears. These properties will include a substantial improvement in wear reducing (from 2 to 10 times), increased micro hardness (from 150 to 8000 kg/mm²), and an improved corrosion resistance.

Sharing the progress

The high performance gears resulting from the project will be characterised by a number of advantages compared to standard gears produced using traditional technologies and heat treatments. These advantages will include an improved efficiency thanks to reduced tooth-related friction losses and an increased component life thanks to reduced operating temperatures under full load. There will also be a substantial reduction in lubrication requirements. New developments in air hardening steels, as opposed to quenched oil, will help to reduce the negative environmental impact of heat treatments. Another aim is to reduce the manufacturing time and the number of process stages, especially for small batches of high performance gears.

Besides addressing these strategic objectives, X-Gear will develop guidelines, best practices, and manufacturing and design tools. These measures are to stimulate standardisation, harmonisation and facilitating of emerging technologies to the large, scattered European community of SMEs of the mechanical sector, including gear and machine producers. Overall, the project is well set to provide the European subsector of gear manufacturing with the tools to adapt to ever toughening competition.



Collective Research Volume 3

“The X-Gear project is to spread and standardise novel technologies and new materials for a new generation of gears.”

Project title

Development of Gear Drive-Trains Based on New Materials and Novel Gear Systems (X-Gear)

Contract number

30433

Duration

36 months

Global project costs

€2 697 094

EC contribution

€1 872 586

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