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Europe's SMEs – contributing and benefiting

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Twelve win through in second IP-SME call

Out of the 85 submissions in response to the second call for proposals devoted to Integrated Projects for SMEs (IP-SME) under Thematic Priority 3, approval for funding was gained by 12 proposals, subject to final contract negotiation. Launched on 13 December 2003 with an indicative budget of €80 million, the call focused on SMEs in traditional, less RTD-intensive industries, and aimed to support the development of new knowledge-based added-value products and services, and of safer and more sustainable processes through eco-innovation.

As for the IP and NoE calls, a two-stage evaluation procedure was used. This is considered more appropriate to the multi-sectoral, bottom-up and SME-intensive character of TP3 and should facilitate participation by smaller enterprises. The call resulted in a large number of responses, with funding requests totalling more than six times the available allocation. After the first stage, based on outline proposals addressing a limited set of criteria, the 21 most promising eligible projects were selected. Of these, ten were coordinated by industrial SMEs and four by other types of SME.

The short-listed candidates then proceeded to the second stage of full proposal evaluation. This process, which included hearings, produced 12 'finalists', with grant requests averaging around €6 million, all of which were retained for detailed contractual negotiation. As anticipated in the call, the retained proposals address the challenge of creating sustainable and knowledge-based European industries in the present decade through the application of new technologies, and of new production and organisation models. The overall standard was considered by the evaluators to be noticeably higher than that of 2003 – probably thanks to improved understanding of the principles of the IP-SME initiative.

European nano-community looks into the future

Worldwide public investment in nanotechnology R&D has risen from around €400 million in 1997 to some €3 billion today. However, there are concerns that some aspects of nanotechnology may introduce new health, environmental and societal risks that need to be addressed.

In May 2004, the European Commission published the Communication 'Towards a European Strategy for Nanotechnology', in which it advocated an integrated and responsible approach. This Communication has been welcomed and extensively discussed at the political level in the European Council under the Irish and Dutch Presidencies. In addition, to gather the opinions of the wider nanotechnology community, the thematic network Nanoforum conducted a consultation on its website (www.nanoforum.org).

With a total of 720 respondents – mostly researchers and managers based in EU Member States – this is one of the largest soundings of its kind ever conducted in Europe. A first summary report reveals the following widely held perceptions:

- North America is the leader in nanosciences (76%) and technology transfer (77%), with Europe and Asia falling behind.
- European investment is lower (but not much lower) than in the USA and Japan (60%). Stronger R&D support is needed in particular for sensor applications, information and communication technologies (ICT), health/safety/environment and societal issues.
- In sectoral terms, the greatest impact will be in chemistry and materials (94%), followed by biotechnology (88%), ICT (79%), healthcare (77%) and security/defence (58%). Energy, environment, equipment engineering and consumer products are also expected to experience a moderate to high impact.
- A significant increase in funding for nanotechnology is needed in FP7 (79%), possibly more than twice the current amount (25%).
- Europe lacks coherent infrastructure and critical mass (80%). A new large infrastructure should be established at EU (64%) and national/regional (34%) levels.
- There is an urgent need for development of nanotechnology education curricula, with interdisciplinary approaches the most important aspect (90%).
- Europe must have an integrated strategy to maintain its competitiveness (85%).
- EU or international bodies should regulate nanotechnology within five years (46%) or ten years (25%).
- Risk research must be integrated as early as possible in the R&D process (75%). All parties involved, including national/regional governments, the media and the European Commission, should engage in informing the public.
- International co-operation with high-tech countries has a high priority (96%), as does the introduction of an international code of responsible conduct (87%).

The conclusions of the survey will form a valuable input to a Nanotechnology Action Plan which the Commission is currently preparing for publication in spring 2005.

Last FP6 call round announced

The last major round of calls for FP6 projects under Thematic Priority 3 was published on 8 December 2004. Three calls collectively cover a wide range of research topics, using both new and traditional funding instruments, including the Integrated Projects for SMEs (IP-SME), that are specific to this Priority.

The first of the three (FP6-2004-NMP-NI-4) is for large-scale Integrated Projects. It has a budget for Commission funding of €150 million and a deadline of 17 March for the submission of short, initial 'incomplete' proposals. For projects meeting the evaluation criteria at this stage, coordinators will be invited to submit full proposals by 15 September 2005.

The *European Industrial Research* magazine provides information and research results in the field of Industrial Technologies – a key element in the EU Sixth Framework Programme (FP6) for research and technological development. Priority 3 focuses on nanotechnologies and nanosciences, knowledge-based multifunctional materials, new production processes and devices. It promotes the transition to a knowledge-based society in Europe.

Visit the *Industrial Technologies* website at:
http://europa.eu.int/comm/research/industrial_technologies/index_en.html
for more extensive coverage of the issues discussed in this magazine and to discover many more themes and articles on Commission-funded industrial research, updated on a regular basis.

Further information about Priority 3 is also available from the NMP Information Desk:
rtd-nmp@cec.eu.int

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The second call (FP6-2004-NMP-TI-4) is for smaller projects using the traditional instruments – STREPS, Coordination Actions and Specific Support Actions. With a budget of €120 million, its closing date is 15 September 2005.
The third (FP6-2004-NMP-SME-4) is a dedicated call for IP-SMEs – the very popular adaptation of the basic Integrated Project model pioneered by the NMP programme. This has a budget of €100 million and a deadline of 17 March 2005 for the submission of first-stage proposals. Shortlisted projects will be invited to submit full proposals by 15 September 2005.

Survey shows investment shortfall

The first European industrial R&D investment scoreboard reveals that investment in R&D by the top 500 European companies between 2002 and 2003 fell by 2%, whereas for the top 500 non-EU companies it grew by 3.9%. This finding confirms that the EU is lagging seriously behind in its objective of increasing research investment to 3% of GDP by the year 2010.
Produced as part of the European research investment action plan, the scoreboard (ftp://ftp.cordis.lu/pub/nmp/docs/2004_scoreboard.zip) makes it possible to compare investment among EU companies and sectors, and with US and Japanese companies. It paints a full picture of the competitive situation of EU firms in the global R&D environment, showing that European R&D investment is not only declining, but also strongly concentrated along three dimensions:

- Large companies – the top 20 companies account for more than 55% of the total R&D investment by the EU-500.
- Few sectors – the four largest sectors in terms of R&D investment (automotive, pharmaceuticals and biotechnology, IT hardware, and electronics and electrical equipment) are responsible for 67% of total investment.
- Geography – companies with registered head offices located in Germany, France and the UK account for 74% of the total.

"To raise the number of European 'industrial R&D champions' we need to create an environment that supports such investment," said Research Commissioner Janez Potočnik. "But the commitment of the companies themselves is crucial."

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editorial

Small is more than just beautiful

We will say it again – the success of small and medium-sized enterprises is critical for the social and economic well-being of the European Union. But simply repeating this mantra will not make it happen.
A concerted and sustained effort to support and develop the SME sector and its entrepreneurs is needed to provide the framework conditions in which small companies can flourish.

In this issue of *European Industrial Technologies* we focus on SMEs and their participation in industrial research projects, looking at how they are encouraged to take part, the available funding mechanisms instruments, and the potential benefits. Their participation is important because SMEs that invest in research are investing not only in their own future but also in the economic growth of the European Union.

The NMP priority is actively facilitating strong SME participation through the IP-SME scheme described in this edition's main feature. It also looks at Collective Research projects, led by industry associations. These are significant because such associations are well placed to disseminate innovations to their SME members, often in traditional sectors, who may not have the knowledge or resources to participate directly in R&D projects. These are examples of how research instruments are being tailored to boost the profile and participation of SMEs in EU-funded research on industrial technologies.

In our Viewpoints article, three invited experts contribute their thoughts on the challenges and benefits facing SMEs when participating in EU RTD. Significantly, the experts emphasise that benefits come not only from the RTD outputs, but also from the process of collaboration itself. They highlight the opening to new information, new competences and new opportunities that takes place within research partnerships and networks.

Finally, we report on the development of the Manu*future* platform. It is proposed to give Manu*future* a coordinating role spanning a number of industrial technology platforms. The significance for SMEs is that these platforms represent a tangible effort to put the direction of EU industrial RTD strategy into the hands of those who know best what is needed – industry itself. Manu*future* will promote science and technology-led growth across all industrial sectors, emphasising the co-operation needed to restructure industry into the knowledge-intensive, flexible manufacturing and supply networks the EU needs to maintain global excellence.

Ezio Andreta
Director, Industrial Technologies Directorate
Research DG, European Commission

SMEs in EU research: **benefits** and

The questions of what problems face SMEs taking part in an EU research project, and what they stand to gain, were put by *European Industrial Research* to three experts with very different backgrounds and experience. Jim Lawler is from Enterprise Ireland, which advises SMEs on their development plans, including research, alongside factors such as human resources and marketing. Dr Christof Eberst is from Profactor, an Austrian company offering contract research facilities and research partnership to SMEs. Dr Thierry Sindzingre is himself from an SME. His company, AcXys Technologies, is a young French spin-off company in the early stages of EU-funded collaborative research.

Challenging

One of the main problems for SMEs that want to take part in EU research is to discover how their own plans might match those of potential projects. Christof Eberst says it is often difficult for small companies to find out which areas of research are current funding priorities. "There is a mass of published information – probably too much. To find out what are the really important topics, it is far better to talk to a Commission official." Thierry Sindzingre agrees. "It is very difficult to understand the impact of a research project on your everyday business, and how best to word a proposal. You also have to bear in mind that it may be 18 months from starting the proposal to receiving funding for the project, so you have to be prepared to do all the preparatory work without funding."

Thierry Sindzingre

Jim Lawler feels this is an area where development agencies like Enterprise Ireland can help. "It is important to know about the different research instruments. But the real challenge is to find out about particular research proposals being put together, and to decide whether a particular SME is in the right area to make a real contribution. This is hard enough for large companies. In SMEs with very limited human resources, the Chief Executive often has to run the research project as well as the company. Development agencies and the EU National Contact Points (NCPs) for the research programmes can analyse the technology sectors where expertise is needed for particular projects, and then identify SMEs which might be able to contribute and benefit."

Worth the effort?

All three experts agree that SMEs stand to gain substantial benefits from taking part in EU research projects, but warn of possible pitfalls. Sindzingre feels that much of the benefit comes from being part of a network. A small company can gain a great deal of information, experience and advice at a relatively low cost from meeting people and visiting different companies and laboratories. "Other good reasons for participating are to benchmark, to gain competence, to open new geographical or sectoral markets, and to win finance. But I am wary of partners who are only interested in finance."

Eberst emphasises the value of diversity. "By working with other nationalities you learn how they think. They often bring alternative approaches which may be better than your own. What is really important is that you expand your knowledge base, opening new opportunities for export and for future collaboration. Often participants in one project become partners in follow-up work, whether in the framework of further EU projects or outside it." He adds a note of caution. "I believe that the tough part for SMEs comes in the two years after the project, when attention is focused on turning research results into a viable product. If this is considered before and during the project, research represents a great business opportunity. If not, real commercial benefits are unlikely."

Christof Eberst

challenges

The SMEs that take part in EU-funded research make a major contribution to its strategic goals, and to Europe's overall industrial performance. Three experts discuss the multiple benefits the SMEs themselves receive, and highlight the need to consider carefully the long-term objectives.

Jim Lawler has no doubt that participating in EU research is worth it, "provided it is in your strategic interest and you need to access technology, partners or customers. In this case it has a huge benefit. But you need to be aware of the long-term nature of the commitment you are making. Read the small print carefully, or you can enter into unrealistic commitments and run out of resources."

Contributing to EU research

"Smaller companies are the real drivers of innovation," Lawler continues. "Europe's future prosperity depends on looking after their long-term interests, markets and technology. The Barcelona Council called for 3% of European GDP to be spent on R&D, 2% by the private sector. A lot of this will come from small, entrepreneurial companies whose investment in R&D projects is much larger as a proportion of their turnovers."

Christof Eberst highlights SMEs' breadth of knowledge. "We often work with companies with only 20 people. Even the general manager usually has an astounding knowledge of both the technology and the customers' needs." Sindzingre points out that innovation is not just R&D. "It means new ways of doing business, serving customers, organising processes. Being part of an IP-SME enables you to raise your head and look to the future, to think differently from your competitors. Learning how to use innovation is definitely a positive outcome."

Encouraging the wider community of SMEs

Jim Lawler believes that many SMEs, in industries such as transport, energy, new materials and telecommunications, have untapped potential to exploit their specialist knowledge or technology. If they are encouraged to identify opportunities to contribute their skills to supply chains and to R&D, they add value both to customers and to research partners. "The key is to use your knowledge of the market and the main players to figure out new ways of supplying or developing what your customers want," he says.

Jim Lawler

It is not only high-tech SMEs that can benefit. IP-SME projects like Acteco, in which AcXys is a partner, aim for innovation-based process improvement in less R&D-intensive sectors. Christof Eberst and Thierry Sindzingre both believe SME involvement in EU research is a crucial stimulant for the wider industrial community. "It boosts performance by giving SMEs access to technologies that they could not develop themselves," says Eberst. "And giving your customers new, high-quality components that help to compete in global markets helps the whole European economy," Sindzingre concludes.

> The experts

Dr Christof Eberst, head of the division for robotics and adaptive production at Profactor Produktionsforschungs GmbH (AT). His expertise includes industrial robotics, lotsize1-production, embedded systems, operational system intelligence and 3D computer vision.

Jim Lawler, Director of Irish Programmes in Advanced Technology and Director of the Industrial Technologies programme within the Industrial Development Agency, Enterprise Ireland. Member of the High Level Group for the Manu*future* Technology Platform (see page 14).

Dr Thierry Sindzingre, founder and CEO of AcXys Technologies (FR). An expert in plasma science (Grenoble LETI), he worked for eight years with the Air Liquide Group and holds many patents in his own name.

SMEs discovering opportunities in FP6

Small and medium-sized enterprises (SMEs) constitute the vast majority of the European Union's companies and employ around 120 million of its people. Their commitment to research and innovation is vital if the EU is to achieve the Lisbon Council objective of becoming the world's leading knowledge-based economy by 2010.

To encourage SME involvement in transnational initiatives, which aim to boost the industrial competitiveness of the enlarged Community while meeting societal and environmental objectives, more than €2.3 billion from the total €17.5 billion budget for the European Commission's Sixth RTD Framework Programme (FP6) is targeted specifically at SMEs. Thematic Priority 3, covering nanotechnology, materials and production processes (NMP), has introduced a special form of Integrated Projects dedicated to SMEs, known as IP-SMEs. Additional mechanisms to facilitate entry, promote networking and support the dissemination of information are also helping both high-tech SMEs and those in traditional industrial sectors to benefit from the exploitation of new knowledge.

More than 99% of Europe's 20 million manufacturing and service sector private businesses are SMEs, ranging from specialist high-technology companies to conventional firms in traditional sectors. Together, they provide two-thirds of all employment in the EU, and generate half of its new jobs. SMEs play a particularly important role in the NMP priority of FP6 because of its multi-sectoral industrial relevance. Their involvement is crucial in the bid to steer European industry from today's resource-intensive practices towards the types of knowledge-based, sustainable and globally competitive activity envisaged in the Lisbon and Göteborg Council decisions. Their readiness and ability to participate in research will also be essential in building an integrated European Research Area and meeting the Barcelona Council target of raising R&D investment towards 3% of GDP by 2010. Further, SMEs have proved to be a key vector for the effective dissemination of research results, facilitating their timely exploitation and take-up by less research-intensive sectors in a way that improves the competitiveness of industry as a whole.

Resolving the small-business dilemma

Experience shows that SMEs, especially those at the leading edge of technology, are broadly characterised by entrepreneurial spirit and a creative, dynamic response to changes in market demand and the external environment. However, their resource limitations and difficulties in finding funding lead them by necessity to focus on relatively short-term goals.

The main thrust of FP6, by contrast, is towards the attainment of longer-term objectives, through initiatives that provide the continuity and critical mass necessary to achieve breakthrough innovation. This represents a distinct departure from previous Framework Programmes, which were geared to incremental, problem-solving advances achievable within a time frame that was better suited to most SMEs.

The transformation of industry to ensure continuing EU competitiveness and leadership in the 21st century demands both radical long-term solutions and SME participation. To guarantee provision for adequate SME involvement, at least 15% of the budget of the seven FP6 priority ➔

> What is an SME?

On 6 May 2003, the Commission adopted a new Recommendation(1) giving a standard definition of an SME – a micro, small or medium-sized enterprise.

The new definition will be applied with respect to all Community policies including Framework calls for proposals launched from 1 January 2005.

(This therefore does not include the final round of main TP3 calls of 8 December 2004.) It defines an SME as any legal entity engaged in economic activity that:

- has fewer than 250 employees
- has an annual turnover not exceeding €50 million and/or an annual balance sheet total not exceeding €43 million

The enterprise's part ownership of, or by, other legal entities may need to be taken into account in calculating these figures.

(1) Set out in Articles 1-6 of the Annex to Commission Recommendation 2003/361/EC, which can be accessed at http://europa.eu.int/comm/enterprise/enterprise_policy/sme_definition/index_en.htm

thematic areas is assigned to fund their participation – €1.865 billion, after an increase following EU enlargement. A further €473 million is allocated to horizontal research activities involving SMEs. This makes FP6 one of the world's largest financial instruments supporting research and innovation for smaller companies.

Mid-term report

A mid-term evaluation report, prepared by a high-level expert group chaired by former Spanish Minister of State Professor Ramon Marimon[3], was generally positive about the objectives and ambition of FP6's new instruments. It nevertheless voiced some concerns relating to the high costs involved in submitting proposals, and to negative perceptions regarding the large size of the project consortia thought to be needed for IPs and NoEs.

However, "It is a common misconception that the new instruments should be very large," states the report's executive summary. "Critical mass depends on the topic, the thematic area, the participants and the potential impact and added value. The concept of 'one size fits all' should not be applied across all thematic areas and instruments."

The Commission acknowledges that a lack of adequate distinction between the various new instruments, and also between these and traditional instruments, has led to ➔

(3) http://www.cordis.lu/fp6/instruments_review/

> The instruments of FP6

The principal vehicles for funding under FP6 are the new **Integrated Projects (IP)** and **Networks of Excellence (NoE)**, together with **Specific Targeted Research Projects (STREP)**[2]. The **IP** is an instrument to support objective-driven research, where the primary deliverable is new knowledge. A single project may span the whole spectrum from basic to applied research. It should be breakthrough-driven and include innovation-related activities, training, knowledge-management and dialogue with the public. A typical duration is three to five years, with a budget measured in tens of millions of euro. The NMP thematic priority has developed a special form of IP, dedicated to SMEs – see case study examples on pages 9 and 10.

NoEs are designed to strengthen scientific and technological excellence on a particular research topic. They should overcome the fragmentation of European research by building a critical mass of resources and bringing together the expertise needed to provide European leadership in the chosen field. NoEs also have a mandate to spread excellence beyond the boundaries of the immediate partnerships. The maximum duration is seven years, with a budget of millions of euro, but the ultimate aim is for lasting and progressive integration beyond the end of the funded period.

STREPs are an evolved form of the shared-cost RTD projects of FP5, addressing ambitious and highly creative research and targeted at exploring the frontiers of knowledge.

Horizontal research activities involving SMEs

FP6 contains two horizontal-activity schemes intended specifically for SMEs: These primarily address the large numbers of SMEs with the capacity to take on innovations but with limited in-house research capability. In addition there are schemes to encourage participation and take-up by SMEs.

Co-operative Research (CRAFT) enables a number of SMEs from different countries to assign a significant part of the required scientific and technological research to RTD performers, such as universities and research centres. Projects must be completed within a one- to two-year period. Other enterprises and end-users can join, provided they do not assume a dominant role. The intellectual property rights (IPR) to the results belong exclusively to the SME partners, but the other participants involved also benefit through exploitation of the results – see case study example on page 13.

In the **Collective Research** scheme, introduced in FP6 following successful pilot projects in FP5, research is undertaken by RTD performers on behalf of industrial associations or groupings in order to expand the knowledge base of large communities of SMEs, improving their general standard of competitiveness. These are substantial, Europe-wide projects lasting between two and three years, with a core group of SMEs contributing from the definition phase to the dissemination of the final results. Here, it is the industrial associations/ groupings that own the IPR on behalf of the SMEs they represent, while individual SME participants benefit from early access to results.

In addition, **Economic and Technological Intelligence (ETI)** activities are designed to facilitate the participation of SMEs from specific industrial sectors or in specific research themes. They are carried out mainly by intermediaries – such as SME National Contact Points, industrial federations and chambers of commerce, as well as organisations with expertise in economic and technological intelligence – which work with or for innovation players. Projects are typically of one- to three-year duration, with total costs in the range €200 000 to €2 million.

Other **Specific support actions (SSA)**, designed to prepare future RTD activities and policies, are used for foresight scenario-building and more generally to bring new creativity to research. NAoMITEC, for example, is helping SMEs interested in micro- and nanotechnologies to join running FP6 projects.

The new opportunity for industry associations and other SME groupings to join project consortia provides an alternative route for enterprises that are unable to participate alone, while such groupings' broad knowledge of end-user sectors can add real value to upstream industrial research.

Technology take-up measures, aimed at promoting early or broad application of state-of-the-art technologies, are being included in FP6 projects wherever appropriate. This will offer an ideal platform to present SMEs with interesting research results and to encourage the eventual transfer of these findings to the market place.

In many cases, the nature of a project may make it impossible to identify the SMEs that could be involved and contribute until the project's later stages. In such circumstances, consortia can make provision in the project budget to cover this eventuality – FP6's increased flexibility allows additional partners, including SMEs, to join running projects via competitive calls.

(2) http://www.cordis.lu/fp6/instruments.htm

TOOLING-UP FOR SME COMPETITIVENESS

Eurotooling 21[4] is an IP-SME that will equip Europe's many small makers of moulds for plastics production to reposition themselves as high-added-value engineering service providers to the automotive, consumer electronics, optics and other industries. Its 33 partners include nine SME toolmakers, four of their large manufacturing customers, four industrial associations, 11 research institutes and universities, and five SME technology suppliers.

Strong SME input

The SMEs were actively involved in defining the requirements for the project, which began in October 2004 – helping to determine the key areas for action, and establishing a structure to enable long-term impacts to be maximised. As well as participating in the research itself, they will integrate and test the resulting technologies in the context of commercial contracts.

Three 'case studies' form the basis of the four-year project:

1. In-mould assembly of complex parts such as automotive door panels, involving combinations of materials and processes;
2. Micro-injection moulding and machining of optical components for medical and healthcare applications;
3. Short-run injection moulding of large parts capable of withstanding harsh operating conditions and, in some cases, vandalism – these include ATM parts, and panels for trains and planes.

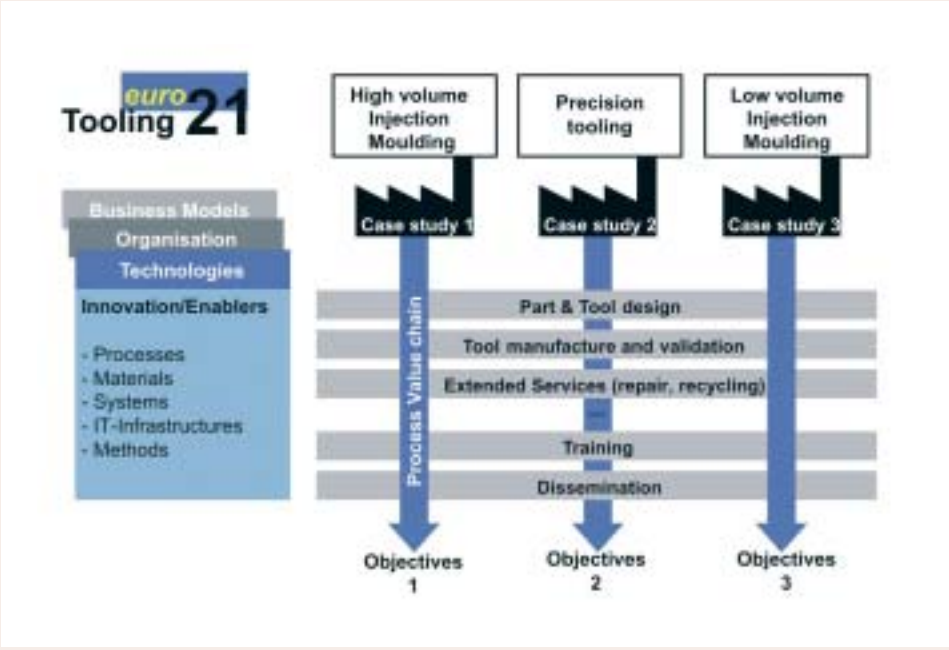
These are linked by three horizontal technology strands, or research areas, in which the SME case study leaders are supported in the learning and implementation process by scientific and technological coaches from the academic partners.

New business model

"What is special about Eurotooling 21 is its bottom-up integration of the complete value chain," says coordinator Rui Tocha of Portugal's Technological Centre for the Mouldmaking, Special Tooling and Plastics Industries (CENTIMFE). "Basic toolmaking is an activity in which Europe is losing out to foreign suppliers. Our aim is therefore to focus on high-tech solutions to emerging applications, with research activities selected in direct response to the needs of the SMEs, and oriented to real user demand.

"To be competitive, we need a completely new business model. Integrating know-how to improve materials and production methods for faster response and lower cost is just part of the picture," Tocha says. "Equally important is the development of extended services such as advanced design and engineering, remote and extended servicing, repair and recycling, which make it possible to build enduring partnerships with customers and provide a continuing return to the knowledge originators."

Eurotooling 21's objective is not just to benefit its direct participants but to transform the European toolmaking industry as a whole. "Training and dissemination are integral elements of the work programme," Tocha emphasises. "The involvement of industrial associations as partners will facilitate the widespread take-up of innovative technologies. We also intend to reach many other SMEs through trade fairs, conferences, publications and brokerage events."



(4) http://www.eurotooling21.com/pgm/welcome.php

LARGE-SCALE SME COLLABORATION PROMISES MACHINE TOOL REVOLUTION

Manufacturing enterprises are under growing pressure to respond to escalating customer expectations fuelled by rapidly evolving technologies. As a consequence, manufacturing machines and the work they perform are becoming more and more complex, leading to increasing difficulties in optimising their set-up and operation.

The 27-member consortium of the IP-SME project, KoBaS[5], is developing an integrated set of software tools that will enable its 13 high-tech European SME partners to offer customised task- and process-planning services to less research-intensive companies in traditional industrial sectors.

Irrespective of the materials employed – metals, wood, leather, stone, plastics, etc. – manufacturers face common requirements for increased product customisation and improved competitiveness based on reduced cost, shorter delivery times and improved quality. "By developing a powerful set of open-source tools founded on techniques such as virtual reality, 3D and discrete events simulation, and finite element analysis, KoBaS will revolutionise current methods of achieving these objectives," says Paolo Pedrazzoli of the Italian coordinating company Technology Transfer System. "As well as permitting advanced task and process planning, the tools will form the basis of machine configuration, maintenance, training and management support services."

Joining the 13 European SMEs in this three-year project are two large industrial user companies, two universities and four research institutes. In the interests of fostering international co-operation, a smaller grouping of industrial and academic participants from China is also included.

Following the start-up meeting on 1 June 2004, work began on a suite of 11 main components addressing issues ranging from user interfacing to web-enabled service delivery. These will be validated on four proposed demonstration platforms:

- a sophisticated wood-machining centre;
- a metal-cutting machine for applications such as aerospace components;
- a materials-testing system for cork, and;
- a metals-injector producing components such as small automotive engine parts.

"To cope with the needs of a wide range of machine types for a number of strategic industrial sectors, the approach will be flexible, adaptable and scalable," notes Pedrazzoli. "With our tools, the machines themselves will become intelligent, aware of their operating status, able to produce the desired products starting from virtual models, and capable of interacting naturally with the user.

"The SME partners will benefit not only from the exploitation of the project's results, but also from the experience of functioning as a network, rather than as individuals," he adds. "This will support the development of their competences and resources by creating critical mass. In addition, the transformation of SMEs operating in traditional industries will reinforce European competitiveness."

The intention is to extend the KoBaS network by creating new centres, and to implement an educational system to spread awareness of the innovative methodology across the whole manufacturing sector.

(5) Knowledge-based customized services for traditional manufacturing sectors provided by a network of high tech SMEs, see http://kobas.itia.cnr.it/

uncertainty among potential proposers about the context, conditions and exact objectives of each. However, it has produced a full response to the Marimon panel's report, and has already taken account of its conclusions in subsequent calls.

Support in place

A number of measures to help SMEs take full advantage of the support available under FP6 are already in place. To ensure transparency and equal access to the new structures and instruments, the system of National Contact Points (NCPs), which was set up under FP5, continues to inform and assist potential participants and contractors. NCPs operate in a variety of ways, some being highly centralised units, while others have decentralised networks based at ministries, universities, research centres or specialist agencies. The SME TechWeb website[6], operated by the Research and SMEs unit of the Research DG, also offers plain-language guidance for technology-oriented SMEs wishing to apply for funding. It contains explanations of the various instruments, informative publications, examples of successful projects and a help-desk.

Building tomorrow's industries

An important part of the NMP programme's mission is to provide the technological basis for European industry to maintain its global competitiveness by effecting a rapid shift towards more knowledge-based, high-added-value products and production processes. In this strategy, SMEs are both key partners and key beneficiaries, and the programme is devoting considerable efforts and resources to building a dynamic community of high-tech SME participants that will act as technology champions in their respective sectors.

SME participation is welcomed in all the programme's calls for proposals, but NMP has also introduced – with notable success – a special form of FP6's Integrated Project instrument, the Integrated Project for SMEs (IP-SME). Identifying specific areas of its work programme which are particularly attractive to SMEs, the programme has launched a total of three calls dedicated to IP-SMEs. Larger firms and industrial associations may also be included in the project consortia, as well as research centres and universities, but the projects are SME-led, and their goals are SME-focused.

The first IP-SME call, in 2003, had an indicative budget of €40 million, but its success in reaching a new, wider constituency of high-tech industrial SMEs has led the programme to increase this allocation in subsequent calls – €80 million was devoted to IP-SMEs in 2004, and €100 million is available for them in the final round of NMP calls, published in December 2004. Since the overall budget for this call is lower than those of previous rounds, this represents a significant increase for the IP-SME instrument as a proportion of the programme's overall budget. In the course of FP6, the NMP priority will have devoted nearly 17% of its resources to IP-SMEs – hard evidence of its commitment to this type of project, and to its SME target group.

Success of special provisions

Designed to encourage SMEs to engage with research and innovation, IP-SMEs support complete packages of research, demonstration, training and dissemination activities devoted to strengthening the scientific and technological base of the participating firms in the context of their regional and international markets. In addition to the standard rules governing IPs, these must meet two additional requirements:

- SMEs must account for at least 50% of the consortium participants;
- SME leadership of projects must be ensured by a system that gives these partners a majority of the voting rights.

The NMP programme's use of a two-stage ➔

(6) http://sme.cordis.lu/

evaluation procedure helps smaller firms to take part in IP-SMEs, enabling coordinators to submit a first partial proposal meeting a limited set of criteria. If there is clearly a realistic prospect of the project being funded, they are then invited to invest more time in completing a fully detailed document. Despite some concern that two-stage evaluation might increase the time taken to process proposals, it was assessed positively by the Marimon report, and has been retained in modified form for the second and third NMP calls.

For the Commission, meeting the Framework Programme's target of devoting 15% of its research budget to SMEs is a legal obligation. For SMEs themselves, it represents an opportunity to build their business in a Europe with a competitive future.

The Commission is closely monitoring SME participation in order to coordinate efforts to reach the 15% target. Thematic Priority 3 (NMP) has consistently performed strongly in this respect. Across all the NMP calls that closed in 2003, SMEs already accounted for 16.1% of Community funding, and for those that closed in 2004 this figure rose to 22.7%, following an adjustment of the work programme to focus increasingly on topics of particular industrial interest and the further increase in the budget for the IP-SME call. In the latest IP-SME call itself, SMEs represented over 67% of all participants, and received nearly 60% of total Community funding.

Final round

The IP-SME call in the third and final round of NMP calls, for which first-stage proposals must be submitted by 17 March 2005, and second-stage proposals by 15 September, focused on textiles, transport, biomaterials and security – four fertile fields for rapid, SME-led growth based on entirely new classes of knowledge-based products and services.

Multifunctional technical textiles targets an industry that is under severe threat from global competition, but at the same time offers tremendous scope for innovation based on new materials. Projects in this area may, for example, develop textile-based tensile structures for use in construction, 'intelligent' clothing equipped with sensors for the remote monitoring of individuals' health parameters, and a new generation of protective clothing.

Simultaneous engineering and production of integrated high-tech components for European transport aims to exploit new capabilities offered by nano- and micro-technologies and multi-functional materials in the construction of automotive components and modules. Projects are expected to reinvigorate the lower end of Europe's transport sector value chain, accompanying innovative components with reliable, flexible and cost-effective production strategies.

Biomaterials technologies for implants aims to achieve major innovations in the orthopaedic, dental and cardiovascular implant industry, based on breakthroughs in new materials and coatings.

Covering environmental, food supply and building security, as well as identification systems for people and goods, **Nanotechnological approaches for improved security systems** is aimed at knowledge-intensive SMEs capable of leading research into highly advanced solutions – and the work needed to prepare for their industrial implementation.

> What SMEs do best

Mark Wells knows better than most how much SMEs need research, and how good they are at spreading new technologies across industry.

After 20 years managing small technology-oriented companies, he is now Secretary-General of Eurexcel, the European Association of innovating SMEs(7). "I have been there myself, so I understand the issues," he says. "On the whole, current funding mechanisms are better suited to the timescales and sectoral focus of large enterprises."

But while large firms are good at turning euros into research, SMEs are much better at turning research back into euros, Wells says. "Perhaps half of all SMEs are 'research-hungry'. For them, new technology is a source of commercial opportunity, and they are nimble enough to exploit it quickly in different industries. That makes them extremely valuable to Integrated Projects, which need to demonstrate their capacity to transfer research outputs to new sectors."

Eurexcel is coordinating an ETI project, StiMulatE, which promotes the use of 'Enterprise Groupings' (EGs) as an easier way for SMEs to join Integrated Projects. As a single legal entity, an EG can act as a full project partner on behalf of a number of SMEs, removing a major barrier to their participation. "The EG takes care of all the paperwork," explains Wells. "The SMEs can concentrate on adapting the technology outputs of the project's core research for application in other sectors."

Wells says that FP6's target of devoting 15% of its budget to SMEs has made a real difference. "But where is the proportionality, if SMEs account for 66% of employment and 50% of new jobs?" he asks. "FP7 should retain a hard target for SME spending, but I hope it will be a lot more than 15%."

(7) Eurexcel http://www.eurexcel.org/

CO-OPERATIVE RESEARCH GRINDS SAVINGS FROM NEW MACHINING TECHNOLOGY

Because of its high speed and versatility, hard turning has replaced grinding for the finishing of many hardened steel parts. A consortium of SMEs used an FP5 CRAFT project to conduct industrial research which is bringing new levels of efficiency to the manufacture of precision cemented-carbide tools.

Combining unusual strength, toughness and hardness, cemented carbide is found in applications from ballpoint pens to industrial tools such as punches, dies and drills. The high-temperature sintering process used for the manufacture of cemented carbide is followed by shrinkage on cooling, which makes high precision impossible. To achieve the required precision, the sintered blank must be finished by grinding or spark erosion, and then by polishing.

The aim of Carbiturn[8] was to develop hard turning as an alternative finishing process for high-precision rotationally symmetric carbide tools with complex profiles. "This is a new approach," says Robert Nefkens, owner and managing director of the small machine-tool manufacturer Hembrug, Carbiturn's coordinating partner. "The traditional grinding process can be time-consuming and costly, and is inherently less flexible."

Co-operative Research projects enable SMEs to commission from specialists research which they do not have the capacity to perform themselves. Hembrug chose the Fraunhofer Institut für Produktionstechnologie (IPT), with which it had worked before, as the project's research performer. Three other SMEs joined the consortium as users. "Burcas had just acquired Hembrug, and had experience of hard-turning carbide tools," says Nefkens. Mößner is a manufacturer of diamond tools suited to cutting cemented carbides.

Different configurations

"We set out to test different kinds of tools in different cutting conditions," recalls Nefkens. Early tests soon achieved a configuration capable of producing precision parts, and unexpectedly revealed that hard turning also makes polishing much quicker – a major advantage.

After an optimisation phase, the team fabricated batches of real tool designs by conventional grinding and also by hard turning, and compared the results. One design was a simple punch made of tungsten carbide with 13% cobalt content. Conventional manufacture of this part might be achieved by plunge grinding followed by contour grinding. In tests, these operations took a total of ten minutes. Using hard turning, they took less than three minutes.

The hard-turning technique does have its limitations. The durability of the cutting tools used to cut the carbide parts is probably the weakest link in the chain. This makes hard turning uneconomic for large carbide tools. But the judges at Intertool 2004 were impressed enough to award Hembrug an innovation prize for a precision machine tool that owes several of its refinements to the Carbiturn project.

Hard sell

For Hubert Balm, the company's international sales manager, the project has brought tangible benefits. "We have already sold machines for hard turning carbides as a result of the project. But although interest is very lively, it will take time to build the first cohort of early adopters willing to invest in order to gain competitive advantage. It will take four or five years before the market for precision hard turning of carbides starts to boom. But it will come."

(8) High-precision hard turning of cemented carbides

Setting the agenda of manufacturing in Europe

For the past two years, the European Commission has worked with key stakeholders to develop a vision for the future of manufacturing in Europe. The Manu*future* platform is intended to lead to a strategic agenda for manufacturing-related research. It will provide a key horizontal element supporting sector-specific European Technology Platforms in the Seventh Framework Programme (FP7), as well as guiding public-private research initiatives at EU and national levels.

Manufacturing plays a major wealth-creating role in our society as a provider of goods, a buyer of services, and an employer. It represents 22% of the gross national product of the EU – about €4 000 billion – and the 2.5 million manufacturing companies in Europe, 99% of which are SMEs, directly account for 18% of jobs. Indirectly, through manufacturing services, every job in manufacturing is linked to two jobs elsewhere in the economy – so around 70% of employment in Europe is related to manufacturing, which is particularly important in the new Member States.

The overall EU trade balance in manufactured goods is positive, in strong contrast to the USA. Europe's particular strengths lie in machinery and equipment, metal and mineral products, chemicals, rubber and plastics and transport equipment. But recent productivity growth has been slower in the EU than in the USA. Europe also lags behind the USA and Japan in high-technology products for export. Moreover, manufacturing has an image problem. It is seen as a traditional sector with falling employment and negative environmental impacts, making it difficult to recruit the right people – particularly among the young.

Key role in Lisbon process

Research into new forms of manufacturing is crucial to support the Lisbon 2000 European Council target of establishing a knowledge-based economy by 2010, as well as Council strategies for sustainable development and for boosting research spending to 3% of EU GDP.

With these factors in mind, a joint workshop was organised in early 2003 by the Commission and Eureka Factory to present the results of foresight studies on the manufacturing sector. Both the FP5 Future of Manufacturing (FUTMAN) project and the Eureka Factory Informan study indicated that EU manufacturing has a bright future as part of a sustainable economy, but needs continuous product and process innovation to maintain and improve its position. Both studies also considered it essential to combine Commission efforts with those of Member States to develop a common vision – starting at the industrial level but going much further in technical, environmental and social terms.

This workshop was followed by a series of Manu*future* events, intended to build consensus and a vision on the way forward for research in the European manufacturing sector that would result in a clear strategic research agenda. Following the first event in Milan in December 2003, and a series of workshops during 2004, a High Level Group of industrial and research experts prepared a vision document[1]. The group's vision is to transform European manufacturing from a resource-intensive to a knowledge-intensive, innovative sector that will achieve and maintain leadership in the global market place.

Clear vision for the future

The key conclusions of the Manu*future* vision document underline the need for a European strategy based on research and innovation:

- *An economy based on service industries alone will not survive in the longer term*

EU industry faces tough competition from developed and low-wage economies. While growing employment in the service sector has compensated for the losses in direct manufacturing employment so far, this cannot continue indefinitely;

- *Industrial transformation must meet competitive, environmental and social challenges*

European manufacturing has to change from a resource- to a knowledge-intensive, innovative sector capable of achieving and

(1) MANUFUTURE: A vision for 2020; report of the High Level Group, November 2004

for the future

maintaining global technological and production leadership;

- *A new approach to manufacturing is required through innovative production*

Europe must move from the traditional structure of manufacturing built on the three pillars of land, labour and capital towards a new structure, based on knowledge and capital. This demands new attitudes towards the acquisition, deployment, protection and funding of knowledge; and

- *A competitive R&D system is created by multiple factors*

The knowledge-driven economy demands a competitive R&D system, facilitated by favourable conditions, a new approach to knowledge generation and innovation, adaptation of education and training schemes, and creation of easily accessible research and innovation infrastructures.

The Manu*future* strategic research agenda must therefore promote industrial transformation, create and secure high-added-value employment, and ensure the maximum possible share of world manufacturing output for Europe.

From a shared vision towards a shared agenda

To take this vision forward a second Manu*future* event was held in Enschede in December 2004 under the auspices of the European Commission and the Dutch presidency of the EU Council. Manu*future* 2004 provided a forum for the audience of key stakeholders to discuss the vision document at a time when plans for the forthcoming Seventh RTD Framework Programme are beginning to take shape. It aimed to kick-start the development of the strategic research agenda that will set the scene for joint public-private support for European manufacturing in FP7. ➔

The Manu*future* mission

"To propose a strategy based on research and innovation, capable of speeding up the rate of industrial transformation in Europe, securing high added value employment and winning a major share of world manufacturing output in the future knowledge-built economy."

The two-day proceedings opened with an introduction to the vision document by Professor Franco Jovane, Director of the Italian Research Council's Institute of Industrial Technologies and Automation, and a member of the Manu*future* High Level Group (HLG). The delegates then dispersed to a series of parallel workshops held on the premises of local manufacturing enterprises acting as sponsors for the conference. The workshop topics covered the main aspects of the HLG's recommendations:

- **Innovating production** – boosting the move from an economy of quantity to one of quality, from an economy of use and waste to a sustainable economy;
- **Adapting the organisation** – replacing linear approaches by a 'manufacturing engineering' strategy that simultaneously addresses all inter-related aspects;
- **Adaptive and digital manufacturing** – using digital methods to integrate new technologies into the design and operation of manufacturing processes;
- **Networked and knowledge-based manufacturing** – using knowledge to optimise resources and processes, as well as transferring it to areas where it can be employed to advantage; and
- **Providing a supportive environment** – in terms of integrating the factory environment with education, and developing better solutions for the financing of innovation.

A platform for take-off

On the second morning, the workshop animators presented the views of their groups, and a general question-and-answer exchange ensued. Inevitably, a wide range of opinions was voiced, but many points of broad cross-group consensus emerged. Representatives of several major stakeholders confirmed their support for a Manu*future* Platform concept encompassing and serving as a coordinating environment for all manufacturing-related technology platforms. Achilleas Mitsos, Director-General of DG Research, then closed the conference by formally announcing the launch of this milestone initiative, the Manu*future* Platform, which will play a key role in securing a competitive future for the European Community.

For more information on Manu*future* follow the Useful Links on the back page.

> Developing the Manu*future* platform

February 2003	Commission/Eureka workshop reviewed outcomes of the FP5 FUTMAN and Eureka Factory Informan foresight projects; discussed follow-up in FP6 and national programmes; and established the basis of an action plan to transform European manufacturing
1-2 December 2003	Manu*future* 2003 event in Milan involving industrialists, academics, bankers and politicians debated a strategy to secure the future of manufacturing in Europe, based on a Commission working document drawn up by a group of experts
December 2003 to February 2004	Commission invited all interested parties to contribute their opinions, particularly on the specific questions posed in the Manu*future* discussion document
June 2004	Commission-appointed High Level Group of industrial and research experts met in Brussels to review progress on the development of a shared vision for the future of manufacturing in Europe
1 July 2004	European experts met in Dortmund, Germany to continue consultation on the Commission's proposed Manu*future* action plan
14-15 September 2004	Leading UK researchers received briefing on Manu*future* project at the 'Manufacturing the future' conference, in Manchester
20 October 2004	Stakeholders met in Milan to share opinions on the structure of the Manu*future* Platform
11 November 2004	High Level Group published its report Manu*future*: A vision for 2020
5-6 December 2004	Manu*future* 2004 conference in Enschede (NL) presents vision document and official launch of the platform
28 February 2005	First meeting of the High Level Group of the Manu*future* Platform – definition of the structure and the plan of activities for 2005
March 2005	First meetings of the working groups – collection of research needs to define the technological aspects of the Strategic Research Agenda (SRA)
April 2005 (to be confirmed)	Second meeting of the High Level Group – presentation of first draft of the SRA and inputs for the Implementation Plans
September 2005	Press Conference at EMO World Machine tools exhibition in Hanover, Germany – public presentation of the SRA
November 2005	Fourth HLG meeting – plenary session with Commissioners J. Potočnik and G. Verheugen, adoption of the SRA and presentation of the Implementation Plans

Making the best of each other's strengths

Building on early experience of joint projects with the US under FP5, a coordinated call in partnership with the National Science Foundation (NSF) has been launched under FP6. There have also been two joint calls between the nanotechnology, intelligent materials and production (NMP) priority and the information society technologies (IST) priority.

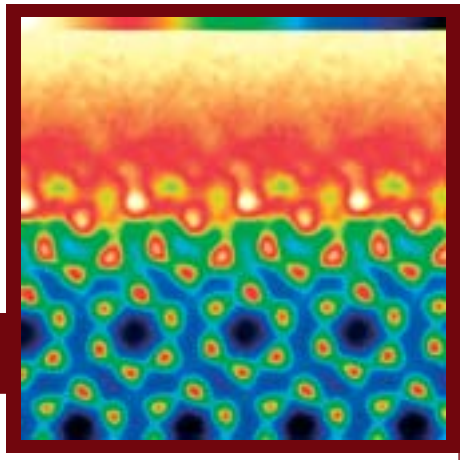
Because of the considerable scope for synergy between Information Society Technologies (Thematic Priority 2) and Nanotechnology, knowledge-based Materials and new Production processes and devices (Thematic Priority 3), two rounds of joint IST-NMP calls for proposals have been published – the second in mid-2004.

The IST priority aims to support innovation and competitiveness in EU companies and industry through intelligent systems, while NMP aims at a sustained transition towards a knowledge-based industry. Research under the joint call will develop these themes together: the Commission expects considerable synergy between the IST and NMP proposals.

The joint call invited proposals on **integrating technologies for manufacturing enterprises**, such as the control and networking of embedded systems for complex manufacturing processes, and customisation, logistics and maintenance by mobile and wireless devices or smart tags; **biosensors**, including research aimed at increasing molecular and cellular recognition and radical improvements in sensitivity, selectivity and reliability; and **nano-electronics and nano-photonics** – for example, new structuring and patterning technologies for high-volume production of integrated circuits, and the use of non-conventional logic and memory devices.

International coordinated call

The joint NMP-NSF call, meanwhile, focuses on **computational modelling** in the materials sciences and nanotechnology. Building on the positive experience of a small number of joint EU-US projects in FP5 (see box), it is the first occasion on which NMP and the NSF have undertaken a fully coordinated evaluation. The two partners will use a procedure of remote evaluation, followed by a three-day 'consensus' meeting of officials and experts from each side, to be held in March, at which they will prepare the final recommendations for funding.



Atomic structure of a silicon-glass interface, with rare earth atoms as bright dots.

> Case study: Nanoam

Nanoam began as a three-year project under FP5's Growth programme, and when the European partners (Oxford University, the Stuttgart Max-Planck Institute, Karlsruhe University and the French Atomic Energy Authority) saw the first joint call of March 2001 for proposals to link EU research centres with those funded by the US National Science Foundation, they recognised the clear opportunities on offer.

Nanoam sets out to explain the behaviour of interfaces between the amorphous (glassy) layers and the crystalline components of ceramics, like those used for making car bearings. Rare earth elements are critical at these interfaces – their nature and content control the strength and toughness of the materials. Nanoam linked leading EU and US research groups able to develop computer models of these interfaces with others which could grow material and use high-resolution electron microscopy and other analytical techniques to verify the computer models and test their predictions. Understanding how cracks in ceramics result from impact, and the key role of the rare earths, will enable tougher and less expensive materials to be developed.

"The joint call enabled us to put together a group comprising the leading computer modelling and experimental groups in the world," says Professor David Cockayne of Oxford University. "We have come an enormous distance and we now have a really good understanding which certainly would not have been possible with any one group. It needed leading investigators working together to tackle the research issues from many different directions to find the answers."

Industrial round-up

This section of the *European Industrial Research* magazine presents a cross-section of successful Commission-funded industrial research projects. Many of these projects are already bearing fruit in the form of improved competitiveness for European industry and a better quality of life for EU citizens.

More information about these projects can be found on the Industrial technologies website at:

http://europa.eu.int/comm/research/industrial_technologies/index_en.html

Natural whey to produce **packaging plastics**

Dairy industry waste – whey, in particular – is a potential source of biologically produced polymers with commercial applications in packaging. **WHEYPOL** is seeking a cost-effective method to exploit this abundant natural material as a starting point for the sustainable production of polymers and other chemicals.

More information:
http://europa.eu.int/comm/research/industrial_technologies/articles/article_805_en.html

Whey – a by-product of the cheese-making process – has long been a source of protein and lactose for food and animal feed. But producing lactose from whey is becoming too expensive. Europe produces about 50 million tonnes of whey annually. Most is processed for feed, but a growing quantity is discharged as effluent. Alternative uses for whey are highly desirable from an environmental viewpoint.

The Wheypol project is developing an integrated industrial process to turn whey into PHAs – biodegradable polyesters that can replace conventional packaging plastics and eventually decompose to yield only carbon dioxide and water. Substantial progress in PHA production has been made. In addition, the upstream stages of biomass separation, extraction and refining have been optimised. The refined polyesters may be blended for use in the production of biodegradable packaging materials. "The polymer scientists in our consortium have confirmed that the PHAs we are now able to produce are of very high quality," says Wheypol coordinator, Professor Gerhart Braunegg of the Graz University of Technology in Austria. "My hope is that, on completion of this project, we can attract funding and partners to build a pilot plant that will enable us to take this encouraging result forward towards commercialisation."

3D network coordinates **lead-free solder research**

The **EU RoHS**[1] Directive, banning the use of hazardous substances in many electronics products, will oblige industry to adopt lead-free soldering techniques by July 2006. ELFNET provides the means to coordinate Community-wide research into alternative methods and materials. Despite the profound effect this will have on industry, EU research to date has been fragmented and uncoordinated, in contrast to that in Japan and the USA.

More information:
http://europa.eu.int/comm/research/industrial_technologies/articles/article_1625_en.html

Recognising the danger, Soldertec Global, an organisation sponsored by the world's tin producers, convened meetings of prominent EU players. These led to the proposal for a European lead-free soldering network (Elfnet). "Elfnet offers opportunities for European researchers to begin to work together and build critical R&D mass," says Dr Jeremy Pearce of ITRI Ltd, the project coordinator. "Our goal is to attract as many relevant inputs as possible, and to make our findings available to the maximum number of interested parties." A central task was to develop an infrastructure capable of handling the diverse interactions that take place within a large and dynamic virtual community. "We created what I describe as a '3D' network," Pearce observes. Its constituents are 19 national networks plus expert groups and industrial networks from affected sectors, such as consumer products and aerospace.

"To link these elements we built a website, customised for our particular on-line networking application. This transnational platform will aid common understanding of the problems and their solutions. It will also help to eliminate duplication of effort and knowledge gaps, and will stimulate key initiatives to improve the long-term competitiveness of the EU in the global microelectronics market."

(1) The European Directive on restriction on the use of certain hazardous substances in electrical and electronic equipment

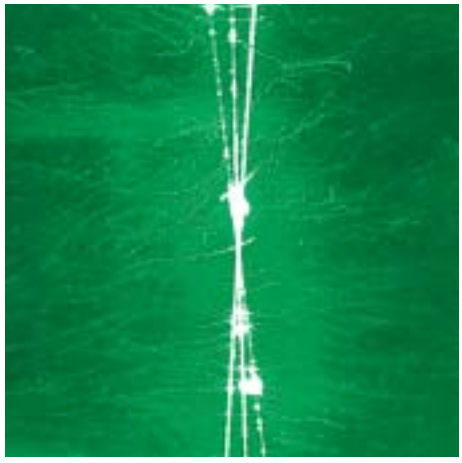
Twinned technologies boost **plating performance**

Pulse plating is used by advanced end users for electro-deposition of metals and alloys in the electronics industry, often preceded by the ultrasonic pre-cleaning of substrates to prepare them for deposition. By combining pulse-plating and ultrasonic techniques, the **ULTRAPLATE** project has produced breakthrough improvements in the speed and precision of electro-deposition of metals and alloys for applications in electronics and micro-devices.

More information:
http://europa.eu.int/comm/research/industrial_technologies/articles/article_1279_en.html

Applying a pulsed current to an electrolytic plating bath gives a finer grained deposit than can be achieved using conventional techniques. Ultrasonic agitation was also known to improve the efficiency of the plating process, although it was only applied for pre-cleaning.

Prior to Ultraplate, little systematic effort had been devoted to studying the combination of these processes. The consortium of eight partners, led by the Institute for Product Development (IPU) of the Technical University of Denmark, began with a study on low- and high-frequency ultrasound in electro-deposition, leading to the design of two laboratory-scale systems. With these, the project showed that ultrasonic agitation produced higher plating speeds as well as denser and more uniform coatings. Improvements were also found in the plating of 3D structures, controlled alloy deposition, and the plating of on-chip micro transformers – discoveries that led to several patents.



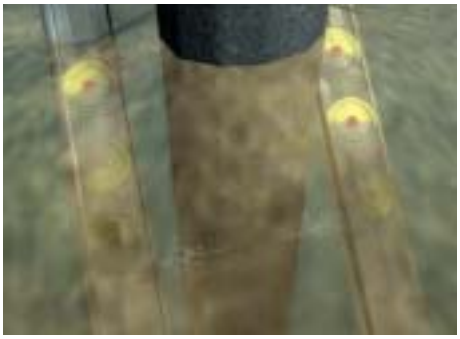
"The whole project has been distinguished by a remarkable spirit of openness and co-operation," says coordinator Dr Jens Dahl Jensen of the IPU. "There were extensive exchanges of people, sharing of equipment and transfer of knowledge, and the result has been a number of positive outcomes with early exploitation potential."

Cutting the legs **from under you**

Many marine oilrigs are becoming redundant and need to be decommissioned. Over the next 20 years, it is estimated that some 4 400 structures will have to be removed worldwide. This demands technologies that do not damage the seabed and avoid contamination from oil residues. The **SBC** diamond wire cutter operates below the seabed to slice underwater structures such as oilrigs and well-heads free with minimal disturbance.

More information:
http://europa.eu.int/comm/research/industrial_technologies/articles/article_1169_en.html

Conventional approaches employed to cut through the legs of structures below the seabed – such as oxy-arc cutting or explosives – need significant amounts of material to be dredged away to gain access. Italian engineering SME Tecnospamec came up with the idea of using a hydraulically activated diamond wire cutter, operating like a band saw and remotely operated.
The technique was developed in the SBC project, led by Tecnospamec with partners from Greece, Italy, Norway and the UK. "The sub bottom cutter (SBC) is a pair of tubes about 1.5 m apart with drilling heads at the end. Pulleys, on which the diamond wire cutting string runs, are placed between the pipes," explains Eddie Grant, managing director of UK partner Cutting Underwater Technologies. "The diamond wire rotates on the pulleys and cuts right through the seabed with minimal disturbance. When it reaches the target structure, it goes right through that as well." Cleaner and more efficient cutting makes possible complete reuse of the structures removed, avoiding the cost of scrapping and disposal. The project started in March 2001 and by its completion in June 2003, SBC had a working prototype that was successfully tested in sea trials off Norway, sponsored by four major oil companies – BP, Shell, Total Fina Elf and Amerada Hess.



Better, greener **coating technologies**

The demand for improved performance and lower cost from mechanical components is driving wider use of coatings. They improve surface hardness, reduce friction and increase wear protection for a wide range of industrial components. Vacuum deposition of wear coatings is more environmentally friendly than galvanic methods – but also more costly. The **TIPCOAT** project has developed lower-cost physical vapour deposition (PVD) processes to encourage take-up.

More information:
http://europa.eu.int/comm/research/industrial_technologies/articles/article_1276_en.html

Tipcoat united seven partners to boost the industrialisation of PVD coating technologies by improving technical performance and reducing costs. "We set three overall objectives," explains project coordinator, Dr Gian-Carlo Caligiani of the Italian company, Oto Melara. "First, to develop an isotropic coating process that would give excellent coating quality on 3D substrates. Second, to cut coating costs by shortening processing times. And third, to demonstrate a mobile unit that could coat the critical areas of large mechanical components *in situ* – this would broaden the field of application."
Using plasma-assisted ion plating, the partners found deposition at higher process pressures helped improve isotropy for 3D substrates and reduce defects. Further, cryogenic coils were successfully tested to reduce pump-down times. Finally, a prototype Local Coating Chamber was tested using various ion sources. Trials showed that suitable ion energies could be obtained within the chambers for high-quality coatings, although adhesion remained a significant problem. The project achieved a great deal, says Dr Caligiani. "One partner has adopted several Tipcoat innovations and has doubled productivity on a high-volume drill production line, allowing a 60% price reduction."

Organic electronics **see the light**

Conventional plastics are electrical insulators, but a remarkable class of polymeric semiconductors is opening a new era of plastics science and technology. The **PLASTRONIX** project has made a series of breakthroughs in polymeric semiconductor design for versatile flexible integrated circuits that can be readily shaped for use in mass-produced electronics devices, from smart labels to flexible TV displays.

More information:
http://europa.eu.int/comm/research/industrial_technologies/articles/article_1557_en.html

Semiconductors form the basis of electronics and optoelectronics and have countless applications in information technology, telecommunications, entertainment and medical equipment. To date, these applications are served by only a handful of inorganic semiconductor materials – rigid crystalline materials such as silicon. The Plastronix project is changing this.

"We are exploring the potential for semiconducting polymer materials in electronics, to take advantage of the specific properties of polymers – in particular, their flexibility and low-cost manufacturing potential," says project coordinator, Dr Dago de Leeuw of Philips Research in the Netherlands. "The project worked towards creating industrial processes which would design and fabricate robust, reliable and low-cost polymer electronic circuits."

Light emission from organic semiconductors is particularly promising – opening the way to foldable TV screens and light-emitting clothing for fashion or safety applications. Disposable electronic bar codes that can be read by a radio-frequency base station is another application with huge potential in the retail and logistics sectors. Just as remarkable is the fact that polymeric semiconductors can be manufactured by printing techniques, which greatly simplifies the manufacturing process. Not surprisingly, many patents have been filed.

Cutting noise to encourage **greater use of rail**

The environmental, social and economic costs of road transport are key reasons to encourage the switch from lorries to the railways. Trains are cleaner, often quicker, use less energy and are safer for pedestrians. But trains that shake houses do not encourage public support for the switch of freight from road to rail. **CASCO** promotes the social acceptance of trains by making them quieter, using small, low-energy damping devices.

More information:
http://europa.eu.int/comm/research/industrial_technologies/articles/article_858_en.html

Noise and vibration from trains arise from the interaction between wheel, track and bridge structures that induce vibrations in neighbouring buildings. "To reduce this noise and vibration you need to dissipate energy by damping – this is traditionally done by passive controls that use the structure's systems response," explains project coordinator Dr Helmut Wenzel of Vienna Consulting Engineers. "The semi-active devices developed by CASCO are based on magneto-rheological fluid dampers that change viscosity dramatically in a magnetic field. They are installed at critical locations throughout structures and underneath railway tracks to eliminate vibration."

The consortium chose the disused Rohrbach railway bridge in Austria for trials, and made extensive measurements using sensors attached to the sleepers and girders. The whole bridge was then taken to the European Laboratory for Structural Assessment[1], which has state-of-the-art equipment for active structural testing with CASCO dampers. "The result is a suite of innovative semi-active devices shown to have excellent results in reducing noise pollution from rail infrastructure," explains Dr Wenzel. "And their small size and low energy consumption may bring other applications in manufacturing, the preservation of historic monuments, and a wealth of anti-seismic applications."

(1) Part of the European Commission's Joint Research Centre DG in Ispra, Italy

Lead-acid batteries – cleaning up their act

Batteries start cars, run mobile phones and other portable gadgets, and provide life-critical power back-up for hospitals and emergency computer and communications systems. They are just too convenient for us to live without – but, dumped in landfill sites, the toxic chemical cocktails that power them pose a significant environmental threat. But not for much longer, thanks to the **CLEANLEAD** project .

More information:
http://europa.eu.int/comm/research/industrial_technologies/articles/article_1167_en.html

Lead-acid batteries are the conventional choice when higher currents are needed – such as in cars and back-up power systems. EU demand for lead is growing at 3% a year, and is predicted to increase further as hybrid electric vehicles gain market share. Much of this demand is met by recycling companies that recover lead from spent batteries. However, conventional recovery techniques produce huge quantities of pollutants – sludge, unstable toxic slags and sulphur dioxide.

"Nobody likes lead – it's poisonous and needs to be handled carefully," points out Carlos Frías, project coordinator of Tecnicas Reunidas in Spain. "However, there are no economic alternatives to lead-acid batteries." In response, Cleanlead developed cleaner, more sustainable recovery processes. Sulphuric acid is recovered and converted to gypsum to make plasterboard. Battery pastes are desulphurised and the lead recovered by a new electrolytic process. The

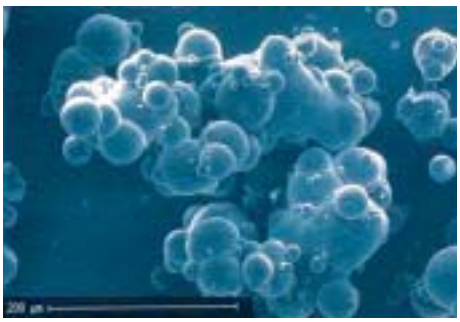
project also optimised the smelting of grids and metals parts to produce smaller quantities of a stable slag.

Following laboratory development, the individual technologies were brought together in an integrated pilot plant with excellent results. "Compared with current practice, Cleanlead processes use 30% less energy, produce no toxic slags, reduce gas emissions by over 90%, result in no toxic sludge and have gypsum as a commercial by-product," Frías explains.

Getting to grips with spray drying

Powder agglomeration is difficult to control because of the way the atomisation process, the mixing of spray and hot air, the drying of suspension droplets and the collision of particles all interact. Yet correct consistency is essential in instant foods, detergents, pharmaceuticals, ceramics and agrochemicals. **EDECAD** set out to make the process more predictable and reliable.

More information:
http://europa.eu.int/comm/research/industrial_technologies/articles/article_1294_en.html



Spray drying creates a mixture of dry and 'sticky' particles that can agglomerate. It is the ratio of dry to sticky particles that determines how the powder behaves. For example, when preparing a bottle for a baby, the right type of agglomeration makes the powder dissolve easily, quickly and completely.

Operating conditions that do not match the drying behaviour can also lead to fouling as sticky particles can attach to the wall of the drying chamber. This behaviour can be modelled using Euler-Lagrange computational fluid dynamics software techniques. These take into account the mass, momentum and energy of the particles and their interaction with the airflow, explains Edecad co-ordinator Ruud Verdurmen of NIZO food research.

The project is developing a new predictive software tool to ensure powder-based products are made with the appropriate consistency, and behave reliably from one batch to the next. The result will be a design tool for manufacturing to control the final powder properties. Edecad focused on the food industry, where spray drying is the predominant drying process, and the tool should help manufacturers to control the production of complex powders, such as baby foods and diet and sport food ingredients, much more precisely. The tool should also be applicable to non-food applications, and other industries have already shown interest.

Working **on water**

Industry needs large amounts of water to produce many goods vital to our economic and social well-being. But industry is an equally heavy producer of liquid effluents that must be cleaned and recycled, or treated before release into the environment. The **ILE** thematic network offers a systematic approach to environmentally friendly disposal of water used for processing, cleaning and cooling.

More information:
http://europa.eu.int/comm/research/industrial_technologies/articles/article_1168_en.html

In response to ever tighter environmental legislation, the many industrial sectors that produce effluent have generated considerable knowledge and expertise, as well as solutions to many specific liquid waste problems. But the difficulty has been that this knowledge and these technologies are scattered both geographically and sectorally.
The thematic network on Industrial Liquid Effluents (ILE), which includes non-EU partners, is collecting the dispersed knowledge on effluent treatment technologies to make it more widely available. The network is divided into four clusters covering plating, mines and metallurgy, paper, and textile and leather.
As well as collecting 'best available technologies' (BATs) from its members, the network holds regular regional workshops. "We are seeking win-win exchanges by facilitating communication," explains project coordinator Pascal Négré of IPM in

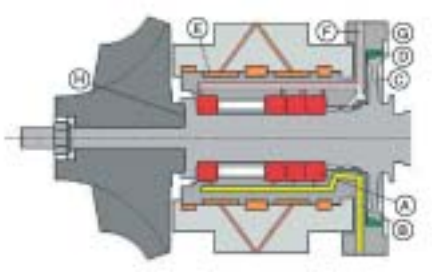
France. "The sectoral structure of the network makes vertical exchanges easiest, for example transfer of knowledge on particular techniques from the Canadian paper industry to Scandinavian counterparts. However, horizontal transfers, where paper industry effluent technology is transferred into another sector such as textiles, are just as important." A key output of the network will be a 'white book' collating all identified BATs that contribute to closed loop recycling and zero liquid waste.

Paving the way for new **turbine engines**

Large gas turbines have revolutionised air travel, and continuing improvements in design and manufacturing have made them extremely efficient and reliable. However, small turbines for more down-to-earth applications are hindered by poor performance. Design know-how is needed if they are to be as successful as their larger cousins. The **STR** project developed new components and production processes for more affordable and efficient small gas turbines.

More information:
http://europa.eu.int/comm/research/industrial_technologies/articles/article_1166_en.html

For transport applications, where efficiency is paramount, the pressure is on to develop better ways of designing components for small, 30 to 200 kW gas turbine engines. The STR project set out to develop design methodologies for small turbomachine components that would allow reliably and efficient mass manufacture at a low cost. Design targets included efficiency, fuel and CO_2 emissions and engine size.
The partners designed and manufactured two sets of axial turbine components that were evaluated in a gas turbine engine. Results show substantial performance improvements. "Such step improvements in axial turbomachine design are new and pave the way for high efficiency turbine engines for the power and transportation industries," says project coordinator Dr Shahram Etemad of Imperial College London.
Efforts were also directed towards radial turbomachinery, and with similar success.



Radial turbomachines are used extensively – millions of them are in use in homes, vehicles and industries. STR reduced component manufacturing costs 30-fold by developing designs suitable for mass manufacture using precision castings instead of fully machined parts. Once these components become available they should make a big impact on Europe's transportation and deregulated electricity-generating markets.

KI-AF-04-005-EN-C

Events

Advanced Nanotechnology: Materials, Processes, Structures & Applications

4 -8 April 2005, NMRC, Cork, Ireland
VisionOnline advanced training week. http://www.nano.org.uk/events/Apr05/AdvancedNanotechnology.pdf

The World Nano-Economic Congress (WNEC)

20-21 April 2005, Dublin, Ireland
Addressing the realities of the industrial commercialisation of nanotechnology, the event is jointly organised by the European NanoBusiness Association and the Irish Nanotechnology Association.

ELECTROCOR 2005

2-4 May 2005, Cadiz, Spain
The Fifth International Conference on the Simulation of Electrochemical Processes http://www.wessex.ac.uk/conferences/2005/ecor05/index.html

ANVOC symposium 'Application of nanotechnologies for a cleaner environment.

30 May to 1 June 2005, Istanbul, Turkey
A conference on the application of nanotechnologies to the separation and recovery of volatile organic compounds from waste air streams using membranes.
http://www.membrane.nl/anvoc2005/

Nanoscale Surface Self-Assembly – a EuCheMS Conference

9-23 June 2005, Stockholm, Sweden
More information: http://www.surfchem.kth.se/yki/sfg/EUCHEM/Index.htm

New literature

Results of nanotechnology survey highlight wants and needs of Europe's scientists

The results of an on-line survey on 'a European strategy for nanotechnology' illustrate the areas that Europe's researchers consider should be a priority. Respondents overwhelmingly called for more European funding, new infrastructure, further nanotechnology education and training, increased international co-operation and a dialogue with society. For the survey results see http://www.nanoforum.org/

CORDIS publishes profiles of first FP6 projects in support of SMEs

The EU's Sixth Framework Programme (FP6) encourages participation by small and medium-sized enterprises (SMEs) in research projects, and includes special activities to increase SME competitiveness and research capabilities. CORDIS, the European Community Research and Development Information Service, has now published profiles of the first FP6 projects in support of SMEs at http://sme.cordis.lu/economic/eti_projects.cfm and http://sme.cordis.lu/collective/infobrochure.cfm#7

Scoreboard reveals decline in EU industrial R&D spending

The top 500 EU companies investing in research and development (R&D) spent a combined €101 billion on research in 2003 – down on the total for 2002, and in contrast to the increased investments made by leading non-EU companies. The finding was revealed in the first EU Industrial Research Investment Scoreboard, published on 10 December 2004. Download from ftp://ftp.cordis.lu/pub/nmp/docs/2004_scoreboard.zip

EU funding instruments – the Europides view

A new eight-page colour leaflet from the European Commission provides a more lighthearted overview of funding instruments offered for industrial research in the EU Sixth Framework Programme (FP6). The objective of research under this Thematic Priority (Nanotechnologies, knowledge-based Materials and new Production – NMP) is to achieve breakthrough through greater integration of partners, sectors and skills. The leaflet, together with associated posters and animated presentations, can be downloaded from http://www.europa.eu.int/comm/research/industrial_technologies/lists/documentlibrary_en.html or from http://www.cordis.lu/nmp/europides.htm

Useful links

Research DG – Sixth Framework Programme

Official site of the Commission Research DG that gives general information on the Sixth Framework Programme (FP6).
http://europa.eu.int/comm/research/fp6/index_en.html

CORDIS

The Community Research and Development Information Service (CORDIS) FP6 website provides all the information you need to participate in the Framework Programme.
http://www.cordis.lu/fp6/
Additional information can be found through the National Contact Points that provide guidance and practical information on participation in FP6.
http:/www.cordis.lu/fp6/getsupport/

Priority 3 – Industrial Technologies

For information about FP6 thematic priority 3: Nanotechnology and nanosciences, knowledge-based multifunctional materials, and new production processes and devices, http://europa.eu.int/comm/research/industrial_technologies/index_en.html
http://www.cordis.lu/fp6/nmp.htm
For more information specifically on nanotechnologies http://www.cordis.lu/nanotechnology/

EU-funded steel research

More information about coal and steel research, and the new Research Fund for Coal and Steel, can be found on the CORDIS steel website.
http://www.cordis.lu/coal-steel-rtd/steel/